

The Relationship Between Communicative Health Literacy and Patient Loyalty in China: A Chain Mediation Study Based on Social Exchange Theory

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Objective: In the Chinese medical context, there is a large variation in patient health literacy levels and an imbalance of power between doctors and patients. The mechanism by which communicative health literacy (CHL) influences patient loyalty (PL) remains unclear. This study aims to explore how CHL in the medical context improves PL by promoting enhancement of perceived health literacy (EPHL) and strengthening decision-making involvement satisfaction (DMIS) based on the Social Exchange Theory (SET).

Methods: This study employs a questionnaire survey to collect data from five representative cities in China (Beijing, Shanghai, Guangzhou, Wuhan, and Chengdu), with a total of 4018 questionnaires collected, yielding 3264 valid questionnaires after quality control (valid rate: 81.23%). A structural equation model is used to examine the relationships between CHL, EPHL, DMIS, and PL, and to test the relevant hypotheses. Additionally, data from three cities in Jiangsu Province, China, are collected, with 2393 questionnaires collected and 1942 valid questionnaires obtained (valid rate: 81.15%), to conduct a robustness test of the model.

Results: CHL was significantly positively correlated with EPHL ($\beta=0.516$), DMIS ($\beta=0.329$), and PL ($\beta=0.192$). EPHL was also significantly positively correlated with DMIS ($\beta=0.301$) and PL ($\beta=0.355$). DMIS was significantly positively correlated with PL ($\beta=0.316$). EPHL partially mediated the relationship between CHL and DMIS (32.02%), and between CHL and PL (48.80%). DMIS partially mediated the relationship between CHL and PL (35.02%). EPHL and DMIS played a chain-mediated role between CHL and PL (20.33%). DMIS partially mediated the relationship between EPHL and PL (21.11%).

Conclusion: This study extends the application of SET to the realm of doctor-patient communication, and is the first to confirm the sequential process of “cognitive reserve - capability construction - emotional identification - relational return” within a Chinese context. It provides a new perspective for understanding the formation mechanism of PL and offers theoretical support for the construction of health literacy-oriented medical institutions. Future research could expand the sample scope to cover different cultural backgrounds and various types of medical institutions, thereby enhancing the model's generalizability and further exploring its mechanisms of action.

Keywords: communicative health literacy, enhancement of perceived health literacy, decision-making involvement satisfaction, patient loyalty, social exchange theory

Introduction

Background

In the field of medical services, patient loyalty (PL) has become a core indicator for measuring the quality of medical care and the competitiveness of medical institutions.¹⁻³ The mechanism by which the quality of doctor-patient interactions affects loyalty has gradually become a focus of both academia and practice.⁴⁻⁷ However, the doctor-patient

relationship in China exhibits unique complexity. The tiered diagnosis and treatment system is accelerating, yet the service capacity of primary-level medical institutions remains limited,^{8–10} high-quality medical resources are concentrated in high-level hospitals, creating a pronounced “siphon effect” that increases the difficulty of building long-term trust relationships.^{11,12}

In mature healthcare systems, long-term doctor-patient relationships and patient-centered decision-making models are widely recognized. As early as the 1960s–1970s, the US healthcare system has generally emphasized the construction of family physician and general practitioner systems, stressing continuous care and long-term doctor-patient relationships to promote trust accumulation and improve healthcare quality.¹³ In Germany, surveys of general practice, multiple sclerosis, and dental patients also indicate that patients generally prefer to co-decide treatment plans with their doctors.¹⁴ In English-speaking countries such as Canada, the United States, the United Kingdom, and Australia, patient-centered medical models have become mainstream, advocating patient autonomy, active participation, and shared decision-making, forming a communication model centered on shared care.¹⁵ In contrast, under China’s collectivist cultural background, patients are often placed in a subordinate position, and doctor-patient communication is more hierarchical and paternalistic.^{15–17} Research shows that some doctors in China still underestimate the importance of patient consultation and shared decision-making, believing that patients lack rational judgment and that participation in treatment plans may not improve outcomes. For example, a survey in Shandong, China, found that over 20% of doctors hold this view.¹⁷ Furthermore, China’s medical service structure characterized by “short doctor-patient contact, high pressure, and high mobility” further limits the depth and quality of doctor-patient communication.¹⁸ This phenomenon of power imbalance between doctors and patients poses numerous challenges to trust-building and communication quality. Overall, the long-established communication culture in Western countries centered on patient autonomy and continuous care differs significantly from the doctor-patient relationship in China’s collectivist and high-load medical environment. It is precisely this cultural and structural contrast that provides a unique contextual perspective for this study and highlights the theoretical innovation space for exploring communication mechanisms within China’s medical system.

PL typically denotes patients’ continuous choice intention and recommendation behavior toward a medical institution or physician.⁷ It not only reflects their sustained preference and willingness to recommend the same provider, but also embodies affective identification and psychological commitment, constituting a vital foundation for long-term value creation in medical service relationships. Research demonstrates that PL is significantly associated with medical service quality and serves as a key indicator for evaluating institutional competitiveness and improving health outcomes.¹⁹ Further empirical evidence reveals that patient trust mediates the relationship between satisfaction and loyalty, indicating that loyalty is rooted not merely in behavioral intention, but also in cognitive understanding and emotional connection.²⁰ Existing measurement tools for PL have predominantly emphasized outcome-level constructs such as care-seeking intention and recommendation behavior, often examining linkages among service quality,²¹ satisfaction,²² doctor-patient relationship,⁷ and loyalty. The present study, by contrast, focuses on the formation process of loyalty, expands its theoretical scope and measurement dimensions, and offers a novel analytical framework for elucidating the generative mechanisms of loyalty within doctor-patient relationships.

Health literacy is commonly described as a prerequisite for good health decisions, healthy behaviors, and overall health.²³ As the ability of individuals to obtain and understand health information, health literacy is crucial for promoting health and reducing disparities. Traditional research often views health literacy as a static individual trait, neglecting its interactive relationship with communication behavior. In recent years, the concept of Communicative Health Literacy (CHL) has provided a new perspective to address this issue. Unlike traditional communication evaluation, CHL emphasizes patients’ ability to actively express themselves, interact effectively, and process information in medical contexts.²⁴ Existing research has primarily focused on the development and validation of CHL measurement tools, lacking systematic analysis of theoretical connotation and mechanism. In Ishikawa et al’s health literacy scale, CHL items focus on individuals’ ability to process general health information, not covering doctor-patient interaction capabilities.²⁵ Chinn et al’s All Aspects of Health Literacy Scale (AAHLS) contains only three CHL items, limiting its independent application.²⁶ Some empirical studies use communication quality as the independent variable without directly verifying CHL’s role.⁷ In the Chinese medical context, heterogeneous patient health literacy²⁷ and doctor-patient power asymmetry²⁸ make revealing CHL’s internal logic of influencing loyalty through multi-stage resource exchange

more theoretically valuable and practically significant. Moreover, no previous study has applied this CHL measurement tool in Chinese populations. CHL can facilitate effective communication and interaction between patients and doctors. Higher levels of health literacy imply the capability to make good health decisions. When patients possess good CHL, they are able to participate more effectively in medical decision-making, enhance their perceived health literacy, and improve decision-making involvement satisfaction (DMIS). This satisfaction is an important resource that patients obtain through doctor-patient interactions. When the resources they gain outweigh their investments, it strengthens their trust in and loyalty to medical services. Based on the Social Exchange Theory (SET), this study integrates the aforementioned stages to fully present the resource exchange process of SET: patients start with CHL (cognitive reserve) → transform into enhancement of perceived health literacy (EPHL) (capability construction) through interaction → EPHL facilitates DMIS (emotional identification) → ultimately driving loyalty (relational return). This chain path directly corresponds to the path logic of SET.

