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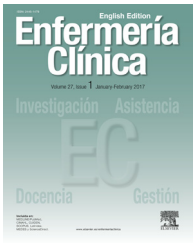

ORIGINAL ARTICLE

The factors that influence the adaptation process 6 months after a stroke: A path analysis☆

Kelana Kusuma Dharma*, Nurbani Nurbani, Puspa Wardhani, Winnellia Fridina Rangkuti, Halina Rahayu, Raju Kapadia

School of Nursing, Politeknik Kesehatan Kementerian Kesehatan, Pontianak, Indonesia

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KEYWORDS
Self-efficacy;
Physiological adaptation;
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Quality of life;
Stroke rehabilitation

Abstract
Objective: The purpose of this study was to identify the determinant factors that influence the adaptation process and quality of life after a stroke.
Methods: This study is an observational study using a cross-sectional design. Respondents were patients who were 6 months post-discharge after non-hemorrhagic strokae and their family caregivers. Information about respondents was taken from medical record data at two regional general hospitals in West Kalimantan Province, Indonesia. A total of 80 patients were selected using a consecutive sampling method. Theoretical models of patient and caregiver factors that influence adaptation responses and post-stroke quality of life were tested using path analysis.
Result: Caregiver coping, self-efficacy, and illness acceptance had a direct effect on the post-stroke psychosocial adaptation response by 58.1%, with self-efficacy contributing the most ($\beta = 0.668$, $P < .0001$). Self-efficacy, illness acceptance, and healthy behavior had a direct effect on the physiological adaptation response by 24.3%, where self-efficacy also contributed the most ($\beta = 0.272$, $P < .014$). Psychosocial adaptation and physiological adaptation had a direct effect on the quality of life by 54.6%, where psychosocial adaptation showed the largest contribution ($\beta = 0.63$, $P < .0001$).
Conclusion: Self-efficacy contributes the most to both psychosocial and physiological adaptations 6 months after stroke. Psychosocial adaptation and self-efficacy have been proven to be the determinant factors that contribute the most to the quality of life of patients 6 months after stroke.

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* Corresponding author.
E-mail address: kelana_kusuma@poltekkes-pontianak.ac.id (K.K. Dharma).

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PALABRAS CLAVE
Autoeficacia;
Adaptación fisiológica;
Adaptación psicológica;
Calidad de vida;
Rehabilitación de accidentes cerebrovasculares

Los factores que influyen en el proceso de adaptación 6 meses después de un ictus: un análisis de trayectoria

Resumen
Objetivo: El propósito de este estudio fue identificar los factores determinantes que influyen en el proceso de adaptación y calidad de vida después de un ictus.
Métodos: Este estudio es un estudio observacional utilizando un diseño transversal. Se encuestaron pacientes 6 meses después de su alta tras un accidente cerebrovascular no hemorrágico y sus familiares cuidadores. La información sobre los encuestados se obtuvo de los datos de registros médicos en dos hospitales generales regionales en la provincia de Kalimantan Occidental, Indonesia. Se seleccionó un total de 80 pacientes mediante un método de muestreo consecutivo. Los modelos teóricos de los factores del paciente y del cuidador que influyen en las respuestas de adaptación y la calidad de vida posterior al accidente cerebrovascular se probaron mediante análisis de ruta.
Resultados: El afrontamiento, la autoeficacia y la aceptación de la enfermedad del cuidador tuvieron un efecto directo en la respuesta de adaptación psicosocial posterior al ictus en un 58,1%, siendo la autoeficacia la que más contribuyó (β = 0,668, P < ,0001). La autoeficacia, la aceptación de la enfermedad y el comportamiento saludable tuvieron un efecto directo en la respuesta de adaptación fisiológica en un 24,3%, donde la autoeficacia también contribuyó más (β = 0,272, P < ,014). La adaptación psicosocial y la adaptación fisiológica tuvieron un efecto directo en la calidad de vida en un 54,6%, donde la adaptación psicosocial presentó la mayor contribución (β = 0,63, P < ,0001).
Conclusión: La autoeficacia contribuye más a las adaptaciones psicosociales y fisiológicas 6 meses después del accidente cerebrovascular. La adaptación psicosocial y la autoeficacia han demostrado ser los factores determinantes que más contribuyen a la calidad de vida de los pacientes 6 meses después del ictus.

