

PERCEIVED SERVICE QUALITY, PERCEIVED VALUE AND HEALTH LITERACY AS PREDICTORS OF SATISFACTION, TRUST AND LOYALTY AMONG PATIENTS WITH CHRONIC DISEASES IN PRIMARY HEALTHCARE INSTITUTIONS IN MAOMING, CHINA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Primary healthcare institutions are expected to provide accessible, continuous and person-centred care for patients with chronic diseases. However, patient-reported determinants of satisfaction, trust and loyalty in primary healthcare remain insufficiently understood, particularly in non-metropolitan Chinese settings.

Objective: This study assessed patient perceived value (PPV), perceived service quality (PSQ), patient health literacy (PHL), patient satisfaction (PS), patient trust (PT) and patient loyalty (PL), and examined whether PPV, PSQ and PHL predicted PS, PT and PL among chronic disease patients in Maoming, China.

Materials and Methods: A cross-sectional survey was conducted among 600 outpatients with chronic diseases from 10 primary healthcare institutions, including six township health centres and four community health service centres. Structured questionnaires measured PPV, PSQ, PHL, PS, PT and PL. Descriptive statistics, group comparisons, simple linear regression and multivariable linear regression were performed using SPSS.

Results: No significant gender differences were observed. Significant age-group differences were observed for all six variables. Mean scores for PPV, PSQ, PHL, PS, PT and PL were 3.307 ± 0.495 , 3.451 ± 0.405 , 1.691 ± 0.515 , 3.410 ± 0.688 , 3.474 ± 0.847 and 3.398 ± 0.618 , respectively. In simple linear regression, compared with patients aged 18–44 years, those aged 45–59 years reported lower PS ($t = -2.734$, $p = 0.006$), whereas those aged ≥ 60 years reported lower PS, PT and PL (all $p < 0.001$). PPV, PSQ and PHL remained independently and positively associated with all three outcomes (all $p < 0.001$). In the final multivariable models, higher PPV, PSQ and PHL scores were independently and positively associated with higher PS, PT and PL scores (all $p < 0.001$).

Conclusion: Satisfaction, trust and loyalty were mainly associated with modifiable patient-facing factors. Improving perceived service quality, perceived value and health-literate communication may strengthen these relational outcomes and support sustained primary-care use.

KEYWORDS: primary healthcare; chronic diseases, patient perceived value, perceived service quality, patient health literacy, patient satisfaction, patient trust, patient loyalty

1. INTRODUCTION

Non-communicable diseases (NCDs) continue to place substantial pressure on health systems. World Health Organization reported that NCDs caused at least 43 million deaths in 2021, accounting for three-quarters of non-pandemic-related deaths globally (World Health Organization, 2025). Primary healthcare is positioned as a whole-of-society approach that brings prevention, treatment, rehabilitation and health promotion closer to people's everyday environments (Primary Health Care, 2025). These priorities are consistent with Sustainable Development Goal 3 (SDG 3): Ensure healthy lives and promote well-being for all at all ages (United Nations, 2015). SDG 3 is particularly relevant to chronic disease management because it emphasises the prevention and treatment of non-communicable diseases and access to quality essential healthcare services.

This policy logic is particularly relevant to chronic disease management in China. Primary healthcare institutions are expected to serve as a regular source of care for prevention, follow-up, medication guidance and long-term patient support. Yet, persistent preference for tertiary hospitals and uneven confidence in primary healthcare institutions suggest that physical access alone is insufficient. Patient perceived value, perceived service quality, health literacy, satisfaction, trust and loyalty are therefore important indicators of whether primary care is accepted as a credible and sustainable source of chronic care (Xu et al., 2025; Zhang et al., 2025a; Zhang et al., 2025b).

Patient perceived value (PPV) reflects the balance between perceived benefits and sacrifices, including time, cost, effort and psychological uncertainty (Feng & Duan, 2008). Patient perceived service quality (PSQ) captures how

patients evaluate the performance of service processes (Cronin & Taylor, 1994). In health services research, perceived quality is closely connected with satisfaction, value appraisal and behavioural intentions. Patient health literacy (PHL) is crucial because chronic disease management requires patients to access, understand, appraise and use health information over repeated encounters (Chinn et al., 2013).

Although satisfaction, trust and loyalty have been widely investigated in hospital settings, fewer studies have examined PPV, PSQ and PHL simultaneously as predictors of satisfaction, trust and loyalty among chronic disease patients in primary healthcare institutions. Existing evidence has commonly considered these constructs separately or in hospital-based populations, limiting understanding of how service appraisal, value appraisal and patient capability jointly relate to relational outcomes in primary care. While PSQ and PPV look at the institution's delivery, PHL captures the patient's internal capacity to engage with that delivery. Combining these approaches provides a holistic picture of the healthcare ecosystem. This gap is important because chronic disease care depends on repeated use of primary care, stable doctor–patient relationships and patient engagement. The present study therefore used baseline data from 10 primary healthcare institutions in Maoming, China, to describe patient-reported variables and identify modifiable predictors of relational outcomes.

2. MATERIALS AND METHODS

2.1 Study design and reporting guideline

This study used a cross-sectional survey design. The manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement, which provides guidance for the transparent and complete reporting of observational studies, including cross-sectional studies (von Elm et al., 2007).

2.2 Setting and participants

The survey was conducted from 1 March to 30 April 2025 in 10 primary healthcare institutions in Maoming, Guangdong Province, China, including six township health centres and four community health service centres. A stratified sampling strategy was used, with the five administrative districts of Maoming treated as strata. Primary healthcare institutions were selected within each district, and eligible patients were recruited systematically according to chronic disease registration numbers, with an initial quota of 64 participants per institution.

The minimum sample size was estimated using Daniel's single-population proportion formula:

$$n = \frac{Z^2 P \cdot (1 - P)}{d^2}$$

where $Z = 1.96$ for a 95% confidence level, $P = 0.343$, based on the reported prevalence of non-communicable diseases (NCDs) in China in 2018, and $d = 0.04$ as the absolute precision. The calculated minimum sample size was 542. After allowing for a 15% anticipated non-response or invalid-questionnaire rate, the target sample size was increased to 638 (Naing et al., 2022). A total of 640 questionnaires were distributed across the 10 institutions. After excluding incomplete or irregular questionnaires, 600 valid questionnaires were retained for analysis, exceeding the minimum required sample size.

