Based on the Status Quo of Outcomes Reported by Stroke Patients and Correlation Analysis of Influence Factors

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Abstract

Background: This study assesses the quality of life during hospitalization using a stroke patient-reported outcomes scale. It investigates the current status of patient-reported outcomes in stroke patients and explores their correlation with blood lipids.

Objective: To investigate the status of reported outcomes in stroke patients and to study the relationship with blood lipid.

Methods: Convenient sampling was employed to select a cohort of 195 stroke patients as the study participants. The Stroke-PRO scale was used to assess patients' conditions across physical, psychological, social, and therapeutic domains.Multiple linear regression analysis was applied to identify factors influencing stroke patient-reported outcomes, while correlation analysis was conducted to explore the relationship between these outcomes and blood lipid levels. This approach aimed to recognize potential factors and risk indicators that may impact recurrent events, facilitating early intervention measures.

Results: The Stroke-PRO score in this study was (4.09±0.29). By multiple linear regression analysis, residence, occupation, physical exercise, Barthel, Braden, NHISS at admission and stroke type were the influencing factors for reported outcomes of stroke patients (P< 0.05). Correlation analysis showed that triglyceride, serum total cholesterol and low density lipoprotein were negatively correlated with stroke-Pro scores in Stroke patients (P< 0.05), while high density lipoprotein was positively correlated with stroke patients (P< 0.05).

Conclusions: Stroke patients have a low level of health and reported outcomes that need to be improved.Nursing staff should pay attention to the quality of life and blood lipid indexes of patients, actively capture the actual health status, and take early intervention measures to promote the recovery of patients.

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Abstract

Background: Stroke is the leading cause of acquired disability and the second leading cause of death worldwide. Its rate of incidence, disability, mortality, and recurrence is high, and the patients appear a variety of discomfort symptoms, which not only affect their rehabilitation function, but also reduce their daily life ability and quality of life. Nowadays, with the improvement of China's medical standard, patients pay more and more attention to their quality of life and health status. However, diagnostic techniques and effective treatments for stroke patients are still limited but urgently required.

Objective: This study aimed to evaluate the quality of life during hospitalization using a stroke patient-reported outcomes scale, and further to recognize potential factors and risk indicators that may impact recurrent events, facilitating early intervention measures.

MethodsThis is a registry-based, retrospective observational cross-sectional study on the stroke patients. Convenient sampling method was employed to select various indicators of patients. Then, the Stroke-PRO scale was used to assess patients' conditions across physical, psychological, social, and therapeutic domains. Multiple linear regression analysis was applied to identify factors influencing stroke patient-reported outcomes, while correlation analysis was conducted to explore the relationship between these outcomes and blood lipid levels.

Results: The Stroke-PRO score in this study was (4.09±0.29) points. By multiple linear regression analysis, residence, occupation, physical exercise, Barthel, Braden, NHISS at admission and stroke type were the risk factors for reported outcomes of stroke patients ($P< 0.05$). Correlation analysis showed that serum triglyceride, total cholesterol, and low-density lipoprotein were negatively correlated with stroke-Pro scores in stroke patients ($P< 0.05$), while high-density lipoprotein was positively correlated with stroke patients ($P< 0.05$). The 95% confidence interval (CI) was [-0.3126, -0.0314] for triglyceride, [0.1692, 0.4388] for high-density lipoprotein, [-0.2892, -0.0068] for cholesterol, [-0.2982, -0.0158] for low-density lipoprotein, and [-0.1206, 0.1606] for blood glucose.

Conclusion: Stroke patients have a low level of health and their reported outcomes that need to be improved. Accordingly, nursing staff should pay attention to the quality of life and blood lipid indexes of stroke patients, actively capture the actual health status, and take early intervention measures to promote their recovery.