What is known?

Self-efficacy, illness acceptance, and caregiver coping are determinants of psychosocial adaptation 6 months after stroke. Self-efficacy, illness acceptance, and a healthy lifestyle are determinants of physiological adaptation 6 months after stroke.

What it contributes?

Psychological interventions for post-stroke patients that are focused on increasing self-efficacy and illness acceptance are needed to achieve optimal adaptation after stroke.

Introduction

Post-stroke patients experience long-term disability due to nerve cell damage. They need a long time to reintegrate into the community life. Some patients also experience self-care dependence, anxiety, and depression. Research shows that 26% of patients have a disability in performing basic daily activities, and 50% of patients have decreased physical mobility due to hemiparesis, which causes them to depend on their family or others for self-care.[1] Patients also experience post-stroke depression, which can slow down the recovery process.[2] Disability and depression reduce the productivity and quality of life of post-stroke patients.[3] Adaptation to disability is a key factor in achieving an optimal quality of life and accelerating the process of reintegration into community life after a stroke. Effective physiological and psychosocial adaptations can improve the quality of life in post-stroke patients. Caregivers of stroke patients also experience a moderate level of burden that can reduce their quality of life.[4] An increase in the burden and a decrease in the quality of life of caregivers will impact the quality of care they provide to patients.

The greater impact of post-stroke disability is the increasing cost of healthcare. Research on the economic burden of a stroke shows that post-stroke outpatient care per patient per month is quite large in several countries, the highest in the United Kingdom at $883 and the lowest in Malaysia at $192.[5] The cost of ischemic stroke care per person throughout life, including hospitalization, rehabilitation, and follow-up care, is $140,048 in the United States. Stroke care comprises 3%–4% of total health financing in Western countries.[1] Disability and its consequences are the causes of the high cost of post-stroke care. To reduce the burden, patients have to adapt to disability conditions. For this reason, it is important to identify the factors influencing the post-stroke adaptation response.

Patient factors such as self-efficacy and illness acceptance are important factors that influence adaptation responses in dealing with post-stroke disability conditions. Self-efficacy is an individual's assessment of the ability to organize and carry out actions.[6] Positive self-efficacy encourages patients to carry out effective adaptation behaviors to achieve optimal quality of life after a stroke. Patients use their reflective thinking, knowledge, and skills to decide what course of action they will take.[6] Self-efficacy and self-management encourage patients to use adaptive coping strategies to deal with the problems after a stroke. Coping mechanisms have a direct positive impact on adaptation responses to disability conditions.[7] The control process carried out by the individual produces adaptive behavior consisting of three modes of psychosocial adaptation (self-concept, role function, and interdependence) and one physiological mode. Adaptive control processes result in effective adaptation behavior or vice versa.[8]

The adaptation response of post-stroke patients is not only influenced by patient factors but also by family caregiver factors such as burden and coping strategy. There is a relationship between caregiver burden with coping strategies they use to deal with problems and the adaptation responses when caring for patients.[9] The burden felt by caregivers in caring for post-stroke patients affects their ability to cope with stressful situations.[9] The caregiver's coping strategies have a direct impact on the quality of care they provide to patients, which will affect the patient's adaptation process.

Our hypothesis is that patient factors such as self-efficacy, illness acceptance, and healthy life behavior, as well as caregiver factors such as caregiver's burden and caregiver's coping, affect the patient's adaptive response (psychosocial and physiological) to various post-stroke disability conditions. The adaptive response then affects the patient's quality of life. So far, we have not found an empirical model that integrates patient and family factors that influence adaptation in post-stroke patients. This study aims to identify the patient and caregiver factors that contribute to the adaptation process and quality of life of post-stroke patients.