Eligible participants were adults with diagnosed chronic diseases who attended one of the selected institutions during the survey period and were able to complete the questionnaire independently or with standardised assistance from trained investigators.

2.3 Measures

The questionnaire measured six variables: patient perceived value (PPV), perceived service quality (PSQ), patient health literacy (PHL), patient satisfaction (PS), patient trust (PT) and patient loyalty (PL). Table 1 presents the measurement basis, scoring and interpretation, role in the model, and source of each variable.

A pre-test was conducted before the baseline survey to assess questionnaire reliability and factorability. Cronbach's α coefficients for PPV, PSQ, PHL, PS, PT and PL ranged from 0.790 to 0.932, and Kaiser-Meyer-Olkin (KMO) values ranged from 0.706 to 0.900. These values exceeded commonly accepted thresholds of 0.70 for internal consistency and 0.60 for sampling adequacy, supporting acceptable internal consistency and sampling adequacy for factor analysis (Nunnally & Bernstein, 1994; Kaiser, 1974).

2.4 Data collection and quality control

Trained investigators administered the questionnaire using a standardised explanation to minimise interviewer-related variation (e.g., reading items aloud verbatim to patients with visual impairments or lower literacy without altering the wording). Completed questionnaires were checked for completeness and response regularity. Records with substantial missing information or obvious response irregularities were excluded before analysis.

Table 1. Measurement Framework and Scoring

Variables	Role in analysis	Measurement basis	Scoring / interpretation	Primary use in the model	Source

Patient perceived value (PPV)	Predictor	Chinese Patient Perceived Value Scale; perceived value literature	Five-point scale; higher score indicates stronger perceived value	Service value appraisal	(Feng & Duan, 2008)
Perceived service quality (PSQ)	Predictor	SERVPERF performance-based service quality approach	Five-point scale; higher score indicates better perceived service quality	Service performance appraisal	(Cronin & Taylor, 1994)
Patient health literacy (PHL)	Predictor	All Aspects of Health Literacy Scale (AAHLS)	Three-point scale; higher score indicates stronger health literacy	Patient capability	(Chinn et al., 2013)
Patient satisfaction (PS)	Outcome	EUROPEP tradition for evaluation of general practice care	Five-point scale; higher score indicates higher satisfaction	Relational evaluation	(Chen et al., 2020)
Patient trust (PT)	Outcome	Wake Forest Physician Trust Scale tradition	Five-point scale; higher score indicates higher trust	Relational confidence	(Chen et al., 2020)
Patient loyalty (PL)	Outcome	Patient loyalty and revisit/recommendation literature	Five-point scale; higher score indicates stronger loyalty intention	Behavioural intention	(Zhang, 2021)

2.5 Statistical analysis

Statistical analyses were performed using SPSS. Frequencies and percentages were used to describe categorical variables, whereas means and standard deviations were used to summarise continuous scale scores. Independent-samples t tests were used to examine gender differences. One-way analysis of variance (one-way ANOVA) was used for age-group comparisons; when the homogeneity-of-variance assumption was violated, Welch's robust test and Games–Howell post-hoc comparisons were applied. Simple linear regression was used to assess the unadjusted associations of demographic variables, PPV, PSQ and PHL with the three outcomes (PS, PT and PL). Multiple linear regression analyses were then conducted with demographic variables, PPV, PSQ and PHL as candidate predictors of PS, PT and PL; the final parsimonious models retained PPV, PSQ and PHL. Model fit was evaluated using the F statistic, R^2 , adjusted R^2 and the Durbin–Watson statistic. Statistical significance was set at $p < 0.05$.

2.6 Ethical considerations

The study protocol was reviewed and approved by the Research Ethics Committee of Management and Science University, Malaysia (Approval No. EA-L1-PGC-2025-04-0010), and by the Academic Review Committee of the Maoming Science and Technology Bureau (Approval No. 2025619). Before data collection, all participants received information about the study's purpose, procedures, potential risks, voluntary participation and data protection. Verbal informed consent was obtained from each participant before questionnaire administration, and confidentiality was maintained throughout the study.

3. RESULTS

3.1 Participant characteristics

The baseline sample included 600 valid respondents. Men and women were almost equally represented. More than half of the participants were aged 60 years or above (51.7%), and most were married (59.9%). Farmers/self-employed respondents (45.0%) and unemployed/retired respondents (32.5%) formed the majority of the cohort. Educational attainment was generally low (junior high school and below, 39.8%), and most participants reported annual household income below 60,000 yuan (62.0%). Multimorbidity was also common, with more than 60% reporting at least two chronic disease types (Table 2).

Table 2. Demographic Characteristics of the Baseline Study (N=600)

Variable		Total N (%)	Male N (%)	Female N (%)
Gender	Male	298 (49.7)	298 (49.7)	302 (50.3)
	Female	302 (50.3)		
Age	18-44	109 (18.2)	54 (18.1)	55 (18.2)
	45-59	181 (30.1)	84 (28.2)	97 (32.1)
	≥60	310 (51.7)	160 (53.7)	150 (49.7)
Marital Status	Unmarried	87 (14.5)	50 (16.8)	37 (12.3)
	Married	359 (59.9)	175 (58.7)	184 (60.9)
	Divorced	89 (14.8)	46 (15.4)	43 (14.2)
	Widowed	65 (10.8)	27 (9.1)	38 (12.6)
Occupatio n	Employees	135 (22.5)	58 (19.5)	77 (25.5)
	Unemployed/Retired	195 (32.5)	106 (35.6)	89 (29.5)
	Farmers/Self-employed	270 (45.0)	134 (45.0)	136 (45.0)
Education Level	Junior high school and below	239 (39.8)	129 (43.3)	110 (36.4)
	High school / Vocational school	179 (29.8)	85 (28.5)	94 (31.1)
	College/Undergraduate degree	136 (22.7)	67 (22.5)	69 (22.8)
	Master's degree or higher	46 (7.7)	17 (5.7)	29 (9.6)
Income	<60,000	372 (62.0)	191 (64.1)	181 (59.9)
	60,000-120,000	169 (28.2)	80 (26.8)	89 (29.5)
	> 120,000	59 (9.8)	27 (9.1)	32 (10.6)
Types of chronic diseases	1	234 (39.0)	118 (39.6)	116 (38.4)
	2	217 (36.2)	109 (36.6)	108 (35.8)
	≥3	149 (24.8)	71 (23.8)	78 (25.8)

Note: Percentages are calculated using the total valid baseline sample or the gender-specific denominators, as appropriate.