In this context, the mechanism through which CHL affects PL remains unclear. Existing research has shown that patients' health literacy level is significantly correlated with the quality of doctor-patient information exchange. For instance, Ishikawa et al found that diabetic patients with higher CHL experienced more sufficient information exchange during their visits.²⁹ Other studies have indicated that the quality of doctor-patient communication is significantly positively correlated with PL.⁷ Additionally, a questionnaire survey of patients in Chinese public hospitals revealed that although patient satisfaction did not directly affect loyalty, it significantly enhanced loyalty through the mediating variable of patient trust.²⁰ Based on this evidence, while related pathways have been partially verified, two major gaps persist in current research: first, few studies have analyzed how CHL forms a loyalty-driving chain through cognitive transformation and emotional identification; second, there is a lack of contextualized interpretation of resource exchange mechanisms within China's doctor-patient power asymmetry context.

Furthermore, recent studies have indicated that patients with lower socioeconomic status often face greater barriers in health information acquisition, communication initiative, and doctor-patient trust.^{30,31} The proliferation of digital health tools may either amplify or narrow this gap across different demographic groups.^{32,33} This suggests that socioeconomic background and disparities in digital health literacy may serve as important potential confounders influencing doctor-patient communication and PL. Therefore, this study incorporates variables such as registration category, hospital type, age, gender, marital status, and education level as control factors in the analysis to mitigate potential confounding effects and enhance the robustness of the findings.

In summary, under the dual constraints of uneven patient health literacy and doctor-patient power asymmetry, this study will, based on SET, explore how CHL promotes PL through perceived fairness and trust in the Chinese context, constructing a chain mediation model of "cognitive reserve - capability construction - emotional identification - relational return". It is worth noting that the CHL, EPHL, DMIS, and PL involved in this study originate from multiple disciplinary fields, possessing interdisciplinary attributes in public health, humanistic communication, clinical decision-making, and psychological behavior, which endows the model with a naturally multidisciplinary perspective-an important innovation of this study. Through this model, this study aims to reveal the important role of CHL in the medical context and its influence mechanism on PL, and to provide new strategies for medical institutions and physicians on how to enhance PL in practice.

Theoretical Framework

The theoretical framework of this study is constructed based on SET. SET emphasizes that individuals contribute their time, energy, and skills to obtain various rewards, including salary, benefits, and job security.³⁴ The resources involved in the exchange encompass two dimensions: economic resources (tangible) and socio-emotional resources (symbolic).³⁵ In doctor-patient relationships, information and emotions are the most common resources exchanged, while satisfaction and loyalty are also important outcomes of the exchange. When patients perceive that the resources they obtain from doctor-patient interactions (such as informational support, emotional care, trust, and satisfaction) outweigh the costs they have invested, they are more likely to maintain this relationship and exhibit higher loyalty.

Nutbeam's model categorizes health literacy into three sequential levels: Functional health literacy, Interactive health literacy, and Critical health literacy. Among them, both Interactive health literacy and Critical health literacy are more advanced cognitive skills.³⁶ CHL has been further developed based on Nutbeam's model. It reflects the patient's ability to

clearly express their own needs, effectively obtain and understand health information, and actively participate in medical decision-making during the communication process with doctors.²⁴ Therefore, CHL represents a comprehensive ability that patients possess, covering aspects such as cognition, communication, social interaction, information processing, and decision-making. These abilities help patients to better exchange information, preferences, emotions, and trust with doctors during their interactions.

In the Integrated model of health literacy proposed by Kristine Sørensen et al, the “application” dimension in the “Health care” domain means that patients can use health information to make informed decisions about medical issues.³⁷ Danielle M Muscat et al were the first to explore the expansion of health literacy into the shared decision-making model, and they proposed that health literacy skills should be developed for shared decision-making.³⁸ Enhanced health literacy and satisfactory decision-making involvement can be regarded as valuable exchange outcomes between patients and healthcare providers, which helps to establish long-term trusting relationships.

In the theoretical framework of this study, CHL is regarded as the starting point and resource foundation of social exchange, representing patients’ ability to express needs, understand information, and share personal experiences and emotions in doctor-patient communication. EPHL reflects the “resource gains” that patients perceive in the interaction, that is, the sense of control, autonomy, and trust obtained through effective communication, and is the intermediate product of resource transformation in the social exchange process. DMIS embodies socio-emotional returns, reflecting the emotional feedback of respect, being heard, and value realization that patients experience in shared decision-making. Finally, PL is regarded as the long-term outcome of the social exchange relationship, typically manifested as patients’ trust in medical institutions, continuous choice, and positive recommendation behavior.

In summary, based on SET, this study proposes the chain mediation path “CHL → EPHL → DMIS → PL” to explore how CHL drives the formation of PL through resource acquisition, emotional identification, and social returns. This path helps further expand the applicability of SET in the medical service field and provides a potential reference for deepening the understanding of resource exchange mechanisms in doctor-patient interactions: that is, when patients possess high CHL, they can achieve dual cognitive-emotional returns in the interaction, perceive higher empowerment and satisfaction, and thus form stable trust and loyalty. This framework provides ideas for exploring the potential links of EPHL and DMIS between CHL and PL, and also offers a new theoretical perspective for explaining the possible mechanism of action of CHL in long-term doctor-patient relationships and organizational performance. The hypothesized model is shown in Figure 1.

Research Hypotheses

CHL refers to the patient’s ability to clearly express their needs, obtain and understand information, and participate in decision-making during interactions with doctors.²⁴ Patients with high levels of health literacy tend to have a greater awareness of their own health conditions.³⁹ In contrast, individuals with limited health literacy are more likely to misunderstand health information.⁴⁰ Conversely, individuals possessing adequate health literacy tend to communicate their needs more effectively, acquire and comprehend information more efficiently during interactions with healthcare professionals, thereby enhancing their health literacy further. CHL serves as patients’ cognitive/communication resource input (Resource Input); high CHL helps improve patients’ ability to acquire and process information, thereby being transformed in interaction into perceived health literacy empowerment- that is, the cognitive reserve → capability construction pathway.²⁴ Therefore, this study proposes the following hypotheses.

H1: CHL is positively correlated with EPHL.