Materials and methods

Study design and participants

This research is an analytic observational study with a cross-sectional design. We identified patient factors that influence the adaptation process, including illness acceptance, self-efficacy, and healthy behavior, as well as caregiver factors, including caregiver burden and caregiver coping.

The population in this study was post-stroke patients and their caregivers at home. Eligibility criteria for patients included 6 months post-discharge after non-hemorrhagic stroke, no complications from other chronic diseases (such as heart disease, diabetes mellitus, and kidney failure), and experiencing physical disabilities that require caregiver assistance. Meanwhile, the eligibility criteria for caregivers included the patient's nuclear family (husband/wife, parents, children/in-laws, and siblings), aged 30–50 years, and living with the patient. The number of samples used in this study was calculated using the sample size formula for cross sectional studies with quantitative variables[10]:

$$n = \frac{Z_{1-\alpha/2}{}^2 SD^2}{d^2}$$

Standard Deviation (SD) of the dependent variable (quality of life) based on the previous study was 4.06 with an absolute error of precision of 0.89.[11] With a normal standard variate of 1.96 (5% type 1 error/alpha 0.5), the sample size was 80 patients and their caregivers. We selected samples based on eligibility criteria until this number was met. We conducted a home visit to collect data. The respondent's biodata and addresses were obtained from medical records at two regional general hospitals in West Kalimantan, Indonesia.

Data collection

This study was conducted over 9 months, from February 2020 to October 2020. Data collection was carried out by trained observers (professional nurses). The observers determined physiological adaptation using the Barthel index and gave the respondents instructions on how to fill out the questionnaire. We trained them on how to use the instruments and collect data. According to the research objectives and relevance for measuring the variables, we used the following instruments:

1 Short version of the Stroke Specific Quality of Life Scale (SSQOL): Measured the quality of life of post-stroke patients. The construct validity of the short version SSQOL using confirmatory factor analysis proves that two domains of quality of life (psychosocial and physical) are validly structured. Item factor loading for the psychosocial domain ranges from 0.46 to 0.63, while for the physical domain, it ranges from 0.68 to 0.88.[12] The reliability test for this instrument in three different places ranged from 0.78 to 0.89.[13]
2 Psychosocial adaptation scale: Measured the psychosocial adaptation of post-stroke patients. This instrument was adopted from the Quality of Life in Epilepsy Inventory (QOLIE-89). We adopted and used items related to psychosocial adaptation responses, including self-concept, role function, and interdependence.[14]
3 Barthel Index (BI): Measured the physiological adaptation of post-stroke patients. The BI psychometric test to measure daily living activity in stroke patients showed good results. The internal consistency of the BI in four measurements (14 days, 30 days, 90 days, and 180 days after stroke) showed an alpha value range of 0.89–0.92. Inter-rater reliability had a total kappa value score of 0.94.[15]
4 Caregiver Burden Scale (CBS): Measured caregiver burden of caring for post-stroke patients, including physical burden, emotional burden, family relationships, financial burdens, and free time. The internal consistency of the CBS using Cronbach's alpha showed a total alpha coefficient of 0.91, in which the sub-scale coefficient was 0.75–0.93.[16]
5 Stroke Caregiver Coping Scale (SCCS): Measured the caregiver's coping while caring for the post-stroke patient.

The SCCS validity test showed that the score of each item was correlated with its total score with a correlation coefficient range of 0.54–0.83. The internal consistency test showed a Cronbach alpha of 0.81.

6 Stroke Illness Acceptance Scale (SIAS): Measured the patient's self-acceptance of various post-stroke disability conditions. The SIAS validity test uses item-total correlation, and proved that all items were significantly correlated with a total value in the range of 0.59–0.73. The internal consistency test showed a Cronbach alpha value of 0.743.