3.2 Gender-based comparisons

Gender-based comparisons showed no statistically significant differences for any of the six variables, indicating that men and women reported broadly comparable perceptions and relational outcomes in this baseline cohort (Table 3).

Table 3. Gender-Based Comparisons of Variables (N = 600)

Variable	Mean ± SD	Male (N = 298) Mean ± SD	Female (N = 302) Mean ± SD	P-value
PPV	3.307 ± 0.495	3.321 ± 0.500	3.292 ± 0.490	0.467
PSQ	3.451 ± 0.405	3.473 ± 0.406	3.429 ± 0.404	0.184
PHL	1.691 ± 0.515	1.689 ± 0.520	1.692 ± 0.510	0.946
PS	3.410 ± 0.688	3.385 ± 0.702	3.434 ± 0.673	0.380
PT	3.474 ± 0.847	3.460 ± 0.853	3.488 ± 0.841	0.689
PL	3.398 ± 0.618	3.398 ± 0.604	3.397 ± 0.633	0.990

Note: P-values were obtained from independent-samples t tests. Statistical significance was set at $p < 0.05$; none of the comparisons was statistically significant.

3.3 Age-group differences

Significant age-group differences were observed for all six variables. Patients aged 18–44 years generally reported the most favourable scores, whereas patients aged 60 years or above had lower scores for PPV, PSQ, PHL, PS, PT and PL. The strongest age gradient was observed for PHL, for which the mean score decreased monotonically across the three age groups (Table 4).

Table 4. Baseline age-group differences in Patient Perceived Value (PPV), Perceived Service Quality (PSQ), Patient Health Literacy (PHL), Patient Satisfaction (PS), Patient Trust (PT) and Patient Loyalty (PL) (N = 600)

Variable	Age group	N	Mean ± SD	Omnibus test	p-value	Significant post-hoc differences ($p < 0.05$)
PPV	18–44	109	3.393 ± 0.463	F (2,597) = 3.222	0.041	18–44 > ≥60
	45–59	181	3.331 ± 0.484			
	≥60	310	3.237 ± 0.552			
PSQ	18–44	109	3.409 ± 0.332	F (2,597) = 6.537	0.002	18–44 > ≥60

	45–59	181	3.320 ± 0.418			
	≥60	310	3.230 ± 0.482			
PHL	18–44	109	1.893 ± 0.596	Welch F (2,250.615) =12.273	<0.001	18–44 > 45–59; 18–44 > ≥60; 45–59 > ≥60
	45–59	181	1.724 ± 0.531			
	≥60	310	1.600 ± 0.449			
PS	18–44	109	3.653 ± 0.638	F (2,597) =9.414	<0.001	18–44 > 45–59; 18–44 > ≥60
	45–59	181	3.413 ± 0.656			
	≥60	310	3.321 ± 0.693			
PT	18–44	109	3.732 ± 0.769	F (2,597) =9.710	<0.001	18–44 > ≥60; 45–59 > ≥60
	45–59	181	3.540 ± 0.877			
	≥60	310	3.327 ± 0.881			
PL	18–44	109	3.613 ± 0.632	F (2,597) =12.921	<0.001	18–44 > ≥60; 45–59 > ≥60
	45–59	181	3.470 ± 0.642			
	≥60	310	3.269 ± 0.636			

Note: Omnibus tests were one-way ANOVA except for PHL, which used Welch's robust test because the homogeneity-of-variance assumption was violated. Post-hoc comparisons were interpreted accordingly, Tukey HSD for variables meeting homogeneity assumptions and Games–Howell for PHL. PHL was scored on a 1–3 scale, whereas PPV, PSQ, PS, PT and PL were scored on 1–5 scales; absolute mean differences should therefore be interpreted within each scale's response range rather than compared directly across constructs.

3.4 Simple linear regression results

In the simple regression models, age showed the most consistent demographic associations. Compared to patients aged 18–44 years, those aged 45–59 years reported lower PS ($t = -2.734$, $p = 0.006$), but the associations with PT and PL were not statistically significant. Patients aged ≥60 years reported lower PS ($t = -4.330$), PT ($t = -4.185$) and PL ($t = -4.711$; all $p < 0.001$). Unemployed or retired status was associated with lower PS and PT, whereas college or undergraduate education was associated with higher PS, PT and PL; a master's degree or higher was associated with higher PL. PPV, PSQ and PHL were positively associated with all three outcomes (all $p < 0.001$), indicating that service appraisal, value appraisal and health literacy capacity were more consistently related to relational outcomes than most demographic characteristics (Table 5).

Table 5. Simple Linear Regression Model of Patient Satisfaction (PS), Patient Trust (PT) and Patient Loyalty (PL)

Model		t (PS)	P-value (PS)	t (PT)	P-value (PT)	t (PL)	P-value (PL)
Gender	Female	0.878	0.380	0.400	0.689	-0.013	0.990
Age	45-59	-2.734	0.006*	-1.832	0.067	-1.799	0.072
	≥60	-4.330	< 0.001*	-4.185	< 0.001*	-4.711	< 0.001*
Marital Status	Married	-0.053	0.958	1.261	0.208	0.370	0.711
	Divorced	-0.088	0.930	-0.332	0.740	-0.356	0.722
	Widowed	0.533	0.594	1.209	0.227	0.628	0.530
Occupation Type	Unemployed/Retired	-2.786	0.006*	-2.493	0.013*	-1.229	0.220
	Farmer/Self-employed	-0.896	0.371	-0.326	0.745	-0.148	0.883
Education Level	High school/Vocational school	1.034	0.302	-0.335	0.738	0.805	0.421
	College/Undergraduate degree	2.732	0.006*	1.977	0.048*	3.951	< 0.001*
	Master's degree or higher	1.352	0.177	1.955	0.051	2.656	0.008*
Income	60,000-120,000	1.749	0.081	1.173	0.241	0.434	0.665
	> 120,000	0.309	0.757	0.736	0.462	1.683	0.093
Chronic Disease Types	2	0.311	0.756	-0.096	0.923	0.135	0.893
	≥3	0.503	0.615	-0.049	0.961	0.740	0.460

Independent Variable	PPV	10.563	<0.001*	8.994	<0.001*	7.081	<0.001*
	PSQ	9.952	<0.001*	10.993	<0.001*	12.836	<0.001*
	PHL	9.131	<0.001*	7.485	<0.001*	8.704	<0.001*

Note: *p < 0.05. Reference categories: male; age 18–44; unmarried; employees; junior high school and below; income <60,000 yuan; one chronic disease type. To keep the manuscript table compact, the original dissertation summary table is retained as t and p values.