Keywords

stroke; patient-reported outcomes; blood lipids; influence factor; correlation analysis; nursing care

Introduction

Cerebral stroke, also known as “stroke” or cerebrovascular accident, is an acute cerebrovascular disease caused by various factors, leading to the rupture or blockage of cerebral blood vessels. It

primarily results in ischemic or hemorrhagic damage to brain tissue [1]. Stroke can be categorized into three distinct sub types, 87% of which are ischemic stroke (IS), following with 10% hemorrhagic stroke (HS), and 3% subarachnoid (HS) [2]. Stroke poses a severe threat to the human health, ranking the leading cause of acquired disability and adult mortality in China [3], and the second leading cause of death worldwide [4, 5]. About 50 % stroke patients have reduced mobility, and 26 % remain disabled in basic activities of daily living (ADLs) after a stroke [6]. With increasing recurrence rates, stroke is characterized by a high incidence, high disability rate, high mortality rate, high recurrence rate, and substantial economic burden [7]. Utilizing data from the Global Burden of Disease (GBD) study 2021, Ma et al, revealed a decline of 9.3% (95% CI, 3.3%-15.5%) in age-standardized incidence and 39.8% (95% CI, 28.6%-50.7%) in mortality rates from 1990 to 2019[8].

Patients experience various symptoms including physical and psychological manifestations during medical disease treatment and rehabilitation [9-11]. These symptoms not only impact patients' recovery functions but also reduce their daily life capabilities and quality of life, imposing a heavy burden on family caregivers and society at large. Up to now, there is no effective treatment for stroke, and prevention is the most feasible strategy to reduce the harm of stroke and reduce its social burden. As we know, the five leading risk factors for stroke are high systolic blood pressure, high body mass index (BMI), high fasting plasma glucose (FPG), and ambient particulate matter pollution, and smoking [12-14]. In addition, drinking, aging population, physical inactivity, and metabolic problems also affect the incidence of stroke [15]. According to WHO, effective stroke prevention strategies include targeting modifiable risk factors, such as hypertension, control of elevated lipids, diabetes, smoking, low physical activity, unhealthy diet, and abdominal obesity [6]. Therefore, early identification of risk factors is essential to prevent stroke.

Foreign studies on Patient-Reported Outcomes (PROs) originated in the 1970s. The Food and Drug Administration (FDA) defines PROs as "all information about a patient's health status that comes directly from the patient and does not require interpretation by a doctor or others" [16, 17]. Often in the form of self-assessment scales, PROs comprehensively assess outcomes such as symptom burden, emotional status, functional level, and quality of life related to the disease and treatment, offering a holistic understanding of patients' health levels [18, 19]. Accordingly, PROs are usually more sensitive than methods like physician interviews or scoring. Considering limited research in China, the applicability of PROs in stroke patients still requires further validation.

Although the qualitative research findings are from our single institution, this study is of vital significance for the accurate identification and effective management of stroke patients' symptoms using comprehensive assessment methods. Therefore, the aim of this study is to utilize patient self-assessment reports on health-related outcomes to early identify changes in stroke patients' status and improve disease progression, which could be broadly distributed to a diverse sample of stroke caregivers.

Methods

Study design and sample

Convenience sampling was employed to select stroke patients from the Neurology and Neurosurgery Department of a tertiary hospital between May 2023 and September 2023 in Lianyungang City, Jiangsu Province, China. Details of participant inclusion and exclusion criteria are shown in Table 1.

Table 1 Participant Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria

1. According to the diagnostic criteria for stroke outlined in the "Diagnosis of Various Major Cerebrovascular Diseases in China 2019"[20], the patients were confirmed through head CT or (and) MRI examinations. 2. Age > 40 years. 3. Clear consciousness, without cognitive or communication impairments 4. Informed consent and voluntary participation in the study. 5. Complete clinical data.	Patients who are unconscious, have language or intellectual impairments preventing comprehension or questionnaire completion, or refuse to participate in this project are excluded.

Procedure and data collection

Based on multivariate linear regression analysis, the sample size was set at 5-10 times the number of independent variables [21]. Considering 16 influence factors and a 15% expected loss rate in this study, the calculated sample size ranged from 96 to 195 cases. The study received ethical approval from the hospital ethics committee with approval number KY-20230215002-01, and all participants were adequately informed and consented to the research.