7 The Stroke Self Efficacy Questionnaire (SSEQ): Measured self-efficacy in post-stroke patients, and consisted of self-management and activities. The SSEQ has a good psychometric value, so it is appropriate to measure the self-efficacy of post-stroke patients.[17] The internal consistency test showed good results with a Cronbach alpha value of 0.90.[18]

8 The Simple Lifestyle Indicator Questionnaire (SLIQ): Measured a healthy lifestyle. The psychometric test of this instrument using test-retest showed the correlation coefficient for each question had a range of 0.63–0.97.[19] The SLIQ is a valid instrument when compared to other standard instruments for every aspect of lifestyle.[20]

Procedure

We took patient data from the medical records of two regional general hospitals in West Kalimantan Province, Indonesia. Patients who met the eligibility criteria were used as samples. We then contacted patients or their families by telephone to convey the aims of the study. If patients and their families consented to participate in the study, we made an appointment to make a home visit for data collection.

Data analysis

The theoretical model of the determinants of adaptation response and post-stroke quality of life was tested using path analysis. We analyzed the data in the following stages: testing the normal distribution of data on all numerical variables, conducting collinearity tests between independent variables, conducting screening to determine candidate independent variables to be included in the model, calculating the path coefficient of each substructure using linear regression analysis (standardized coefficient), developing an empirical model based on path analysis results, and performing a goodness of fit test to determine whether the research data and empirical model meet the criteria of good fit. The good fit criteria we used included a minimum goodness fit index (GFI) of 0.95, an adjusted goodness fit index (AGFI) of at least 0.90, and a root mean square error of approximation (RMSEA) of less than 0.07.[21]

Ethical consideration

We upheld ethical principles in this study by maintaining the confidentiality of respondents, filling out the questionnaire when the respondent was in a stable medical condition, and considering that the benefits exceeded the possible risks.

Table 1 Characteristic of participants.

Characteristics	n (%)	Mean (SD)
Patient's age (years)		58.64 (5.22)
Patient's sex		
Male	42 (52.5)	
Female	38 (47.5)	
Hemiparesis side		
Right	39 (48.8)	
Left	41 (51.3)	
Caregiver's age (years)		42.74 (9.68)
Caregiver-patient relationship		
Husband/wife	29 (36.3)	
Child	34 (42.5)	
Son/daughter in law	8 (10.0)	
Brother/sister	9 (11.3)	

Table 2 Caregiver factors, patient factors, adaptation responses, and quality of life 6 months after stroke.

Characteristics	Mean (SD)	CI 95%
Quality of life	31.53 (4.52)	30.52—32.53
Psychosocial Adaptation	34.81 (5.83)	33.51—36.11
Physiological Adaptation	62.13 (10.33)	59.82—64.43
Caregiver burden	34.03 (5.29)	32.85—35.20
Caregiver coping	117.36 (9.80)	115.18—119.54
Illness acceptance	34.20 (6.40)	32.78—35.62
Self-efficacy	24.73 (3.92)	23.85—25.60
Healthy life behavior	21.74 (3.15)	21.04—22.44

The research protocol was reviewed and obtained an ethical clearance statement from the Health Research Ethics Committee (HREC) of the Health Polytechnic of the Ministry of Health Pontianak Indonesia, with the number No. 195.1/KEPK-PK.PKP/V/2019.

Results

Demographic and clinical characteristics of participants

Table 1 shows that the mean age of the caregivers (42.74 years) was younger than the mean age of the patients (58.64 years). This was possible because more than half of the caregivers were the son/daughter (42.5%) or son/daughter-in-law (10%) of patients. The number of male and female respondents was almost equal. Similarly, the hemiparesis on the right side was almost the same as that on the left side. The bivariate statistical test proved that there was no significant relationship between all participant characteristics with psychosocial adaptation, physiological adaptation, and quality of life 6 months after stroke.

Table 2 shows the mean score and standard deviation of caregiver factors, patient factors, adaptation responses, and quality of life 6 months after stroke.