3.5 Multiple linear regression results

Multiple linear regression analyses initially considered demographic variables, PPV, PSQ and PHL as candidate predictors. The final parsimonious models retained PPV, PSQ and PHL, each of which was positively associated with PS, PT and PL (all p < 0.001). Based on adjusted R² values, the final models accounted for 29.0%, 25.8% and 28.8% of the variance in PS, PT and PL, respectively (Table 6).

Table 6. Combined Multiple Linear Regression Analysis of Patient Perceived Value (PPV), Perceived Service Quality (PSQ) and Patient Health Literacy (PHL) on Patient Satisfaction (PS), Patient Trust (PT) and Patient Loyalty (PL)

Outcome	Predictor	B	SE	95% CI lower	95% CI upper	t	p-value
PS	Constant	0.062	0.233	-0.394	0.519	0.269	0.788
	PPV	0.399	0.050	0.301	0.497	7.985	<0.001*
	PSQ	0.432	0.061	0.311	0.552	7.048	<0.001*
	PHL	0.319	0.048	0.225	0.412	6.683	<0.001*
PT	Constant	-0.602	0.293	-1.177	-0.027	-2.057	0.040
	PPV	0.398	0.063	0.275	0.522	6.331	<0.001*
	PSQ	0.655	0.077	0.504	0.807	8.502	<0.001*
	PHL	0.295	0.060	0.177	0.413	4.911	<0.001*
PL	Constant	0.355	0.209	-0.056	0.766	1.697	0.090
	PPV	0.175	0.045	0.086	0.263	3.887	<0.001*
	PSQ	0.582	0.055	0.473	0.690	10.554	<0.001*
	PHL	0.271	0.043	0.186	0.355	6.308	<0.001*

Note: *p < 0.05. Candidate predictors included gender, age group, marital status, occupation, education, income, number of chronic disease types, PPV, PSQ and PHL; only variables retained in the final parsimonious models are presented. Model fit: PS, F (3,596) = 82.394, p<0.001, R²=0.293, adjusted R²=0.290, Durbin-Watson=2.096; PT, F (3,596) = 70.308, p<0.001, R²=0.261, adjusted R²=0.258, Durbin-Watson=2.028; PL, F (3,596) = 81.834, p<0.001, R²=0.292, adjusted R²=0.288, Durbin-Watson=1.890.

3.6 Analytical framework

This baseline cross-sectional study examined how modifiable patient-facing factors were associated with relational outcomes in primary healthcare. Patient perceived value (PPV), perceived service quality (PSQ) and patient health literacy (PHL) were treated as explanatory predictors because they reflect patients' evaluation of service value, care quality and capacity to understand and use health information. Patient satisfaction (PS), patient trust (PT) and patient loyalty (PL) were treated as relational outcomes because they indicate patients' overall appraisal of care, confidence in healthcare providers and willingness to continue using primary healthcare services.

The analysis first described the baseline levels of PPV, PSQ, PHL, PS, PT and PL and then examined demographic differences by gender and age group. Simple linear regression was used to explore associations between potential predictors and PS, PT and PL. Multiple linear regression analyses subsequently evaluated demographic variables, PPV, PSQ and PHL as candidate predictors; the final parsimonious models retained PPV, PSQ and PHL. Because the study used cross-sectional baseline data, the framework was interpreted in terms of statistical prediction and association rather than causality.

4. DISCUSSION

4.1 Principal findings

This study provides a baseline account of patient-reported experience and relational outcomes among chronic disease patients in Maoming primary healthcare institutions. Three findings are central. First, mean scores for PPV, PSQ, PS, PT and PL were around the midpoint of their five-point scales, whereas PHL was measured on a

three-point scale and should be interpreted separately. Second, gender differences were not significant, but age-group differences were consistent, with patients aged 60 years or above generally reporting less favourable perceptions and outcomes. Third, PPV, PSQ and PHL were consistently and positively associated with PS, PT and PL in the final models.

The moderate levels of PS, PT and PL suggest that primary healthcare in this cohort was not perceived negatively, but there is meaningful room for improvement. For chronic disease management, moderate scores should not be interpreted as an adequate endpoint, because sustained primary-care use depends on repeated consultations, medication adjustment, lifestyle counselling and patients' confidence that primary care can provide useful and reliable support over time. Recent Chinese primary-care evidence similarly shows that patient participation and perceived value are important for trust among chronic disease patients, and that patients with higher health literacy are more likely to participate in primary healthcare (Xu et al., 2025; Zhang et al., 2025a). Because PHL was measured on a 3-point scale, while the other constructs used 5-point scales, its mean should be interpreted within its own response range rather than compared directly with the other mean scores.

The present study extends these findings by demonstrating that PPV, PSQ and PHL were consistently associated not only with trust but also with satisfaction and loyalty in the same baseline cohort. Patient perceived value has been found to mediate the relationship between patient participation and trust among 884 chronic disease patients in Shandong (Zhang et al., 2025a), while health literacy profiles have been reported to be associated with participation in primary healthcare among 911 chronic disease patients (Xu et al., 2025).

4.2 Interpretation of demographic findings

The absence of significant gender differences indicates that gender composition is unlikely to explain baseline variation in the six variables. This finding suggests that male and female patients in this sample had broadly comparable primary-care experiences, and that gender alone may be less useful than age, health literacy or service-experience indicators for identifying groups requiring additional support. Nevertheless, gender-related differences in healthcare experience may vary across cultural and service contexts and should not be dismissed in future research.