Decision-making involvement satisfaction (DMIS) is an individual’s subjective evaluation of the medical decision-making process and outcome, reflecting the respect they feel during the decision-making process.⁴¹ According to the theoretical conception of “incorporating health literacy into the shared decision-making model” proposed by Danielle M. Muscat et al,³⁸ and the “application” dimension in the Integrated model of health literacy proposed by Kristine Sørensen et al, which represents the patient’s ability to use health information to make informed decisions about medical issues,³⁷ this study boldly infers that satisfaction with the “application” of health literacy is equivalent to satisfaction with shared decision-making. CHL serves as an input resource that helps enhance patients’ ability to express themselves and

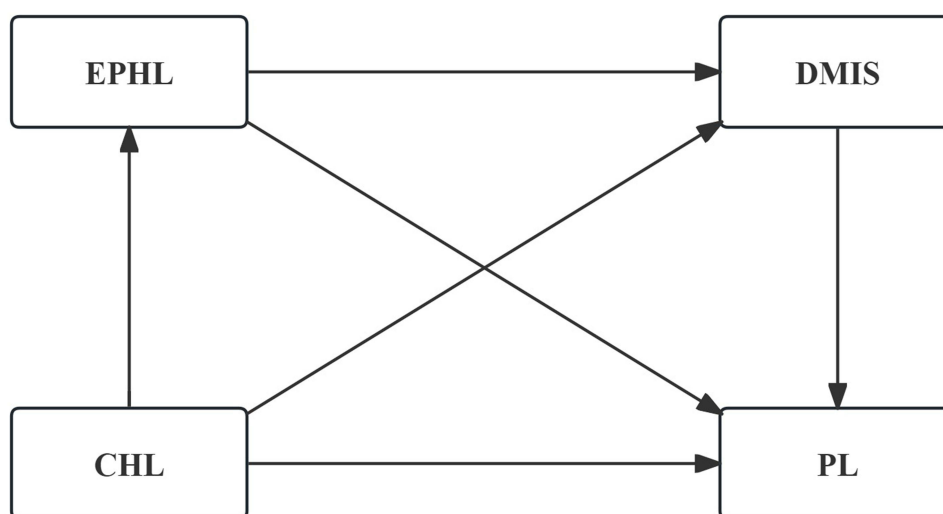


Figure 1 Hypothesized Model.

Abbreviations: CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

participate in interactions, thereby increasing emotional returns (feeling respected, being heard) in the shared decision-making process, ie, improving DMIS (cognitive reserve → emotional identification pathway).³⁸ Therefore, this study proposes the following hypothesis.

H2: CHL is positively correlated with DMIS.

Loyalty to medical services refers to the tendency of an individual to choose the same medical institution again to meet their future medical needs, based on their satisfaction with past medical experiences and trust in medical service providers and medical professionals.⁷ The better the feedback patients have on their experiences, the more likely they are to feel valued by medical service providers and to have high loyalty to the hospital.⁴² Patients possessing a high level of CHL are capable of articulating their symptoms and requirements with clarity, and they demonstrate a superior understanding of medical advice and treatment protocols. This results in a favorable experience, which in turn strengthens their satisfaction and loyalty towards healthcare services. CHL, as a stable input resource, promotes patients' long-term relationship maintenance behaviors when it generates sustained positive returns (information, respect, trust) through interaction, thereby reflecting the cognitive reserve → relational return pathway.¹⁹ Therefore, this study proposes the following hypothesis.

H3: CHL is positively correlated with PL.

Under normal circumstances, health literacy is the foundation for patients to participate in medical decision-making.^{43–45} Improvements in health literacy enable individuals to better understand medical information, thereby allowing them to more confidently express their opinions and choices during the decision-making process. This enhanced ability can increase individuals' sense of participation and satisfaction in the decision-making process. Moreover, patients with different levels of health literacy significantly differ in the topics they discuss during communication.⁴⁶ Enhancing patients' health literacy can also help them better evaluate the risks and benefits of medical plans, further increasing their satisfaction with decision-making participation. EPHL represents the capability conversion (Resource Conversion) that patients acquire through exchange. This capability enhancement increases patients' sense of control and feeling valued in decision-making interactions, thereby promoting shared decision-making (capability construction → emotional identification).³⁶ Therefore, this study proposes the following hypothesis.

H4: EPHL is positively correlated with DMIS.

EPHL not only helps individuals better manage their own health but also strengthens their trust in medical service providers.^{47,48} Higher levels of health literacy enable individuals to more accurately understand medical information, thereby allowing them to more accurately assess the professional competence and service quality of medical service providers. The determinants of PL include satisfaction, service quality, and a sense of trust.¹⁹ When patients have a high evaluation of the professionalism and service quality of medical service providers, they are more likely to develop trust and satisfaction with the medical service providers. EPHL, as a resource gain obtained through interaction, is often accompanied by higher levels of trust and satisfaction, and these positive experiences may contribute to the sustained development of the relationship—that is, capability construction → relational return.⁴⁹ Therefore, this study proposes the following hypothesis.

H5: EPHL is positively correlated with PL.

Shared decision-making is a patient-centered approach to medical care.⁵⁰ Patients with high DMIS often feel respected and valued in the medical process through a “patient-centered” approach. This positive emotional experience may enhance their satisfaction with medical service providers. Patient satisfaction with medical services is one of the key factors influencing their loyalty.^{4,22,51} Higher levels of satisfaction can motivate patients to more willingly choose the same medical service provider for subsequent medical services. DMIS may be conceptualized as socio-emotional returns within the exchange process. Higher levels of DMIS are typically associated with positive emotional experiences such as feeling respected and being heard, and such emotional returns may underpin the formation and maintenance of loyalty relationships (emotional return → relationship maintenance).²⁰ Therefore, this study proposes the following hypothesis.

H6: DMIS is positively correlated with PL.

Among the three levels of health literacy, CHL is similar to interactive health literacy, both of which are considered advanced cognitive skills.³⁶ Many patients, due to their lack of medical knowledge, often struggle to communicate effectively with medical staff.^{52,53} However, individuals with higher levels of CHL are able to communicate more effectively with doctors. Research has shown that effective communication is an important prerequisite for improving patients’ health literacy.^{23,54,55} At the same time, when patients have higher levels of health literacy, they are usually more proactive in participating in shared decision-making.⁵⁶ During the shared decision-making process, patients are more likely to effectively express their needs, understand doctors’ recommendations, and be satisfied with the decision outcomes. CHL contributes to enhancing patients’ capacity to acquire, understand, and apply health information, enabling the gradual transformation of information into perceivable interactive capability, and potentially augmenting their sense of involvement and emotional feedback in medical interactions.⁵⁷ This hypothesis corresponds to the mediating chain of “cognitive reserve → capability construction → emotional identification” in SET. Therefore, this study proposes the following hypothesis.

H7: EPHL mediates the relationship between CHL and DMIS.

In modern medical practice, the paternalistic care model of physicians is gradually shifting towards a model that shares power, information, and decision-making with patients.⁵⁸ This patient-centered approach to medical care emphasizes patient participation and autonomy. Individuals with higher levels of CHL are able to more clearly express their preferences and values, and engage in more effective interactions with doctors during the medical decision-making process. This positive communication may enhance individuals’ sense of control and satisfaction in the decision-making process. Communication quality and satisfaction are key drivers of PL.⁴ If CHL investment can generate emotional returns during the decision-making process, this emotional return will be transformed into relationship maintenance behaviors, reflecting the exchange path of “cognitive reserve → emotional identification → relational return”.⁵⁹ Therefore, this study proposes the following hypothesis.

H8: DMIS mediates the relationship between CHL and PL.