Demographic and Clinical Variables

Questionnaires were used to collect demographic information, including age, sex, body mass index (BMI), occupation, marital status, monthly family income, level of education, residence, smoking history, and alcohol consumption history. Furthermore, we placed a specific focus on collecting relevant patient medical history, including a history of hypertension, diabetes, heart disease, and stroke. Simultaneously, laboratory data such as fasting blood glucose (FBG), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and total cholesterol (TC) were also collected to gain insights into the condition during the patients' hospitalization.

Stroke-PRO

The Stroke-PRO scale developed by Professor Yano Zhang from Shanxi Medical University was utilized to gather symptom data [22]. The scale is divided into f 46 items consisting 10 dimensions across 4 domains, with Likert five-point scale ratings. Responses are scaled from 0 to 4 points, employing a unique calculation process for positive and negative items. Positive item scores are calculated as 1 plus the actual score, and negative item scores are calculated as 5 minus the actual score. Each item has a score range of 1- 5 points. As the number of items varies across dimensions/domains, direct comparison of five-point scores within different dimensions/domains is not possible. Therefore, the scale score is computed by summing all item scores and dividing by the total number of items on the scale. The total score reflects the patient's overall quality of life, with higher scores indicating better quality of life and lower scores indicating poorer quality. Previous research has demonstrated the scale's strong reliability and validity, with Cronbach's coefficients for the four domains (physiological, psychological, social, and therapeutic) being 0.888, 0.908, 0.879, and 0.861, respectively, implying high reliability [23].

Data collection and quality control methods

Our research team defined the inclusion and exclusion criteria and two trained investigators explain the unified guidance to the patients who meet the standards. The investigators responsible for patient screening and recruitment underwent training to strictly adhere to clear inclusion and exclusion criteria for subjects. Detailed documentation of each patient's screening process, including reasons for inclusion and exclusion, was meticulously maintained to minimize bias. After seeking informed consent from patients, questionnaires were distributed on site and patients were asked to fill them out

independently. During which the investigators only explain what the patient does not understand. The general data of the patients were obtained from the medical records by the investigators, and the clinical objective indicators were collected from the hospital electronic medical record system of the patients, along with the social demographic data, disease and treatment related data.

Statistical analysis

Data analysis was conducted using SPSS 27.0 statistical software. Normality tests were applied for continuous data, with normally distributed continuous data described as mean ± standard deviation, and non-normally distributed data presented as median with the 25th and 75th percentile. Descriptive statistics, including frequency and percentage, were employed for categorical data. Single-factor analysis of variance and multiple linear regression were utilized to analyze the influence factors of patient-reported outcomes in stroke patients. Pearson correlation analysis was performed to explore the correlation between patient-reported outcomes and lipid profiles. A significance level of $P < 0.05$ is considered statistically significant.

Results

Status of Patient-Reported Outcomes in Stroke Patients

A total of 195 patients were included in this study, comprising 123 males (63.1%) and 72 females (36.9%), with an average age of (66.77±10.82) years. The Stroke-PRO scale score for stroke patients was (4.09±0.29) points. Specifically, the scores for the physiological domain, psychological domain, social domain, and therapeutic domain were (18.57±2.22), (15.78±0.9), (6.46±0.55), and (5.22±0.39) points, respectively.

Single-Factor Analysis of Patient-Reported Outcomes in Stroke Patients

Among stroke patients, there were statistical differences ($P < 0.05$) in Stroke-PRO scores with different residential areas, occupations, physical exercise habits, stroke types, Barthel index, Braden scale, and National Institute of Health Stroke Scale (NIHSS) scores at admission (Table 2).