Age differences deserve closer attention. The ≥ 60 group reported lower PPV, PSQ, PHL, PS, PT and PL. This may reflect a combination of lower health-literacy resources, greater multimorbidity, higher visit frequency and greater exposure to access or navigation barriers. In older chronic disease patients, routine consultations often involve medication adjustments, follow-up instructions and lifestyle recommendations. If these are not communicated clearly or adapted to patients' literacy level, lower perceived value and lower relational outcomes may follow. The health-literacy profile study among 911 chronic disease patients in Shandong supports this interpretation by showing that age and education were associated with health-literacy profiles and that higher literacy was linked to stronger participation in primary healthcare (Xu et al., 2025). The present findings therefore suggest that older age should not be treated simply as a fixed risk factor but as a marker of greater communication, navigation and support needs in chronic disease management. Because these differences were observed cross-sectionally, the study cannot determine whether they arose from ageing itself, health-literacy limitations, disease complexity or accumulated service experiences; older age is therefore better interpreted as a marker of greater support needs than as a causal explanation.

This age-related pattern is consistent with broader chronic disease care evidence. A study examined 2,429 chronic disease patients in 80 primary healthcare facilities in Johannesburg and reported that satisfaction was shaped by both patient-level and service-level factors rather than access alone (Kagura et al., 2023). Similarly, an analysis of outpatient chronic disease care in Korea emphasised that patient-centred outpatient service quality is essential for improving satisfaction and health outcomes (Cha, 2025). Although these studies were conducted in different health systems and cannot directly explain the Maoming findings, they support the broader interpretation that older patients require not merely available services but care that is understandable, responsive and relevant to their complex long-term needs.

4.3 Interpretation of regression findings

The simple linear regression results showed that demographic associations existed, especially for age, but the most consistent associations were observed for PPV, PSQ and PHL. This distinction is practically important. Demographic characteristics can identify vulnerable groups, but they are not easily modifiable. By contrast, service quality, value perception and health-literate communication can be changed through institutional management, staff training, workflow design and patient education.

In the final multiple regression models, PPV, PSQ and PHL remained positively associated with PS, PT and PL. Based on adjusted R^2 values, the models explained 29.0% of the variance in satisfaction, 25.8% in trust and 28.8% in loyalty. The remaining unexplained variance should be viewed as an opportunity for further investigation of structural and contextual determinants of primary care in Maoming. These may include continuity with the same clinician across visits, consultation duration, medicine availability and out-of-pocket costs, waiting time, referral experience, disease severity, family support and institutional reputation. The Durbin–Watson statistics were close to 2.0, suggesting no obvious residual autocorrelation; however, this should not be over-interpreted as evidence

of causal adequacy because the study was cross-sectional. The regression results should therefore be interpreted as adjusted statistical associations rather than causal pathways.

PSQ was positively associated with all three relational outcomes. Patients' evaluations of service performance may reflect perceived reliability, responsiveness and communication during care. This interpretation is consistent with the SERVPERF emphasis on experienced performance (Cronin & Taylor, 1994). A survey of 3,025 primary healthcare patients in Shandong found that those reporting high perceived service quality were more likely to regard primary healthcare as their usual source of care, which directly supports the present finding that PSQ is strongly associated with relational outcomes relevant to sustained primary-care use (Zhang et al., 2025b). Although that study examined service-use orientation rather than satisfaction, trust or loyalty, it supports the relevance of perceived service quality to sustained primary-care engagement.

Nevertheless, the association between PSQ and relational outcomes should not be interpreted as evidence that technical service capacity alone is sufficient. Patients often evaluate quality through visible and experiential dimensions, such as waiting time, staff attitude, clarity of explanation, responsiveness, follow-up reliability and referral convenience. The implementation of China's hierarchical medical system did not automatically improve perceived primary-care quality and was associated with a short-term decline in perceived quality among rural residents, suggesting that policy-level promotion of primary care must be matched by improvements that patients can perceive (Zhao et al., 2025).

PPV was also positively associated with all three outcomes. For chronic disease patients, value is not limited to financial cost; it includes time, convenience, usefulness of advice, emotional reassurance and whether the consultation helps patients manage their condition. A 2025 Shandong study of 884 chronic disease patients found that perceived value mediated the association between patient participation and trust in primary healthcare physicians, supporting the relevance of value appraisal to doctor–patient relationships (Zhang et al., 2025a). The present study broadens this evidence by showing that PPV was associated not only with trust but also with satisfaction and loyalty. Because the present analysis was cross-sectional, these associations do not establish the direction of influence.

PHL was a significant predictor of PS, PT and PL. Patients with stronger literacy-related capacity may understand clinical explanations more easily, ask more relevant questions, follow care plans with greater confidence and evaluate primary-care services more constructively. Conversely, lower PHL may make the consultation feel confusing or less useful, especially for older patients with multiple chronic conditions. This supports the need to embed health-literate communication, teach-back, simple written materials and patient-centred explanations into routine chronic disease consultations (Xu et al., 2025; Chinn & McCarthy, 2013). This interpretation is supported by a meta-analysis of randomised controlled trials, which found that health literacy interventions are effective for patients with chronic diseases, although intervention quality, duration and reliable primary-care support remain important (Shao et al., 2023). A systematic review further shows that digital health literacy is increasingly relevant for patients with diabetes, hypertension and rheumatoid arthritis, suggesting that health literacy support in primary care should include both face-to-face communication and the ability to use digital health information (Zaghloul et al., 2025).

4.4 Relational outcomes: satisfaction, trust and loyalty

Satisfaction, trust and loyalty should be understood as related but distinct relational outcomes. Satisfaction reflects patients' evaluation of the service experience, trust reflects confidence in providers and institutions, and loyalty reflects willingness to continue using or recommending primary healthcare. A survey of 1,696 patients in Henan public hospitals found that patient satisfaction affected loyalty directly and indirectly through trust, indicating that trust can function as an important relational bridge between experience and behavioural intention (Liu et al., 2021). Although the study was conducted in hospitals rather than primary healthcare institutions, it supports the analytical decision of the present study to examine PS, PT and PL together.