Patients with higher levels of CHL may more easily enhance their health literacy further during the communication process. An increase in EPHL means that patients are better able to recognize the value of cognitive resources. Research has shown that perceived value has a positive impact on PL.⁶⁰ Additionally, studies have indicated that the higher the level of health literacy, the greater the trust patients have in doctors and the healthcare system.⁶¹ In summary, CHL may indirectly promote patients' loyalty to medical service providers by enhancing perceived value. EPHL, as a capability gain, may enable patients to more readily acquire trust and satisfaction in subsequent interactions, thereby fostering loyalty; this hypothesis corresponds to the indirect path of "cognitive reserve → capability construction → relational identification" in SET.^{49,62} Therefore, this study proposes the following hypothesis.

H9: EPHL mediates the relationship between CHL and PL.

Health literacy is commonly described as a prerequisite for good health decisions, healthy behaviors, and overall health.⁴³ CHL can facilitate effective communication and interaction between patients and doctors.²⁴ Higher levels of health literacy imply the capability to make good health decisions.⁴³ When patients possess good CHL, they are able to participate more effectively in medical decision-making, enhance their health literacy, and improve DMIS. This satisfaction is an important resource that patients obtain through doctor-patient interactions. When the resources they gain outweigh their investments, it strengthens their trust in and loyalty to medical services. Based on SET, this study integrates the aforementioned stages to fully present the resource exchange process of SET: patients start with CHL (cognitive reserve) → transform into EPHL (capability construction) through interaction → EPHL facilitates DMIS (emotional identification) → ultimately driving loyalty (relational return). This chain path directly corresponds to the path logic of SET.

H10: EPHL and DMIS play a chain mediating role between CHL and PL.

Objects and Methods

Research Subjects

This study employed a convenience sampling survey method. A pilot survey was conducted from February 13 to February 16, 2024, and the questionnaire was optimized based on the results of the pilot survey to form the final survey questionnaire. The questionnaire consists of two parts: demographic characteristics and scales. All scales used in this study were selected from validated and well-established instruments. After translation into Chinese, these scales were appropriately adjusted to ensure that their original meanings were retained while making them more suitable for the reading and comprehension habits of the Chinese population. This study was approved by the ethics committee, and an electronic informed consent form was placed on the first page of the questionnaire. Participants were required to actively click the "Agree" button before filling out the questionnaire to indicate their voluntary participation in the study; those who did not click "Agree" could not access the formal question pages. The survey was distributed through Questionnaire Star (<https://www.wjx.cn>) in five representative large cities across China: Shanghai (eastern region), Chengdu (western region), Guangzhou (southern region), Beijing (northern region), and Wuhan (central region). Additionally, to further validate the model, the survey was also distributed in three representative cities within Jiangsu Province (the province where the research team is based): Suzhou (southern region), Nanjing (central region), and Xuzhou (northern region). The survey targeted patients who had visited a hospital within the past six months. To better facilitate respondents' recall of their medical visits, the study included situational prefixes such as "During this medical visit." or "Through this medical visit." before each item. Modifications to some scales were also attuned to Chinese respondents' cognitive and linguistic conventions. The questionnaire for this study was distributed through an online platform, with all items set as mandatory. Participants were required to complete all entries before submission, resulting in no missing values in the obtained data and eliminating the need for missing data processing. Additionally, to ensure data quality, this study implemented a dual-person independent verification procedure, guaranteeing the accuracy and reliability of the data.

The formal survey was conducted from February 17 to March 4, 2024. Using the convenience sampling method, a total of 4018 questionnaires were collected from the five representative large cities. According to the quality control criteria, the system of Questionnaire Star automatically excluded 750 invalid questionnaires (668 questionnaires with insufficient completion time; 1 questionnaire with an ineligible survey respondent; 81 questionnaires with incorrect answers to common knowledge questions). Additionally, 4 duplicate questionnaires were manually identified and removed, resulting in a total of 754 invalid questionnaires. Consequently, 3,264 valid questionnaires remained, yielding an effective response rate of 81.23%. In Jiangsu Province, a total of 2,393 questionnaires were collected. Using the VIP features of Questionnaire Star to set rules for screening, 447 invalid questionnaires were automatically excluded (364 questionnaires with completion time < 200 seconds; 2 questionnaires with ineligible participants; 81 questionnaires with incorrect answers to common knowledge questions). Moreover, 4 duplicate questionnaires were manually identified and removed, resulting in a total of 451 invalid questionnaires. Thus, 1,942 valid questionnaires remained, with an effective response rate of 81.15%.

Research Instruments

Communicative Health Literacy Scale

The HLS₁₉ instrument used in this research was developed within the “European Health Literacy Population Survey 2019–2021 (HLS₁₉)” conducted by M-POHL. It is a novel measurement tool designed to assess CHL in individuals’ interactions with physicians.²⁴ Individual health literacy is conditional and situational.^{63,64} The six-item short version of the HLS₁₉ scale demonstrates a good unidimensional structure.

Enhancement of Perceived Health Literacy Scale

This scale was adapted from some widely validated health literacy measurement instruments in existing literature. The wording of the items has been appropriately adjusted to fit the comprehension of Chinese respondents. In this study, this variable is redefined as perceived health literacy improvement. The response options were presented on a 5-point Likert scale, ranging from Strongly Disagree to Strongly Agree.

Decision-Making Involvement Satisfaction Scale

The Clinical Decision-making Involvement and Satisfaction (CDIS) patient version was developed by Slade et al.⁶⁵ The satisfaction subscale of the patient version of the CDIS provided a reference for the development of DMIS in this study. Based on the Chinese adaptation of CDIS by Chongmei Huang et al, the wording of the items has been appropriately adjusted to fit the comprehension of Chinese respondents.⁴¹ The response options were presented on a 5-point Likert scale, ranging from Strongly Disagree to Strongly Agree.

Patient Loyalty Scale

This scale was adapted from the patient loyalty scale developed by Huang et al.⁶⁶ The scale primarily measures the intention to choose the same doctor again in the future and to recommend this doctor to others. The wording of the items has been appropriately adjusted to fit the comprehension of Chinese respondents. The response options were presented on a 5-point Likert scale, ranging from Strongly Disagree to Strongly Agree.

Statistical Methods

This study used SPSS 26.0 and AMOS 26.0 software for data processing and statistical analysis. First, the normality assumption of continuous variables was tested using P-P plots, histograms, and other methods to ensure that the data met the prerequisites for subsequent analyses. Before formal analysis, given that scale items were contextually adapted and rephrased, this study randomly divided the sample into two subsamples (each $n \approx 50\%$ of the total sample size) for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) respectively, to systematically examine the appropriateness and structural validity of the measurement instrument in the context of this study. Specifically, SPSS 26.0 was first used for EFA, followed by AMOS 26.0 for CFA through a multi-model comparison strategy (eg, single-factor model, multi-factor competing models) to select the best-fitting measurement model. Subsequently, Cronbach’s α

coefficient and composite reliability (CR) were used to assess scale reliability, and Harman's single-factor test was employed to diagnose common method bias.

Second, descriptive statistical analysis was used to present the basic information of respondents and the means, standard deviations, and distribution characteristics of the research variables. For variables that met the normal distribution, Pearson correlation analysis was used to assess their linear associations; otherwise, Spearman rank correlation test was used to provide preliminary evidence for hypothesis testing.