Table 2 Single-Factor Analysis of General Information and Patient-Reported Outcomes in Stroke Patients (n=195)

Variable	Cases [n (%)]	PRO score (point $\bar{x}\pm s$)	t	P
Gender			1.393	0.239
Male	123(63.1)	4.11±0.29		
Female	72(36.9)	4.06±0.28		
Age			1.002	0.479
□50	9(4.6)	4.11±0.25		
50□69	104(53.3)	4.14±0.28		
□70	82(42.1)	4.02±0.28		
BMI			1.015	0.468
□18.5	5(2.6)	3.84±0.29		
18.5□	56(28.7)	4.08±0.28		
24□	95(48.7)	4.09±0.29		
≥28	39(20.0)	4.12±0.28		
Educational Level			1.967	0.12
Elementary school	77(39.5)	4.07±0.28		
Junior high school	74(38.0)	4.05±0.28		

Technical/High school	30(15.4)	4.18±0.3		
College and above	14(7.2)	4.17±0.32		
Residence			6.427	0.012
Rural	82(42.1)	4.03±0.28		
Town	113(57.9)	4.13±0.29		
Smoking history			0.940	0.392
Yes	66(33.8)	4.07±0.27		
No	112(57.4)	4.11±0.28		
Former smoker	17(8.7)	4.02±0.39		
Alcohol history			1.775	0.172
Yes	72(36.9)	4.13±0.29		
No	112(57.4)	4.07±0.26		
Occupation			3.678	0.013
Former drinker	11(5.6)	3.98±0.44		
Unemployed	21(10.7)	4.02±0.27		
Retired	77(39.4)	4.12±0.29		
Employed	38(19.5)	4.19±0.27		
Farmer	59(30.2)	4.02±0.28		
Physical exercise			7.522	□0.001
None	98(50.2)	4.02±0.28		
Frequent	42(21.5)	4.2±0.31		
Occasional	55(28.2)	4.14±0.25		
Polypharmacy			2.447	0.119
Yes	131(67.1)	4.11±0.3		
No	64(32.8)	4.04±0.25		
Stroke Type			3.306	0.039
Subarachnoid Hemorrhage	16(8.2)	4.04±0.24		
Intracerebral Hemorrhage	41(21.0)	4±0.2		
Ischemic Stroke	138(70.7)	4.12±0.31		
High blood pressure			0.899	0.344
Yes	151(77.4)	4.1±0.29		
No	44(22.6)	4.05±0.26		
Diabetes			1.584	0.21
Yes	59(30.3)	4.13±0.3		
No	136(69.7)	4.07±0.28		
Heart disease			1.969	0.162
Yes	26(13.3)	4.02±0.27		
No	169(86.7)	4.1±0.29		
Duration of complications (years)			1.069	0.378
≤1	34(17.4)	4.09±0.24		
2□	36(18.5)	4.07±0.24		
6□	14(7.2)	4.11±0.32		
≥10	111(56.9)	4.1±0.31		
Stroke history			1.224	0.27
Yes	119(61.1)	4.11±0.26		
No	76(38.9)	4.06±0.32		
NHISS (point)			6.236	□0.001

0: normal	53(27.2)	4.32±0.23		
1-4: Minor apoplexy	73(37.4)	4.09±0.26		
5-15: Moderate apoplexy	51(26.2)	3.9±0.24		
16-20: Moderate-severe apoplexy	9(4.6)	3.93±0.2		
21-42: Severe apoplexy	9(4.6)	3.94±0.14		
Bl			8.196	□0.001
0□40	90(46.2)	3.92±0.22		
41□60	26(13.3)	4.05±0.29		
61□99	75(38.5)	4.29±0.22		
100	4(2.0)	4.35±0.23		
Braden			11.365	□0.001
10□12	11(5.6)	3.79±0.16		
13□14	20(10.3)	3.84±0.23		
15□18	45(23.1)	3.96±0.27		
19□23	119(61.0)	4.21±0.24		

Multivariate Analysis of Patient-Reported Outcomes in Stroke Patients

Using the Stroke-PRO score as the dependent variable, a multiple regression analysis was conducted with variables that showed statistical significance in the single-factor analysis as independent variables [24]. The assignment of values for independent variables was presented (Table 3). The results revealed that Barthel Index, Braden Scale, and NIHSS Score at admission were significant factors influencing patient-reported outcomes in stroke patients ($P < 0.05$) (Table 4).