The trust findings are also consistent with evidence from Chinese healthcare institutions. An examination of 564 tuberculosis patients in Dalian found that doctor–patient communication, medical service quality and service satisfaction were positively associated with patient trust, with service quality and satisfaction acting as mediating mechanisms (Du et al., 2020). This is consistent with the positive association between PSQ and PT in the present study. However, the present study extends this evidence to chronic disease patients in primary healthcare institutions.

Loyalty deserves particular attention because it is directly connected with sustained primary-care use. A national cross-sectional study of 2,697 patients in 2025 found that loyalty to primary care institutions in China was associated with demographic characteristics, family doctor contract status, willingness to seek care from primary care institutions, trust and satisfaction (Li et al., 2025). Compared to the national study, the present research provides a more focused analysis of chronic disease patients in a non-metropolitan city and shows that modifiable experience-related factors, especially PSQ, were strongly associated with loyalty.

5. CONTRIBUTION AND IMPLICATIONS

This study extends current evidence by integrating PPV, PSQ and PHL within a single baseline model of PS, PT and PL among chronic disease patients in primary healthcare, while providing data from non-metropolitan

Maoming. The findings connect service appraisal, value appraisal and patient capability with distinct relational outcomes and identify modifiable targets that are more actionable than demographic characteristics alone. In practice, primary healthcare managers should prioritise reliability, responsiveness, continuity, clear communication and patient-relevant advice, frontline staff should use plain language, teach-back, concise written instructions and follow-up reinforcement, particularly for older adults and patients with lower educational attainment. These service and communication improvements may strengthen satisfaction, trust and loyalty and thereby support sustained primary-care use and the implementation of hierarchical diagnosis and treatment. These implications are also aligned with SDG 3 by supporting patient-centred chronic disease management and access to quality primary healthcare. Furthermore, the international academic collaboration underpinning this study reflects Sustainable Development Goal 17 (SDG 17): “Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development” (United Nations, 2015). This collaboration illustrates how international knowledge exchange and institutional partnerships can contribute to locally relevant evidence for shared primary healthcare challenges.

6. LIMITATIONS

Several limitations should be considered. The cross-sectional design precludes causal inference and allows the possibility of reciprocal relationships between patient appraisals and relational outcomes. All constructs were self-reported, creating potential common-method and social-desirability bias. As the study was conducted in selected primary healthcare institutions in Maoming, the generalisability of the findings to other regions of China and different healthcare settings should be interpreted with caution. In addition, unmeasured factors, including continuity with a usual clinician, consultation duration, disease severity, medication availability, referral experience and family support, may account for additional outcome variation. Finally, because PHL used a three-point scale whereas the other constructs used five-point scales, direct comparison of their raw mean scores is inappropriate.

7. FUTURE RESEARCH

Future longitudinal and intervention studies should test whether improvements in service quality, perceived value and health-literate communication produce subsequent changes in satisfaction, trust and loyalty. Qualitative work could clarify why older patients report less favourable experiences and identify age-sensitive communication and navigation strategies. Multi-centre studies across diverse Chinese regions should also assess the robustness and generalisability of the observed associations. Future studies should also incorporate structural service indicators, particularly continuity with the same clinician, medicine availability and out-of-pocket costs, to clarify additional variation in patient trust and loyalty.

8. CONCLUSION

Among 600 chronic disease patients attending primary healthcare institutions in Maoming, satisfaction, trust and loyalty were moderate, while older patients reported less favourable scores across patient appraisals and relational outcomes. In the final multivariable models, higher PPV, PSQ and PHL scores were independently and positively associated with higher PS, PT and PL scores. These findings suggest that improving relational outcomes requires more than expanding service availability: primary healthcare institutions should strengthen reliable and responsive service delivery, enhance the perceived usefulness of consultations and embed health-literate communication into routine chronic disease care. Such modifiable strategies may support sustained primary-care use in non-metropolitan Chinese settings.

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Conflict of Interest

The authors declare that they have no conflict of interest. The findings of this study are intended solely for academic research and for informing improvements in primary healthcare service quality, chronic disease management and patient-centred care. No commercial, financial or personal relationships influenced the design, conduct, analysis or reporting of this study.

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Data Availability

The datasets generated and/or analysed during the current study are not publicly available because they contain research data from patients in primary healthcare institutions, but anonymised data may be made available from

the corresponding author on reasonable request and subject to ethical approval. Detailed response frequency distributions for the six study variables are available in Appendices I–VI.

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APPENDIX

APPENDIX I: Item-Level Response Distribution of the Patient Perceived Value (PPV) Scale (Feng & Duan, 2008)

Score	5	4	3	2	1
Items	N (%)	N (%)	N (%)	N (%)	N (%)
Functional value					
PPVF1. Compared with my financial resources and energy, provide good medical technical services.	17 (2.8)	184(30.7)	211(35.2)	161(26.8)	27 (4.5)
PPVF2. Compared with the financial resources and energy I paid, the nursing service provided is very good.	16 (2.7)	162(27.0)	256(42.7)	152(25.3)	14 (2.3)
PPVF3. Compared with the financial resources and energy I paid, provide high quality logistics and ancillary services.	17 (2.8)	150(25.0)	277(46.2)	140(23.3)	16 (2.7)
Emotional value					
PPVE4. The doctor-patient relationship here is harmonious.	37 (6.2)	288(48.0)	200(33.3)	70 (11.7)	5 (0.8)
PPVE5. Convenient and quick to meet my medical service needs.	32 (5.3)	281(46.8)	195(32.5)	83 (13.8)	9 (1.5)
PPVE6. Understand my psychological feelings, take good care of me.	28 (4.7)	299(49.8)	193(32.2)	71 (11.8)	9 (1.5)
PPVE7. Make me know more information about my illness.	40 (6.7)	291(48.5)	187(31.2)	68 (11.3)	14 (2.3)
Social value					
PPVS8. Let me overcome the panic about the illness and restore confidence in life.	35 (5.8)	272(45.3)	204(34.0)	78 (13.0)	11 (1.8)
PPVS9. Enable me to overcome illness and return to normal life (social roles).	44 (7.3)	268(44.7)	204(34.0)	79 (13.2)	5 (0.8)
PPVS10. More relaxed than before the doctor.	29 (4.8)	290(48.3)	174(29.0)	101(16.8)	6 (1.0)
Scoring standard: 1=Strongly disagree; 2=Disagree; 3=Unsure; 4=Agree; 5=Strongly agree					

Mean PPV = 3.307 ± 0.495.