Finally, based on the measurement model established by CFA, AMOS 26.0 was used to construct a structural equation model (SEM) to test the research hypotheses, and model fit was evaluated using indices such as χ^2/df , RMSEA, CFI, and TLI. To ensure the robustness of the statistical results, bootstrap resampling technique (5000 iterations) was used to estimate the standard errors and confidence intervals of the parameters. All statistical tests used a two-tailed $P < 0.05$ as the significance level.

Results

Descriptive Statistics

Among the samples collected from the five representative large cities, the average age of respondents was 36.01 ± 9.11 years. Regarding registration categories, the highest proportion of patients chose general registration (47.1%), followed by specialist registration (44.3%). The types of hospitals visited were primarily county-level public hospitals (32.5%) and township health centers or community health service centers (24.8%). In terms of gender composition, there were slightly more female patients than male patients (52.9% vs 47.1%). The majority of respondents were married (71.5%). In terms of educational level, 46.9% had an associate degree or lower, 46.9% had a bachelor's degree, and 6.2% had a master's degree or higher (Table 1).

Validity Analysis

Structural Validity Analysis

Exploratory factor analysis was conducted on each scale in this study. The Kaiser-Meyer-Olkin (KMO) values for all scales were greater than 0.6, indicating that factor analysis was appropriate. The cumulative variance explained by the

Table 1 Basic Demographic Information of Participants

	N (%)
Age (M$\pm$SD)	36.01 $\pm$ 9.11
Registration Category	
Special Needs Registration	282 (8.6%)
General Registration	1537 (47.1%)
Specialist Registration	1445 (44.3%)
Hospital Type	
Municipal Public Hospital	578 (17.7%)
County-Level Public Hospital	1060 (32.5%)
Township Health Center or Community Health Service Center	810 (24.8%)
Private Hospital or Individual Clinic	816 (25.0%)
Gender	
Male	1538 (47.1%)
Female	1726 (52.9%)
Marital Status	
Married	2335 (71.5%)
Unmarried	929 (28.5%)
Educational Level	
Associate Degree or Lower	1531 (46.9%)
Bachelor's Degree	1532 (46.9%)
Master's Degree or Higher	201 (6.2%)

first factor of each scale ranged from 68.485% to 82.347%. The structure of each scale was rational and adequately explained the underlying factors (Table 2).

Convergent Validity Analysis

Convergent validity analysis was conducted using AMOS. The results showed that the standardized factor loadings for all scales were greater than 0.4, the Average Variance Extracted (AVE) values were greater than 0.5, and the Composite Reliability (CR) values were greater than 0.6, indicating that all scales had good convergent validity (Table 3).

Confirmatory Factor Analysis of Multi-Factor Model

As the model evolved from a single-factor model to a combined model of all factors, the χ^2/df ratio gradually increased, while the GFI, CFI, and NFI values gradually decreased. Conversely, the RMSEA and SRMR values increased. Therefore, the model with separate factors exhibited the best fit (Table 4).

Reliability Analysis

The Cronbach's α coefficients for all scales ranged from 0.891 to 0.930, all of which were greater than 0.7, indicating good internal consistency of the scales. After the removal of any item, the changes in Cronbach's α remained within

Table 2 Exploratory Factor Analysis of Each Scale^a

	KMO	Cumulative Variance Explained (%)	P	Number of Factors
CHL	0.892	68.485	<0.001	1
EPHL	0.803	76.736	<0.001	1
DMIS	0.906	74.987	<0.001	1
PL	0.724	82.347	<0.001	1

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

Table 3 Convergent Validity Analysis of Each Scale^a

Items	Standardized Factor Loadings	AVE	CR
CHL1	0.723	0.611	0.904
CHL2	0.779		
CHL3	0.827		
CHL4	0.746		
CHL5	0.807		
CHL6	0.802		
EPHL1	0.793	0.700	0.903
EPHL2	0.842		
EPHL3	0.918		
EPHL4	0.787		
DMIS1	0.824	0.695	0.932
DMIS2	0.857		
DMIS3	0.878		
DMIS4	0.876		
DMIS5	0.804		
DMIS6	0.757		
PL1	0.901	0.739	0.894
PL2	0.920		
PL3	0.748		

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

Table 4 Confirmatory Factor Analysis of the Multi-Factor Model ^a

Factors	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Without combined	1460.736	146	10.005	0.074	0.943	0.933	0.038
CHL, EPHL, DMIS+PL	3847.681	149	25.823	0.123	0.840	0.814	0.095
CHL, EPHL+DMIS+PL	6983.395	151	46.248	0.167	0.705	0.666	0.119
CHL+EPHL+DMIS+PL	10173.841	152	66.933	0.201	0.567	0.513	0.131

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

acceptable ranges. The Corrected Item-Total Correlation (CITC) for each scale was greater than 0.4. In summary, all scales demonstrated good reliability (Table 5).

Common Method Bias Analysis

During the questionnaire design and survey implementation phases, this study adopted a series of procedural control measures to address common method bias. However, since the questionnaire responses were self-reported by participants, the possibility of common method bias could not be completely ruled out. Therefore, this study utilized Harman's single-factor test to assess the severity of common method bias. The results showed that the first common factor explained 46.219% of the variance, which is below the critical threshold of 50%. Consequently, no significant common method bias was detected in the data collected for this study.

Correlation Analysis

Pearson correlation analysis was employed in this study. Significant positive correlations were found among all variables, with all correlation coefficients were statistically significant ($p < 0.001$). The range of correlation coefficients was 0.440 to 0.574 (Table 6).

Model Construction

The initial structural equation model (SEM) was constructed using AMOS 26.0. In the initial model (M0), the standardized root mean square residual (SRMR) was 0.037, and the root mean square error of approximation (RMSEA) was 0.075, both of which are below the threshold of 0.08. The goodness of fit index (GFI) was 0.911, and the non-normed fit index (NNFI or TLI) was 0.933, both of which exceed the threshold of 0.9. The adjusted goodness of fit index (AGFI) was 0.884, which is close to the recommended threshold of 0.9 (Tables 7, 8). Therefore, the model fit was considered to be acceptable. After controlling for demographic characteristics, the model remained significant (Appendix 1).

Testing and Decomposition of Mediation Effects

EPHL mediates the relationship between CHL and DMIS, accounting for 32.02% of the total effect (0.155/0.484). DMIS mediates the relationship between EPHL and PL, accounting for 21.11% of the total effect (0.095/0.450). EPHL mediates the relationship between CHL and PL, accounting for 48.80% of the total effect (0.183/0.375). DMIS mediates the

Table 5 Reliability Analysis of Each Scale ^a

	Cronbach's α	Range of Cronbach's α after Item Deletion	CITC
CHL	0.904	0.880–0.896	0.685–0.783
EPHL	0.899	0.844–0.882	0.747–0.841
DMIS	0.930	0.912–0.925	0.732–0.844
PL	0.891	0.801–0.905	0.715–0.834

Abbreviations: CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

Table 6 Correlation Analysis of Each Scale^a

	M	SD	CHL	EPHL	DMIS	PL
CHL	3.770	0.880	1.000			
EPHL	3.730	0.940	0.474***	1.000		
DMIS	3.650	0.900	0.449***	0.440***	1.000	
PL	2.940	0.940	0.493***	0.574***	0.548***	1.000

Notes: *** Correlation is significant at the 0.001 level (2-tailed).