Table 3 Assignment of argument variables

Independent variables	Assign
Residence	Town=1, Rural=2□
Occupation	Employed=1, Retired=2, Farmer=3, Unemployed=4
Physical exercise	Frequent=1, None=2, Occasional=3
Stroke type	Subarachnoid Hemorrhage=1, Intracerebral Hemorrhage=2, Ischemic Stroke=3

Table 4 Multiple linear regression analysis of reported outcomes of stroke patients (n=195)

Model	B	SE	Beta	*t*	*P*	95%CI
(Constant)	1.139	.042		27.168	.000	
Barthel	.002	.000	.420	4.754	□.001	[.306,3.272]
Braden	.009	.003	.287	3.389	□.001	[.332,3.011]
NHISS	-.002	.001	-.105	-1.780	.077	[.686,1.459]

Correlation Analysis between Patient-Reported Outcomes and Lipid Profiles in Stroke Patients

The correlation analysis revealed a negative correlation between triglycerides, cholesterol, low-density lipoprotein, and Stroke-PRO scores in stroke patients (All $P < 0.05$). Conversely, there was a positive correlation between the high-density lipoprotein and Stroke-PRO scores ($P < 0.05$) (Table 5).

Table 5 Correlation between patient-reported outcomes and blood lipid indexes in stroke patients (n=195)

Pearson	Triglyceride	HDL	Cholesterol	LDL	FBG
r	-0.172*	0.304**	-0.148*	-0.157*	0.020
95% CI	[-0.313, -0.031]	[0.169, 0.439]	[-0.289, -0.007]	[-0.298, -0.016]	[-0.121, 0.161]
P	0.016	□0.001	0.039	0.028	0.786

Notes□HDL, high density lipoprotein; LDL, low density lipoprotein; FBG, fasting blood glucose. **, *P*□0.001□*, *P*□0.05.

Discussion

The study reveals PRO scores across various domains: physiological (18.57±2.22), psychological (15.78±0.9), social (6.46±0.55), and treatment (5.22±0.39). However, the diverse nature of stroke cases complicates direct score comparison across domains despite using the Likert five-point scoring system. Generally, stroke patients face lower quality of life, likely due to the prolonged disease course, multiple complications, substantial family burdens, and physical functional impairments [25]. Additionally, domestic research has indicated that a high score means more severe symptoms and therefore a poorer quality of life in stroke patient [26]. The severity of stroke within 3-5 days after admission is an independent risk factor for poor quality of life among survivors (P<0.01). Therefore, it is an effective approach to enhancing the quality of life for ischemic stroke patients by improving symptoms as soon as possible [27]. Although there is existing domestic and international research on PROs, standardized measurement tools for assessing outcomes in stroke patients have not been established.

The study underscores the impact of residence on stroke patients' outcome reports, revealing higher Stroke-PRO scores in urban residents compared to rural counterparts. This disparity may arise from varying health awareness, cultural literacy, and medical conditions in rural areas. In line with Tu's findings [28], higher stroke rates in rural areas are linked to an imbalanced distribution of risk factors compared to urban areas. Rural participants exhibit higher proportions of individuals with lower education and monthly income levels, as well as a lower prevalence of hypertension, diabetes, and abnormal lipid levels. Conversely, they possess higher rates of smoking, alcohol consumption, lack of physical activity, and obesity. Rural areas also exhibit lower awareness, treatment, and control rates for hypertension, diabetes, and abnormal lipid levels than urban areas. Therefore, healthcare providers should prioritize health education, disseminate relevant knowledge, and enhance patient consciousness for improving quality of life.