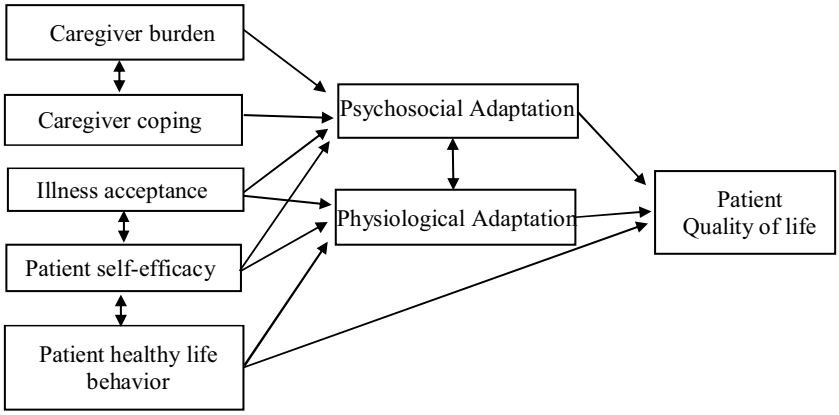

Figure 1 The theoretical model of patient and caregiver factors influencing adaptation response and quality of life after stroke.

Determinant of adaptation process and quality of life after stroke

We integrated three theories to explain patient and family caregiver factors related to the adaptation process of post-stroke patients, including caregiver stress theory, self-efficacy theory, and Roy's adaptation model (RAM) (Fig. 1). Caregiver stress theory can be used to explain the relationship between caregiver burden and their coping and adaptive responses when caring for post-stroke patients.[9] Self-efficacy theory can be used to explain improving behavior or self-management to achieve optimal adaptation and quality of life in post-stroke patients.[6] Meanwhile, RAM can be used to explain the process of adaptation of post-stroke patients, which consists of the stimuli they experience post-stroke, the coping mechanisms they use to deal with those stimuli, and the adaptation responses they show to disability conditions.[7]

The empirical causal relationship between the independent and dependent variables based on the calculation of the path coefficients in the three sub-structures is shown in Fig. 2.

Table 3 shows that psychosocial and physiological adaptations have simultaneous and significant direct effects on the quality of life after stroke. These two variables explained 54.6% of all variance in the quality of life of patients. Psychosocial adaptation had the greatest direct effect on the quality of life of post-stroke patients ($\beta = 0.63$, $P < .0001$). Caregiver coping, illness acceptance, and patient self-efficacy had a simultaneous and significant direct effect on psychosocial adaptation. These three variables explained 58.1% of all variance in psychosocial adaptation. The patient's self-efficacy had the greatest direct effect on psychosocial adaptation ($\beta = 0.668$, $P < .0001$). Illness acceptance, self-efficacy, and a healthy lifestyle had direct and significant effects on physiological adaptation. These three variables explained 24.3% of all variance in physiological adaptation. Self-efficacy had the greatest direct effect on physiological adaptation ($\beta = 0.272$, $P < .014$). Patient self-efficacy had the greatest indirect effect on the quality of life 6 months after stroke through both psychosocial and physiological adaptations, with a contribution of 22.66%.

The goodness of fit test of the model

The results of the goodness of fit test included GFI = 0.963, AGF = 0.936, and RMSEA = 0.068. These results indicated that all tests met the specified criteria. This proved that the research data and empirical models met the criteria of good fit.

Discussion

Path analysis proves that caregiver coping, patient illness acceptance, and patient self-efficacy influence the psychosocial adaptation of patients, in which self-efficacy contributes the most compared to the other variables. Perceived self-efficacy is a person's belief about his/her ability to produce a level of performance that has effects on important life events. Self-efficacy beliefs determine how they feel, think, motivate themselves, and behave.[22] Self-efficacy can increase the patient's confidence in his/her ability to carry out activities in the same way as before the stroke. Self-efficacy beliefs will increase the patient's goal setting based on his/her ability to adapt after stroke. It can motivate and direct patients to carry out positive activities that will increase their adaptability and quality of life. On the other hand, self-efficacy beliefs will increase positive thoughts about their abilities, which can reduce anxiety. Positive self-efficacy can ultimately prevent post-stroke depression.