APPENDIX II: Item-Level Response Distribution of the Perceived Service Quality (PSQ) Scale (Cronin & Taylor, 1994)

Score	5	4	3	2	1
Items	N (%)	N (%)	N (%)	N (%)	N (%)
Tangibles					
PSQT1. Modern, well-matched medical equipment and diagnostic instruments are available here.	38(6.3)	255 (42.5)	220 (36.7)	72 (12.0)	15 (2.5)
PSQT2. Hospitals' physical facilities should be visually appealing.	12 (2.0)	212 (35.3)	270 (45.0)	106 (17.7)	0 (0.0)
PSQT3. Hospital employees should appear neat.	5 (0.8)	214 (35.7)	302 (50.3)	79 (13.2)	0 (0.0)
Reliability					
PSQB4. Hospitals should provide their services at the time they promise to do so.	56 (9.3)	182 (30.3)	276 (46.0)	64 (10.7)	22 (3.7)
PSQB5. When patients have problems, hospital employees should be sympathetic and reassuring.	73 (12.2)	210 (35.0)	204 (34.0)	75 (12.5)	38 (6.3)
PSQB6. Hospitals should be accurate in their billing.	74 (12.3)	227 (37.8)	222 (37.0)	38 (6.3)	39 (6.5)
Responsiveness					

PSQR7. Hospital employees should tell patients exactly when services will be performed.	94 (15.7)	299 (49.8)	145 (24.2)	61 (10.2)	1 (0.2)
PSQR8. It is realistic for patients to expect prompt service from hospital employees.	43 (7.2)	313 (52.2)	185 (30.8)	49 (8.2)	10 (1.7)
PSQR9. Hospital employees should always be willing to help patients.	16 (2.7)	242 (40.3)	268 (44.7)	73 (12.2)	1 (0.2)
Assurance					
PSQA10. Patients should be able to feel safe in their interactions with hospital employees.	139 (23.2)	220 (36.7)	173 (28.8)	54 (9.0)	14 (2.3)
PSQA11. Hospital employees should be knowledgeable.	116 (19.3)	253 (42.2)	159 (26.5)	32 (5.3)	40 (6.7)
PSQA12. Hospital employees should be polite.	128 (21.3)	199 (33.2)	193 (32.2)	45 (7.5)	35 (5.8)
PSQA13. Hospital employees should get adequate support from their employers to do their jobs well.	89 (14.8)	272 (45.3)	163 (27.2)	68 (11.3)	8 (1.3)
Empathy					
PSQE14. Hospital employees should be expected to give patients personal attention.	46 (7.7)	238 (39.7)	245 (40.8)	65 (10.8)	6 (1.0)
PSQE15. It is realistic to expect hospitals to have their patients' best interests at heart.	37 (6.2)	219 (36.5)	265 (44.2)	65 (10.8)	14 (2.3)
Scoring standard: 1= very poor; 2= poor; 3= average; 4= good; 5= very good					

Mean PSQ = 3.451 ± 0.405.

APPENDIX III: Item-Level Response Distribution of the Patient Health Literacy (PHL) Scale (Chinn et al., 2013)

Score	3	2	1
Items	N (%)	N (%)	N (%)
Corresponding to skills in using written health information			
PHL1. How often do you need someone to help you when you are given information to read by your doctor, nurse or pharmacist?	84 (14.0)	263 (43.8)	253 (42.2)
PHL2. When you need help, can you easily get hold of someone to assist you?	88 (14.7)	165 (27.5)	347 (57.8)
PHL3. Aggregate of PHL1 and PHL2	74 (12.3)	181 (30.2)	345 (57.5)
PHL4. Do you need help to fill in official documents?	65 (10.8)	219 (36.5)	316 (52.7)
Communicating with health care providers			
PHL5. When you talk to a doctor or nurse, do you give them all the information they need to help you?	116 (19.3)	179 (29.8)	305 (50.8)
PHL6. When you talk to a doctor or nurse, do you ask the questions you need to ask?	121 (20.2)	207 (34.5)	272 (45.3)
PHL7. When you talk to a doctor or nurse, do you make sure they explain anything that you do not understand?	121 (20.2)	258 (43.0)	221 (36.8)
Health information management			
PHL8. Are you someone who likes to find out lots of different information about your health?	141 (23.5)	170 (28.3)	289 (48.2)
PHL9. How often do you think carefully about whether health information makes sense in your particular situation?	147 (24.5)	169 (28.2)	284 (47.3)
PHL10. How often do you try to work out whether information about your health can be trusted?	130 (21.7)	155 (25.8)	315 (52.5)
PHL11. Are you the sort of person who might question your doctor's or nurse's advice based on your own research?	135 (22.5)	149 (24.8)	316 (52.7)
Scoring standard: 1= rarely; 2= sometimes; 3= often			

Mean PHL = 1.691 ± 0.515.

APPENDIX IV: Item-Level Response Distribution of the Patient Satisfaction (PS) Scale (Chen et al., 2020)