Unemployed patients report lower health levels and quality of life, suggesting that unemployment significantly impacts health outcomes. The difference may be related to several factors such as job nature, psychological stress, economic income, and life pressures. Accordingly, special attention to patients' psychological and economic conditions, coupled with patient-centric approaches like active listening and counseling, is crucial for encouraging self-management and fostering a positive mindset.

Physical exercise significantly influences stroke patients' outcomes, and those lacking exercise exhibit lower Stroke-PRO scores, indicating poorer self-reported health and quality of life. Accumulating evidence has demonstrated that exercise can improve risk factors associated with initial or recurrent stroke, and good exercise has a positive effect on neuroplasticity, thus potentially improve cognition and function. Especially, moderate to high-intensity exercise after a stroke can reduce the risk of stroke recurrence and improve patients' depression [28-30]. Collectively, healthcare providers should stress the importance of functional exercise, creating personalized plans to enhance physical fitness and prevent strokes.

The widely used BI assesses daily living activities, determining recovery needs and care levels. The Braden score gauges pressure ulcer risk, requiring increased attention to patients' daily living abilities. Studies indicate the initial NIHSS score influences outcomes, aligning with clinical experience. During nursing, emphasis on the NIHSS score and personalized care plans aids patient recovery.

Furthermore, the study establishes a link between abnormal blood lipids and stroke occurrence. Dyslipidemia is a major atherosclerotic cardiovascular disease risk factor linked to stroke incidence [31]. Mechanisms triggering atherosclerosis, especially hypercholesterolemia, contribute to coronary

heart disease. LDL-C is the end product of lipoprotein metabolism, and a higher plasma level of LDL-C is a major risk factor for atherosclerotic cardiovascular disease (ASCVD) with a continuous [32]. Elevated TC levels increase ischemic cardiovascular disease risk. Conversely, HDL, an anti-atherosclerotic lipid, correlates negatively with stroke severity and prognosis, and LDL-C levels positively correlate with ischemic stroke risk but negatively with hemorrhagic stroke [33]. Similarly, HDL-C levels negatively correlate with ischemic stroke but not hemorrhagic stroke, while TG levels show a weak positive correlation with ischemic stroke and a negative correlation with hemorrhagic stroke [34].

Considering the above, this study focuses on the relationship between Stroke-PRO scores in stroke patients and blood lipid indicators. Results indicate a negative correlation of triglycerides, cholesterol, and LDL with Stroke-PRO scores), but a positive correlation of HDL with Stroke-PRO scores. This conclusion aligns with the results of the aforementioned study. Therefore, for individuals at high risk of cerebrovascular risk factors, it is recommended that patients reduce stroke risk across smoking cessation, alcohol moderation, regular exercise, a balanced diet, routine follow-ups, weight control, and stable lipid and blood pressure levels [35].

Limitations

Firstly, compared to commonly used quality of life scales, the usage of the Stroke-PRO scale is relatively limited, suggesting a need for broader applicability. Secondly, the Stroke-PRO scale was initially developed within a specific linguistic and cultural context in China. When used in different linguistic and cultural settings, even after translation and cultural adaptation, there may still be comprehension biases. Lastly, patients' health status may change over time, while Stroke-PRO assessments are typically conducted at specific time points. Thus, this approach may not capture the dynamic changes in patients' health throughout the entire rehabilitation process.
While our study employed a convenient sampling method, potentially introducing bias, we mitigated this limitation by furnishing detailed descriptions of key sample characteristics—age, gender, clinical condition—and comparing them to population norms for readers' assessment. Notably, future research should prioritize larger sample sizes for greater representativeness, facilitating early intervention and dynamic tracking of health outcomes in stroke patients.

Conclusion

Given the observed lower health levels, the study underscores the imperative to enhance patient-reported outcomes in stroke care. Significant correlations of patients' characteristics with health levels emphasize the crucial role of lipid management in stroke care. Moreover, accurate patient reporting emerges as a key contributor to improved functional outcomes, enhanced quality of life, and reduced correlation with risk factors.