Self-efficacy plays an important role in maintaining psychological conditions and increasing post-stroke psychosocial adaptation. A longitudinal study of the relationship between general self-efficacy and depression 6 months to 2 years after stroke proved that a decrease in general self-efficacy led to an increase in depression. In the process of social reintegration 6 months after stroke, it is important to implement a program that focuses on increasing self-efficacy to prevent post-stroke depression in the future.[23] There was a significant decrease in the level of depression in patients with high self-efficacy, whereas there was no significant change in patients with low self-efficacy at the end of post-stroke rehabilitation. There was an effect of self-efficacy on the psychological condition and the psychosocial adaptation response of the patient, which

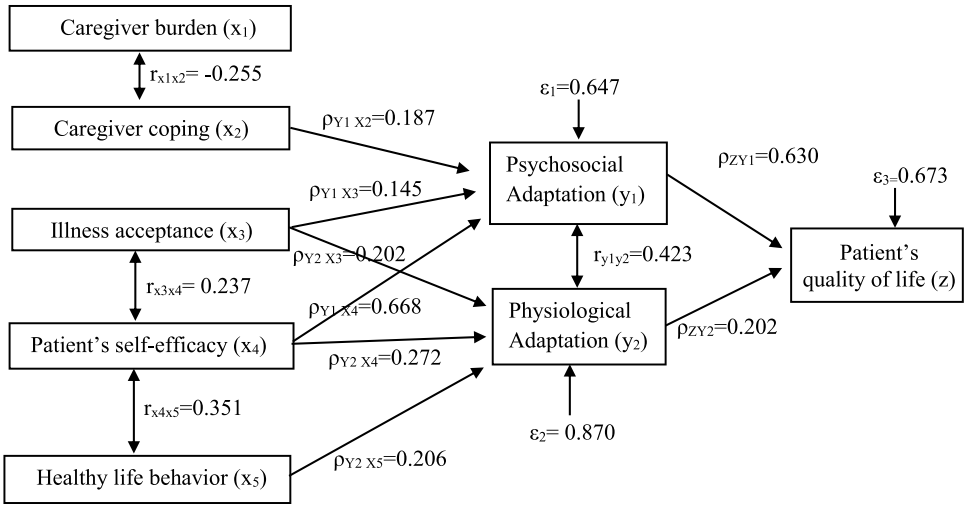

Figure 2 An empirical model of caregiver factors and patient factors that influence adaptation responses and quality of life 6 months after stroke.

Table 3 Standardized direct, indirect, and total effects of patient and caregiver factors on quality of life six mounts after stroke.

Variables	Direct effects	Indirect effects through Psychosocial Adaptation	Indirect effects through Physiological adaptation	Total effect
Caregiver coping	–	0.118		0.118
Illness acceptance	–	0.091	0.041	0.132
Self-efficacy	–	0.421	0.055	0.476
Healthy life behavior	–		0.042	0.042
Psychosocial adaptation	0.630	–	–	0.630
Physiological adaptation	0.202	–	–	0.202

Contribution of each variable = (path coefficient)^2 × 100%.

is indicated by a decrease in the level of depression.[24] High self-efficacy, no history of pre-stroke depression, and high perception of social support are strong protective factors against depressive symptoms.

Illness acceptance is also an important factor in post-stroke psychosocial adaptation. A mixed prospective cohort study demonstrated that patients who did not accept their disability 1 month after a stroke developed depression 9 months after a stroke. Stroke patients who are depressed often say that they are useless, whereas patients who are not depressed generally accept their post-stroke disability.[25] Illness acceptance, apart from having a direct effect on psychosocial adaptation, is also related to self-efficacy. A low level of illness acceptance is associated with low efficacy in post-stroke rehabilitation.[26] Patients without an increase in self-efficacy after 3 weeks of rehabilitation showed a low level of illness acceptance.[27] Increased general self-efficacy and dispositional optimism contribute to increased illness acceptance in patients with polycystic ovary syndrome (PCOS) with their disease.[28] Stroke patients who accept disability conditions will have high confidence in their ability to carry out activities, which then affects the recovery process.