Score	5	4	3	2	1
Items	N (%)	N (%)	N (%)	N (%)	N (%)
Clinical Behavior					
PS1. Making you feel you have time during consultation.	80 (13.3)	234 (39.0)	115 (19.2)	159 (26.5)	12 (2.0)
PS2. Interest in your personal situation.	77 (12.8)	210 (35.0)	218 (36.3)	78 (13.0)	17 (2.8)
PS3. Making it easy for you to tell him or her about your problem.	65 (10.8)	228 (38.0)	181 (30.2)	118 (19.7)	8 (1.3)
PS4. The doctor invites you to participate in medical decision-making (e.g., choice of medication, treatment methods).	109(18 .2)	269 (44.8)	119 (19.8)	96 (16.0)	7 (1.2)
PS5. Listening to you.	91 (15.2)	293 (48.8)	114 (19.0)	87 (14.5)	15 (2.5)
PS6. Keeping your records and data confidential.	103(17 .2)	188 (31.3)	126 (21.0)	172 (28.7)	11 (1.8)
PS7. Quick relief of your symptoms.	91 (15.2)	199 (33.2)	215 (35.8)	89 (14.8)	6 (1.0)
PS8. Helping you to feel well so that you can perform your normal daily activities.	74 (12.3)	285 (47.5)	118 (19.7)	108 (18.0)	15 (2.5)
PS9. Thoroughness.	92 (15.3)	216 (36.0)	190 (31.7)	96 (16.0)	6 (1.0)
PS10. The doctor checks your physical condition (e.g., blood pressure, blood sugar levels).	70 (11.7)	201 (33.5)	198 (33.0)	125 (20.8)	6 (1.0)
PS11. Offering you services for preventing diseases (e.g., screening, health checks, immunizations).	80 (13.3)	181 (30.2)	156 (26.0)	168 (28.0)	15 (2.5)
PS12. Explaining the purpose of tests and treatments and ensuring that you understood how they addressed your concerns.	78 (13.0)	215 (35.8)	145 (24.2)	150 (25.0)	12 (2.0)
PS13. Telling you what you want to know about your symptoms and/or illness.	75 (12.5)	222 (37.0)	209 (34.8)	74 (12.3)	20 (3.3)
PS14. Helping you deal with emotional problems related to your health status.	64 (10.7)	236 (39.3)	191 (31.8)	94 (15.7)	15 (2.5)
PS15. Helping you understand the importance of following his or her advice.	81 (13.5)	289 (48.2)	143 (23.8)	82 (13.7)	5 (0.8)
Continuity and Cooperation					
PS16. Knowing what s/he had done or told you during consultation.	93 (15.5)	228 (38.0)	145 (24.2)	90 (15.0)	44 (7.3)
PS17. Preparing you for what to expect from specialist or hospital care.	139(23 .2)	152 (25.3)	169 (28.2)	103 (17.2)	37 (6.2)
PS18. The helpfulness of the staff (other than the doctor).	133(22 .2)	156 (26.0)	170 (28.3)	104 (17.3)	37 (6.2)
Organization of Care					
PS19. Getting an appointment to suit you.	85 (14.2)	186 (31.0)	176 (29.3)	111 (18.5)	42 (7.0)
PS20. Getting through to the practice on the telephone.	120(20 .0)	160 (26.7)	163 (27.2)	112 (18.7)	45 (7.5)
PS21. Being able to speak to the general practitioner on the telephone.	117(19 .5)	149 (24.8)	176 (29.3)	111 (18.5)	47 (7.8)
PS22. Waiting time in the waiting room.	109(18 .2)	164 (27.3)	178 (29.7)	114 (19.0)	35 (5.8)
PS23. Rapid service is available for emergencies (sudden illness, accidental injury, poisoning, allergic reactions, cardiovascular/cerebrovascular emergencies, etc.).	144(24 .0)	183 (30.5)	141 (23.5)	91 (15.2)	41 (6.8)
Scoring standard: 1=Strongly disagree; 2=Disagree; 3=Unsure; 4=Agree; 5=Strongly agree					

Mean PS = 3.410 ± 0.688.

APPENDIX V: Item-Level Response Distribution of the Patient Trust (PT) Scale (Chen et al., 2020)

Score	5	4	3	2	1
Items	N (%)	N (%)	N (%)	N (%)	N (%)
Technical competence					
PT1. My doctor will do whatever it takes to provide me with all the care I need.	96 (16.0)	177 (29.5)	154 (25.7)	122 (20.3)	51 (8.5)
PT2. Sometimes my doctor cares more about what is convenient for him/her than about my medical needs.	154 (25.7)	155 (25.8)	158 (26.3)	105 (17.5)	28 (4.7)
PT3. My doctor's medical skills are not as good as they should be.	112 (18.7)	182 (30.3)	156 (26.0)	130 (21.7)	20 (3.3)
PT4. My doctor is extremely thorough and careful.	91 (15.2)	182 (30.3)	186 (31.0)	95 (15.8)	46 (7.7)
PT5. I completely trust my doctor's decisions about which medical treatments are best for me.	119 (19.8)	188 (31.3)	142 (23.7)	116 (19.3)	35 (5.8)
Benevolence					
PT6. My doctor is totally honest in telling me about all the different treatment options available for my condition.	119 (19.8)	176 (29.3)	142 (23.7)	125 (20.8)	38 (6.3)
PT7. Sometimes my doctor does not pay full attention to what I am trying to tell him/her.	125 (20.8)	204 (34.0)	138 (23.0)	114 (19.0)	19 (3.2)
PT8. My doctor only thinks about what is best for me.	228 (38.0)	133 (22.2)	136 (22.7)	80 (13.3)	23 (3.8)
PT9. I have no worries about putting my life in my doctor's hands	167 (27.8)	176 (29.3)	123 (20.5)	115 (19.2)	19 (3.2)
PT10. All in all, I have complete trust in my doctor.	198 (33.0)	141 (23.5)	154 (25.7)	88 (14.7)	19 (3.2)
Scoring standard: 1 = Strongly disagree; 2 = Disagree; 3 = Unsure; 4 = Agree; 5 = Strongly agree					

Mean PT = 3.474 ± 0.847.

APPENDIX VI: Item-Level Response Distribution of the Patient Loyalty (PL) Scale (Zhang, 2021)

Score	5	4	3	2	1
Items	N (%)	N (%)	N (%)	N (%)	N (%)
PL1. When I present with clinical symptoms of common diseases, I would first choose here.	34 (5.7)	288 (48.0)	211 (35.2)	62 (10.3)	5 (0.8)
PL2. I would tell people around me about this.	33 (5.5)	262 (43.7)	231 (38.5)	72 (12.0)	2 (0.3)
PL3. I would recommend my relatives and friends to come here.	35 (5.8)	265 (44.1)	224 (37.3)	74 (12.3)	2 (0.3)
PL4. When I get sick again in the future, I will choose this clinic again.	30 (5.0)	268 (44.7)	238 (39.7)	64 (10.7)	0 (0.0)
PL5. If the cost of some services or medicines here is slightly higher than that of other institutions, I will tolerate this and continue to choose the services provided here.	28 (4.7)	211 (35.2)	244 (40.6)	103 (17.2)	14 (2.3)
Scoring standard: 1=Strongly disagree; 2=Disagree; 3=Unsure; 4=Agree; 5=Strongly agree					

Mean PL = 3.398 ± 0.618.