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

Table 7 Model Fit Results for Model (M0)

Indices	Criteria	Results
χ^2/df	<2	19.234
SRMR	<0.08	0.037
RMSEA	<0.08	0.075
GFI	>0.9	0.911
AGFI	>0.9	0.884
NNFI (TLI)	>0.9	0.933
NFI	>0.9	0.943
AIC	–	2896.178
BIC	–	3164.169

Table 8 Standardized Coefficients for Model (M0)^a

Path	Non-Standardized Estimate	Standardized Estimate	95% CI	Standardized Error	C.R.	p
EPHL<-CHL	0.556	0.516	[0.484–0.545]	0.021	26.777	<0.001
DMIS<-CHL	0.347	0.329	[0.289–0.369]	0.021	16.147	<0.001
DMIS<-EPHL	0.294	0.301	[0.262–0.339]	0.02	14.871	<0.001
PL<-CHL	0.224	0.192	[0.157–0.229]	0.022	10.292	<0.001
PL<-EPHL	0.382	0.355	[0.319–0.390]	0.02	18.681	<0.001
PL<-DMIS	0.349	0.316	[0.284–0.349]	0.02	17.529	<0.001

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

relationship between CHL and PL, accounting for 35.02% of the total effect (0.104/0.297). The chain mediating effect of EPHL and DMIS between CHL and PL accounts for 20.33% of the total effect (0.049/0.241) (Table 9).

Small Sample Model Validation

This study employed data from Jiangsu Province in China to validate the generalizability of model M0. The results showed that the model fit was relatively ideal, with the χ^2/df ratio decreasing to 11.721, which also explains the impact of sample size on the χ^2/df ratio mentioned earlier in the text (Table 10). Additionally, the standardized coefficients for each path were 0.483, 0.261, 0.299, 0.181, 0.354, and 0.305, respectively ($p < 0.001$ overall). These results are similar to those obtained from the national data model fitting, further confirming the good generalizability of model M0 (Table 11 and Figure 2).

Discussion

Based on SET, this study explored the direct effects of CHL on EPHL, DMIS, and PL, as well as the mediating effects of EPHL and DMIS. The results supported all hypotheses, revealing the complete chain of effects through which doctor-patient communication impacts loyalty via multi-stage resource exchange. Additionally, the variables involved in the

Table 9 Testing and Decomposition of Mediation Effects^a

No	Effect	Paths	Effect	SE	P	LLCI	ULCI	Proportion of Indirect Effects
①	Direct effect	CHL→DMIS	0.329	0.019	<0.001	0.295	0.362	32.02%
	Indirect effect	CHL→EPHL→DMIS	0.155	0.012	<0.001	0.136	0.174	
	Total effect	CHL→DMIS	0.484	0.015	<0.001	0.457	0.510	
②	Direct effect	EPHL→PL	0.355	0.019	<0.001	0.325	0.384	21.11%
	Indirect effect	EPHL→DMIS→PL	0.095	0.008	<0.001	0.082	0.109	
	Total effect	EPHL→PL	0.450	0.018	<0.001	0.421	0.479	
③	Direct effect	CHL→PL	0.192	0.019	<0.001	0.163	0.223	48.80%
	Indirect effect	CHL→EPHL→PL	0.183	0.011	<0.001	0.165	0.202	
	Total effect	CHL→PL	0.375	0.017	<0.001	0.347	0.405	
④	Direct effect	CHL→PL	0.192	0.019	<0.001	0.163	0.223	35.02%
	Indirect effect	CHL→DMIS→PL	0.104	0.009	<0.001	0.091	0.119	
	Total effect	CHL→PL	0.297	0.018	<0.001	0.267	0.327	
⑤	Direct effect	CHL→PL	0.192	0.019	<0.001	0.163	0.223	20.33%
	Indirect effect	CHL→EPHL→DMIS→PL	0.049	0.004	<0.001	0.042	0.057	
	Total effect	CHL→PL	0.241	0.018	<0.001	0.213	0.272	

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

Table 10 Model Fit Results for Model (M1)

Indices	Criteria	Results
χ^2/df	<2	11.721
SRMR	<0.08	0.039
RMSEA	<0.08	0.074
GFI	>0.9	0.909
AGFI	>0.9	0.881
NNFI (TLI)	>0.9	0.927
NFI	>0.9	0.932
AIC	–	1799.213
BIC	–	2044.358

Table 11 Standardized Coefficients for Model (M1)^a

Path	Non-Standardized Estimate	Standardized Estimate	95% CI	Standardized Error	C.R.	p
EPHL←CHL	0.536	0.483	[0.44–0.523]	0.029	18.753	<0.001
DMIS←CHL	0.280	0.261	[0.207–0.313]	0.029	9.687	<0.001
DMIS←EPHL	0.289	0.299	[0.246–0.349]	0.026	11.005	<0.001
PL←CHL	0.222	0.181	[0.131–0.227]	0.03	7.466	<0.001
PL←EPHL	0.391	0.354	[0.305–0.403]	0.028	13.929	<0.001
PL←DMIS	0.347	0.305	[0.261–0.349]	0.027	13.039	<0.001

Abbreviations: ^a CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

model span public health, humanistic communication, clinical decision-making, and psychobehavioral domains, reflecting its conceptual multidisciplinary nature. This provides a new theoretical framework for understanding the comprehensive mechanisms of health literacy, shared decision-making, and loyalty formation in doctor-patient interactions, and establishes a foundation for future multidisciplinary team research.