Abbreviations

IS ischemic stroke
HS hemorrhagic stroke
ADLs activities of daily living
SBP systolic blood pressure
BMI high body mass index
FPG fasting plasma glucose
PROs Patient-Reported Outcomes
FDA Food and Drug Administration
TG triglycerides
HDL-C high-density lipoprotein cholesterol

LDL-C low-density lipoprotein cholesterol
TC total cholesterol
NIHSS National Institute of Health Stroke Scale
BI Barthel Index

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Author Contribution

JS, LM contributed to the drafting of the manuscript; XM, RZ, SSZ, LLF contributed to Analysis and interpretation of data; JS, TTH contributed to the conception and critical revision of the manuscript; and approved the final version of the submitted manuscript.

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Data Availability

The data used in this study were collected through a questionnaire designed and conducted by the authors themselves. All data generated or analyzed during this study are included in this published article [and its supplementary information files: PRO figures].

Declarations

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethics approval and consent to participate

Firstly, in this study, all methods used by the researcher throughout the questionnaire survey of the study participants were carried out in accordance with the relevant guidelines and regulations. Secondly, this study was approved by the Clinical Research Ethics Committee of the First People's Hospital of Lianyungang (approval number: KY-20230215002-01). Furthermore, it can be demonstrated that the research was conducted in accordance with the standards set out in the 1964 Declaration of Helsinki.
Finally, all participants in this study were young and middle-aged with normal consciousness and cognitive abilities, and all subjects were given informed consent and signed written informed consent.

Consent for publication

No applicable.

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Supplementary Files

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Figures

Table 1 Participant Inclusion and Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
1. According to the diagnostic criteria for stroke outlined in the "Diagnosis of Various Major Cerebrovascular Diseases in China 2019"[20], the patients were confirmed through head CT or (and) MRI examinations. 2. Age > 40 years. 3. Clear consciousness, without cognitive or communication impairments 4. Informed consent and voluntary participation in the study. 5. Complete clinical data.	Patients who are unconscious, have language or intellectual impairments preventing comprehension or questionnaire completion, or refuse to participate in this project are excluded.

Table 2 Single-Factor Analysis Results of General Information and Patient-Reported Outcomes in Stroke Patients (n=195).

Table 2 Single-Factor Analysis of General Information and Patient-Reported Outcomes in Stroke Patients (n=195)

Variable	Cases [n (%)]	PRO score (point, $\bar{x} \pm s$)	t	P
Gender			1.393	0.239
Male	123(63.1)	4.11±0.29		
Female	72(36.9)	4.06±0.28		
Age			1.002	0.479
<50	9(4.6)	4.11±0.25		
50~69	104(53.3)	4.14±0.28		
>70	82(42.1)	4.02±0.28		
BMI			1.015	0.468
<18.5	5(2.6)	3.84±0.29		
18.5~	56(28.7)	4.08±0.28		
24~	95(48.7)	4.09±0.29		
≥28	39(20.0)	4.12±0.28		
Educational Level			1.967	0.12
Elementary school	77(39.5)	4.07±0.28		
Junior high school	74(38.0)	4.05±0.28		
Technical/High school	30(15.4)	4.18±0.3		
College and above	14(7.2)	4.17±0.32		
Residence			6.427	0.012
Rural	82(42.1)	4.03±0.28		
Town	113(57.9)	4.13±0.29		
Smoking history			0.940	0.392
Yes	66(33.8)	4.07±0.27		
No	112(57.4)	4.11±0.28		
Former smoker	17(8.7)	4.02±0.39		
Alcohol history			1.775	0.172
Yes	72(36.9)	4.13±0.29		
No	112(57.4)	4.07±0.26		
Occupation			3.678	0.013
Former drinker	11(5.6)	3.98±0.44		
Unemployed	21(10.7)	4.02±0.27		
Retired	77(39.4)	4.12±0.29		
Employed	38(19.5)	4.19±0.27		
Farmer	59(30.2)	4.02±0.28		
Physical exercise			7.522	<0.001
None	98(50.2)	4.02±0.28		
Frequent	42(21.5)	4.2±0.31		
Occasional	55(28.2)	4.14±0.25		
Polypharmacy			2.447	0.119
Yes	131(67.1)	4.11±0.3		

Table 3 Assignment of argument variables.