The support system from the family caregiver plays an important role in increasing the adaptation response of post-stroke patients.[7] The family caregiver is the closest person who accompanies, facilitates, and helps patients fulfill their basic needs and carry out rehabilitation at home. Caregiver burden increases when caring for patients, which affects the self-control coping they use.[29] This study proves that caregiver coping has an effect on the psychosocial adaptation of post-stroke patients, whereas caregiver burden does not show a significant effect. In contrast, previous studies stated that stroke patients who experience depression and anxiety had caregivers that experienced a high burden.[30] The burden felt by the caregiver has no impact on the patient's psychosocial adaptation, as long as the caregiver has a good coping mechanism.

This study proves that illness acceptance, self-efficacy, and healthy life behavior simultaneously affect physiological adaptation, in which patient self-efficacy contributes the most. Self-efficacy beliefs encourage patients to do positive activities that can improve functional capacity and physical recovery after a stroke. Adequate and routine physical exercise will improve motor function recovery and the ability to perform basic daily activities. The results of this study con-

firm previous studies that prove the effect of self-efficacy on physiological adaptation in post-stroke patients. Research on the effectiveness of stroke self-management programs proves that self-efficacy is a mediating factor that improves the ability of post-stroke patients to work.[31] The better the self-efficacy is, the better the self-care ability of post-stroke patients. Self-care self-efficacy is related to the level of independence of chronic stroke patients in performing basic activities of daily living (BADL). The higher the self-care self-efficacy is, the more independent the patient with regard to BADL.[32] Patients 3 weeks post-stroke rehabilitation without increased self-efficacy showed low functional status in performing BADL.[27]

A healthy lifestyle improves post-stroke physiological adaptation, prevents recurrent stroke, and increases functional capacity and BADL. Post-stroke patients who perform regular physical activity have good general health outcomes.[7] The caregiver empowerment program based on the adaptation model (CEP-BAM) improves a healthy lifestyle and functional capacity after stroke.[11] Lifestyle before the stroke was correlated with quality of life, especially 6 months to 2 years after a stroke. Patients with a low quality of life appear to have had a less healthy lifestyle before they had a stroke.[33]

The path analysis in this study proves that psychosocial adaptation and self-efficacy are the two biggest factors that influence the quality of life 6 months after a stroke. The psychological problem is important for predicting the risk of low quality of life after a stroke. Adequate self-efficacy can improve the quality of life after a stroke. Previous research has proven that self-efficacy training programs increase self-efficacy and the quality of life of post-stroke patients.[34] Self-efficacy has also been shown to increase community reintegration after a stroke.

Limitations

This study was only conducted on patients with non-hemorrhagic strokes. Different types of stroke cause different symptoms and disabilities, which affect the quality of life after a stroke. As a result, the empirical model from this study cannot be applied to patients with hemorrhagic strokes. In addition, this study only involves caregivers who come from the patient's family (family caregiver). Family caregivers have a better psychological closeness with patients than caregivers who are not the patient's family. This causes differences in stress levels, burdens, and coping mechanisms for family caregivers as compared to non-family caregivers. As a result, this empirical model cannot be generalized to patients who are cared for by caregivers who are not the patient's family.

Conclusion

We conclude that self-efficacy, illness acceptance, and caregiver coping are determinants of psychosocial adaptation 6 months after a stroke. Self-efficacy, illness acceptance, and a healthy lifestyle are determinants of physiological adaptation 6 months after a stroke. Self-efficacy contributed the most to both the psychosocial and physiological adaptations 6 months after a stroke. Psychosocial and physiological adaptations directly affect the quality of life 6 months after a stroke, where psychosocial adaptation contributes the most. Nurses need to carry out psychological interventions for post-stroke patients that are focused on increasing self-efficacy and illness acceptance, as well as integrating family caregiver interventions to reduce the burden and improve caregiver coping, to achieve optimal adaptation responses and good quality of life after a stroke.

Conflict of interest

None declared.

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