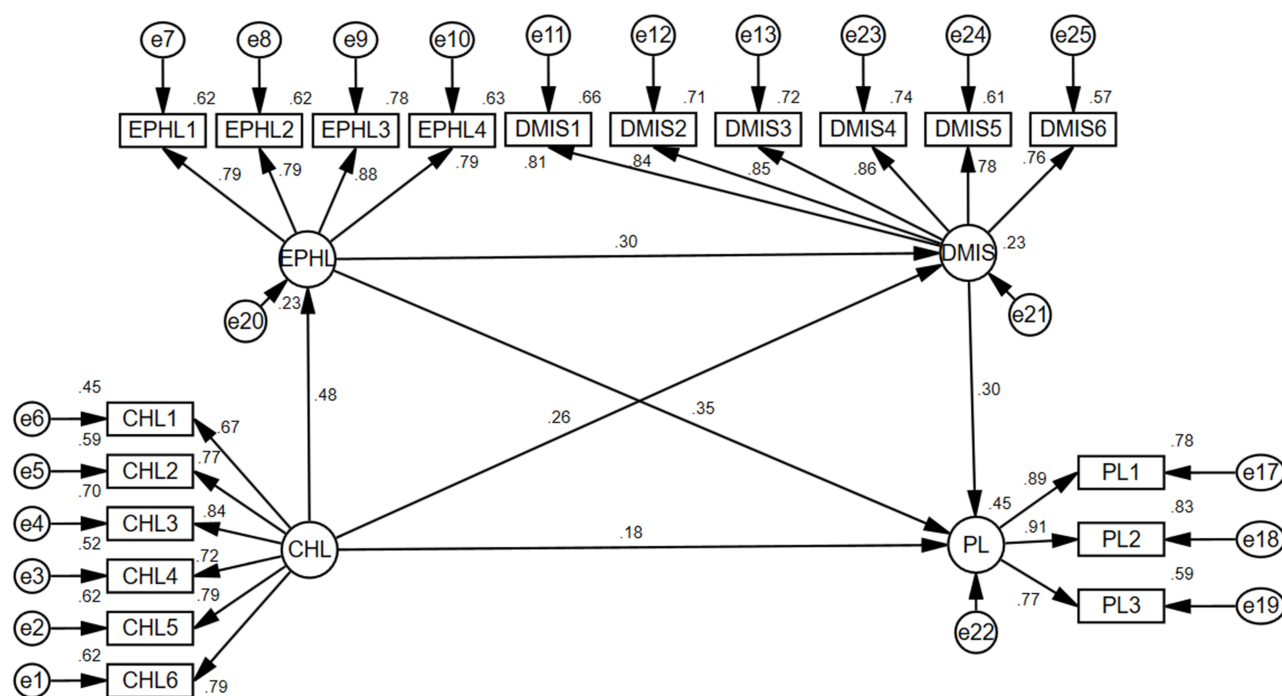


Figure 2 Structural Equation Model Path Diagram (M1).

Abbreviations: CHL, Communicative Health Literacy; EPHL, Enhancement of Perceived Health Literacy; DMIS, Decision-making Involvement Satisfaction; PL, Patient Loyalty.

CHL is positively correlated with EPHL ($\beta=0.516$, $P<0.001$), DMIS ($\beta=0.329$, $P<0.001$), and PL ($\beta=0.192$, $P<0.001$), which confirms the reciprocity principle of resource exchange in SET. CHL reflects the confidence and ease with which patients communicate with doctors.²⁴ Patients with higher levels of CHL are better able to communicate with doctors during medical visits, thereby obtaining more health-promoting information and enhancing their health literacy. In short, individuals with higher CHL are more likely to further improve their health literacy levels. Secondly, when patients have higher levels of CHL, they are more likely to ask questions, express their opinions and needs.²⁴ This active participation in treatment decision-making may lead to greater satisfaction with the decision outcomes. Moreover, good communication between doctors and patients positively impacts PL.⁷ When patients can communicate smoothly with doctors, they have better experiences with medical services, which in turn increases their loyalty to doctors. In summary, patients exchange good CHL for the supply of health information and a sense of control in decision-making from doctors, which may result in positive feedback evaluations of medical services.

EPHL is positively correlated with DMIS ($\beta=0.301$, $P<0.001$) and PL ($\beta=0.355$, $P<0.001$), reflecting the transformation of cognitive resources into emotional commitment and relationship maintenance. In the comprehensive model of health literacy, “application” is the fourth dimension of health literacy, and making informed decisions is a concrete manifestation of this dimension.³⁷ Higher levels of health literacy imply that individuals have the capacity to make good health decisions.⁴³ The enhancement of health literacy empowers patients to comprehend medical information more effectively, leading to greater confidence in their involvement during decision-making and increased satisfaction with the results. This finding also confirms the theoretical conception of “incorporating health literacy into the shared decision-making model” proposed by Danielle M. Muscat et al.³⁸ Additionally, the improvement of patients’ health literacy helps them better manage their own health.⁴⁷ Patients who maintain a positive attitude and behavior towards health are also more likely to recognize and appreciate medical services. Moreover, there is a positive correlation between DMIS and PL ($\beta=0.316$, $P<0.001$), supporting the reinforcing effect of equal interaction on relationship maintenance. Patient satisfaction with medical services usually directly affects their loyalty.^{4,22,51} As an evaluation index of the decision-making process and its outcomes, DMIS may directly drive repeat selection behavior.

In terms of mediating effects, EPHL partially mediates the relationship between CHL and DMIS (indirect effect = 0.155, $P < 0.001$), and also partially mediates the relationship between CHL and PL (indirect effect = 0.183, $P < 0.001$). This reveals the hierarchical transmission logic of “cognitive reserve - capability construction - emotional identification - relational return.” Individuals with higher levels of CHL are more likely to establish good communication with doctors. Effective communication helps individuals obtain, understand health information, and make informed decisions, thereby reinforcing its key role in enhancing health literacy.²³ At the same time, communication aimed at improving health literacy can be regarded as a dynamic and interactive outcome between patients and medical service providers.⁵⁵ This positive outcome may make patients feel more supported and respected in the medical process, thereby enhancing their loyalty to medical services. Therefore, CHL can directly or indirectly enhance patient DMIS and loyalty by promoting improvements in health literacy.

DMIS partially mediates the relationship between CHL and PL (indirect effect = 0.104, $P < 0.001$), revealing the hierarchical transmission logic of “cognitive reserve - emotional identification - relational return.” Compared with individuals with sufficient health literacy, those with limited health literacy have lower awareness of shared decision-making rights, more negative attitudes, and ask fewer questions.⁶⁷ Shared decision-making is key to promoting a shift in healthcare from a paternalistic care model to patient-centered care.⁵⁰ Patient satisfaction with shared decision-making implies that patient-centered care has been effectively implemented. In this process, patients are able to effectively communicate their health-related knowledge and articulate their personal desires and values. They also experience a sense of respect and validation during their interactions with healthcare professionals. Therefore, CHL can directly or indirectly influence PL by enhancing DMIS.

EPHL and DMIS play a chain mediating role between CHL and PL (total indirect effect = 0.049, $P < 0.001$), revealing the cumulative effect of multi-stage resource exchange. The transformation of continuous positive experiences into long-term loyalty creates a hierarchical transmission logic of “cognitive reserve - capability upgrade - emotional identification - relationship return.” Although this model appears to involve the exchange and interaction of resources between patients and doctors, from a higher level, the key to driving this transmission logic lies in the construction of health literacy-oriented medical institutions. Medical institutions with stronger health literacy responsiveness are more likely to bring benefits to patients with lower levels of health literacy.⁶⁸ Existing studies have also shown that health-promoting hospitals have a positive impact on PL.⁶⁰ Therefore, this result suggests a deeper solution strategy, that is, the construction of health literacy-promoting medical institutions brings benefits to patients, doctors, and hospitals at three levels simultaneously.

Furthermore, with the rapid development of Artificial Intelligence (AI) and mobile health (mHealth) technologies, digital tools are profoundly transforming models of health literacy cultivation and dissemination. AI-driven health management systems, intelligent consultation platforms, and personalized health notification technologies can effectively enhance individuals' information acquisition and comprehension abilities, promoting active learning and application of health knowledge.⁶² In the domain of oral health, Chau, Thu, Hsung, McGrath and Lam⁶⁹ developed an AI-powered smart selfie monitoring system for oral health self-management, demonstrating that AI technology can augment individuals' self-monitoring and health decision-making capabilities. Additionally, Deniz-Garcia, Fabelo, Rodriguez-Almeida, Zamora-Zamorano, Castro-Fernandez, Alberiche Ruano, Solvoll, Granja, Schopf, Callico, Soguero-Ruiz and Wagner⁷⁰ noted that integrating AI into mHealth applications not only enhances information availability and interactivity but also improves patients' health behavior change and adherence. These studies suggest that AI technology, as a novel “resource exchange” medium, can reinforce the “cognitive reserve - capability construction - emotional identification - relational return” pathway within the SET framework, offering a new digitally-supported direction for future efforts to enhance CHL and promote PL.