Table 3 Assignment of argument variables

Independent variables	Assign
Residence	Town=1, Rural=2；
Occupation	Employed=1, Retired=2, Farmer=3, Unemployed=4
Physical exercise	Frequent=1, None=2, Occasional=3
Stroke type	Subarachnoid Hemorrhage=1, Intracerebral Hemorrhage=2, Ischemic Stroke=3

Table 4 Results of multiple linear regression analysis of reported outcomes of stroke patients (n=195).

Table 4 Multiple linear regression analysis of reported outcomes of stroke patients (n=195)

Model	B	SE	Beta	*t*	*P*	95%CI
(Constant)	1.139	.042		27.168	.000	
Barthel	.002	.000	.420	4.754	<.001	[.306,3.272]
Braden	.009	.003	.287	3.389	<.001	[.332,3.011]
NHISS	-.002	.001	-.105	-1.780	.077	[.686,1.459]

Table 5 Correlation between reported outcomes and blood lipid indexes in stroke patients (n=195).

Table 5 Correlation between patient-reported outcomes and blood lipid indexes in stroke patients (n=195)

Pearson	Triglyceride	HDL	Cholesterol	LDL	FBG
r	-0.172*	0.304**	-0.148*	-0.157*	0.020
95% CI	[-0.313, -0.031]	[0.169, 0.439]	[-0.289, -0.007]	[-0.298, -0.016]	[-0.121, 0.161]
P	0.016	<0.001	0.039	0.028	0.786

Notes: HDL, high density lipoprotein; LDL, low density lipoprotein; FBG, fasting blood glucose.
**, $P<0.001$, *, $P<0.05$.

Table 2 Single-Factor Analysis Results of General Information and Patient-Reported Outcomes in Stroke Patients (n=195).
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No	64(32.8)	4.04±0.25		
Stroke Type			3.306	0.039
Subarachnoid Hemorrhage	16(8.2)	4.04±0.24		
Intracerebral Hemorrhage	41(21.0)	4±0.2		
Ischemic Stroke	138(70.7)	4.12±0.31		
High blood pressure			0.899	0.344
Yes	151(77.4)	4.1±0.29		
No	44(22.6)	4.05±0.26		
Diabetes			1.584	0.21
Yes	59(30.3)	4.13±0.3		
No	136(69.7)	4.07±0.28		
Heart disease			1.969	0.162
Yes	26(13.3)	4.02±0.27		
No	169(86.7)	4.1±0.29		
Duration of complications (years)			1.069	0.378
≤1	34(17.4)	4.09±0.24		
2~	36(18.5)	4.07±0.24		
6~	14(7.2)	4.11±0.32		
≥10	111(56.9)	4.1±0.31		
Stroke history			1.224	0.27
Yes	119(61.1)	4.11±0.26		
No	76(38.9)	4.06±0.32		
NHISS (point)			6.236	<0.001
0: normal	53(27.2)	4.32±0.23		
1-4: Minor apoplexy	73(37.4)	4.09±0.26		
5-15: Moderate apoplexy	51(26.2)	3.9±0.24		
16-20: Moderate-severe apoplexy	9(4.6)	3.93±0.2		
21-42: Severe apoplexy	9(4.6)	3.94±0.14		
BI			8.196	<0.001
0~40	90(46.2)	3.92±0.22		
41~60	26(13.3)	4.05±0.29		
61~99	75(38.5)	4.29±0.22		
100	4(2.0)	4.35±0.23		
Braden			11.365	<0.001
10~12	11(5.6)	3.79±0.16		
13~14	20(10.3)	3.84±0.23		
15~18	45(23.1)	3.96±0.27		
19~23	119(61.0)	4.21±0.24		