Theoretical Implications

This study is the first to apply CHL as a measurement tool in the Chinese population. Based on SET, this research provides a new perspective for understanding the role of individual CHL in medical contexts. In medical settings, patients exchange their CHL for health information and decision-making respect from doctors. This bidirectional exchange model enriches the theoretical connotations. Meanwhile, this research goes beyond the traditional view of

health literacy as a fixed personal characteristic, confirming its role as a dynamic process in building capabilities. The spiral growth of communication and health literacy among patients sets the stage for their future involvement in decision-making and loyal actions. Additionally, this study enriches the research on the relationship between health literacy and loyalty. Previous studies have mostly focused on the impact of health literacy on health behaviors and outcomes. In contrast, this study links health literacy with PL, revealing the significant role of constructing health literacy-promoting medical institutions.

Policy Implications

Patient Level

Healthcare systems urgently need to develop and implement strategies differentiated by patients' age, language, and cultural background to meet their specific health literacy needs.⁷¹ Systematic health literacy interventions and contextualized communication training should be employed to help patients become active participants in health decision-making. Medical practitioners can employ structured communication, guided questioning, feedback confirmation, and other techniques to facilitate patients' expression of needs, comprehension of information, and application of knowledge to self-health management, thereby achieving a spiral interaction of "information understanding-capacity building-trust reciprocity." This process not only enhances patients' decision-making confidence and compliance but also contributes to the construction of long-term, mutually trusting doctor-patient relationships.

Institutional Level

Medical institutions should integrate health literacy responsiveness into the core domain of service quality management. Specifically, CHL indicators can be incorporated into patient experience and service quality evaluation systems, interdisciplinary health literacy communication training mechanisms can be established, and follow-up and feedback systems can be improved to continuously monitor patients' communication experiences and satisfaction. Concurrently, enhancing healthcare professionals' health literacy capabilities is equally crucial for optimizing doctor-patient communication.^{72,73} This capability is multidimensional in nature, encompassing functional skills (eg, clear expression), communication skills (eg, shared decision-making), and critical skills (eg, facilitating patient empowerment).⁷² Tailoring communication strategies according to patients' health literacy levels can motivate them to play an active role as "co-producers" and make more information-based health decisions.²⁴ Furthermore, developing assessment and improvement tools to support medical institutions in enhancing health literacy responsiveness^{74,75} can help institutionalize health literacy-oriented services, enhancing PL and institutional reputation within a positive cycle of "equity-trust-loyalty."

Policy Level

Policymakers should promote the construction of a health literacy-friendly environment at the macro level, integrating health literacy and communication competencies into medical institution performance assessment and accreditation standards. Policy guidance can be used to encourage collaboration between hospitals and communities to establish a stratified and tiered health education system, forming a literacy support network covering the entire continuum of prevention, treatment, and rehabilitation. Simultaneously, requirements for communication equity and information accessibility should be strengthened in healthcare policies to promote the enhancement of health decision-making capabilities among diverse cultural and age groups and foster the development of a trust-centered medical service ecosystem.

Practical Implications

The healthcare system urgently needs to develop and implement strategies that are differentiated based on patients' age, language, and cultural backgrounds in order to meet their specific health literacy needs.⁷¹ Developing tools that support medical institutions in enhancing their health literacy responsiveness holds significant practical importance.^{74,75} Additionally, improving doctors' health literacy capabilities is equally important for promoting doctor-patient communication.^{72,73} These capabilities are multidimensional, encompassing functional skills (eg, clear communication), communication skills (eg, shared decision-making), and critical skills (eg, patient empowerment).⁷² Tailoring

communication to patients' health literacy levels may enable them to play an active role as co-producers and make informed health decisions.²⁴ Moreover, this study highlights the crucial role of DMIS in the formation of PL. Customizing decision aids according to the needs of patients with low health literacy can ensure shared decision-making while reducing patients' cognitive burden.⁷⁶

Limitations

Despite the achievements of this study, there are still some limitations. First, in terms of sample selection, the samples of this study are limited to medical institutions in specific regions of China. Future studies can expand the scope of samples to cover more different cultural regions and different types of medical institutions to enhance the cultural adaptability and representativeness of the research results. Second, the data collected in this study were obtained through a questionnaire survey, which may be subject to subjective bias and recall bias. Future studies can combine multiple research methods, such as interviews and observation, to obtain more comprehensive and objective data. Third, this study mainly focuses on the direct and mediating effects of CHL. Future research can further explore other potential influencing factors and moderating variables, such as the accessibility of medical services, medical costs, and patients' social support, to gain a deeper understanding of the complex relationships between these variables. Fourth, this study is a cross-sectional design, and therefore the causal association between variables cannot be fully verified. Future studies could further test and strengthen the causal inference of these hypothesized paths through longitudinal or experimental studies.

Conclusion

Based on SET, this study constructed an integrated model in which CHL affects loyalty through multi-stage resource exchange in the Chinese medical context, and explored the hierarchical transmission logic of “cognitive reserve - capability construction - emotional identification - relational return.” Specifically, EPHL and DMIS demonstrated a chain-related trend between CHL and PL. This finding not only provides a new perspective for understanding the possible formation mechanism of PL but also offers important theoretical support for the construction of health literacy-promoting medical institutions. Future research could test the robustness of this model in cross-cultural samples and explore how to translate it into operational policies and institutional management strategies to promote patient-centered high-quality medical services globally.

Abbreviations

CHL, communicative health literacy; PL, patient loyalty; SET, social exchange theory; EPHL, enhancement of perceived health literacy; DMIS, decision-making involvement satisfaction; CDIS, clinical decision-making involvement and satisfaction; SEM, structural equation modeling; AVE, average variance extracted; CR, composite reliability; GFI, goodness of fit index; CFI, comparative fit index; NFI, normed fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; NNFI, non-normed fit index; AGFI, adjusted goodness of fit index.

Data Sharing Statement

Due to privacy restrictions, the datasets used and/or analyzed in this study are available from the corresponding author Renjie Lu (e-mail: renjie_lu@126.com) upon reasonable request.

Ethical Approval and Consent to Participate

The study was approved by the ethics committee of Changzhou Third People's Hospital (02A-A2023030). All participants provided informed consent online before the survey, in accordance with the principles of the Helsinki Declaration.

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Author Contributions

Yang Chen: Article Submission, Questionnaire Survey, Article Writing, Translation & Proofreading. Yijia He: Data Curation, Formal Analysis, Validation, Conceptualization, Supervision. Shenyu Zhao: Literature Review, Visualization, Writing-Review & Editing. Siyuan Wu: Response to Reviewers, Validation, Writing-Review & Editing. Jing Zhou: Investigation, Writing-Review & Editing. Lingmin Hu: Conceptualization, Methodology, Funding Acquisition & Supervision. Renjie Lu: Research Ideas, Determine Revisions, Review & Funding Acquisition. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

Yang Chen and Yijia He are co-first authors for this study. The authors declare that they have no competing interests in this work.

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