FACTORS PREDICTIING ACTIVITY OF DAILY LIVING AMONG YOUNG AND MIDDLE-AGED ADULTS WITH POST-STROKE

Abstract

Objective: To examine factors predicting activities of daily living (ADL) among young and middle-aged stroke survivors during rehabilitation. **Methods:** A cross-sectional study was conducted among 192 young and middle-aged stroke patients (aged 18–59 years) receiving inpatient rehabilitation at a tertiary hospital in Wenzhou, China. Research instruments used to collect data included the Barthel Index, Hamilton Depression Rating Scale, Stroke self-efficacy, and Social Support Rating Scale. Pearson's correlation and standard multiple linear regression were used for analysis. **Results:** The mean activities of daily living (ADL) score was 51.73 ± 24.34, indicating moderate dependence. In multiple regression analysis, The model was statistically significant ($F_{(4, 187)}$= 119.430, p< .001) and explained 71.9% of the variance in ADL (adjusted R^2= .713). Stroke self-efficacy was the strongest positive predictor (β= .740, p< .001), followed by depression as a significant negative predictor (β= −.153, p = .023). Social support (β= −.045, p＞.05) and BMI (β= −.034, p = .395) did not significantly predict ADL.

Conclusion: Rehabilitation interventions should prioritize enhancing patients' confidence in stroke management and alleviating depressive symptoms to optimize ADL recovery. The findings provide evidence for developing targeted nursing interventions to improve functional outcomes in this population.

Keywords: Activities of Daily Living, Post-Stroke, Self-Efficacy, Depression, Social Support, Young and Middle-Aged Adults

INTRODUCTION

Stroke remains a leading cause of long-term disability worldwide, imposing substantial burdens on individuals, families, and healthcare systems (Feigin et al., 2025). In China, approximately 2.5 million new stroke cases occur annually, with

projections indicating a 50% increase in incidence by 2030 (Wu et al., 2019). While stroke has traditionally been considered a disease of older adults, its incidence among young and middle-aged individuals (18–59 years) has risen markedly due to lifestyle factors, work-related stress, and increasing prevalence of metabolic risk factors (Putaala, 2016).

For young and middle-aged stroke survivors, functional dependence in activities of daily living (ADL) represents a particularly devastating consequence. This demographic group constitutes the primary workforce and economic support for their families; therefore, impaired ADL translates into profound role disruption, occupational disability, and reduced quality of life (Sacks et al., 2018). Despite advances in acute stroke care, approximately 60% of survivors experience persistent neurological impairment, and 70–80% demonstrate reduced self-care ability following stroke (Platz et al., 2021). Understanding the factors that predict ADL recovery in this specific population is essential for developing targeted rehabilitation strategies.

ADLrefers to fundamental self-care tasks necessary for independent living, including eating, bathing, dressing, toileting, and mobility. The Barthel Index is the most widely used measure to assess functional independence in stroke populations(Mahoney & Barthel, 1965). ADL recovery after stroke is influenced by multiple biological, psychological, and social factors. According to the biopsychosocial model of rehabilitation, functional outcomes are determined not only by physical impairment but also by psychological adaptation and social environmental resources(Bandura, 2001).

Among potential predictors, stroke self-efficacy—defined as patients' confidence in their ability to perform stroke-related tasks and self-management behaviors—has emerged as a critical psychological resource. Bandura's social cognitive theory posits that self-efficacy beliefs influence motivation, effort expenditure, and persistence in the face of challenges (Bandura, 2001). Higher stroke self-efficacy has been consistently associated with better rehabilitation engagement and functional outcomes (Jones et al., 2008).

Post-stroke depression (PSD) represents another significant factor affecting functional recovery. Depression occurs in approximately 30–50% of stroke survivors and is associated with reduced motivation, poor treatment adherence, and delayed neurological recovery (Medeiros et al., 2020). The relationship between depression and ADL appears bidirectional: functional impairment increases depression risk, while depressive symptoms hinder rehabilitation participation and functional gains (Li et al., 2023).

Social support serves as a protective psychosocial resource that buffers against functional decline. Adequate support from family, particularly spouses, provides practical assistance and emotional encouragement necessary for rehabilitation participation (Leńska-Mieciek et al., 2020; Northcott et al., 2016). Finally, body mass index (BMI) may influence functional recovery through its effects on metabolic status, cardiovascular health, and physical capacity, although evidence regarding its specific impact on post-stroke ADL remains inconsistent.

Despite increasing recognition of these factors, limited studies have specifically examined the combined predictive effects of biological (BMI), psychological (depression, self-efficacy), and social (social support) factors on ADL among young and middle-aged stroke survivors. Most existing research has focused on elderly populations or examined these factors in isolation. Therefore, this study aimed to identify the key predictors of ADL in young and middle-aged stroke patients during rehabilitation, providing evidence for integrated, patient-centered nursing interventions.

Methods

Study Design and Participants

This study employed a predictive cross-sectional design. Participants were recruited from the Rehabilitation Department of the Second Affiliated Hospital of Wenzhou Medical University, a tertiary teaching hospital in Zhejiang Province, China. Eligibility criteria included: (1) age 18–59 years (young and middle-aged adults); (2)

diagnosed with first-ever ischemic or hemorrhagic stroke confirmed by CT or MRI; (3) within the rehabilitation stage (post-acute phase, >2 weeks since onset); (4) ability to communicate and complete questionnaires; and (5) provision of informed consent. Exclusion criteria included: severe cognitive impairment (Mini-Mental State Examination <10), pre-stroke psychiatric disorders, or concurrent severe medical conditions preventing participation.

Sample Size Calculation

Sample size was determined using G*Power 3.1.9.7 software for multiple linear regression analysis. Parameters included: effect size $f^2 = 0.15$ (medium effect), significance level $\alpha = 0.05$ (two-tailed), statistical power $1-\beta = 0.80$, and number of predictors = 4 (BMI, depression, stroke self-efficacy, social support). The calculated required sample size was 129 participants. Considering potential incomplete data (estimated 15% attrition), the target sample was inflated to 155. A total of 192 participants were enrolled, exceeding the required sample and ensuring adequate statistical power.

Research Instruments

1. Activities of Daily Living (ADL)

ADL was measured using the Barthel Index (Mahoney & Barthel, 1965), which assesses 10 basic self-care items (feeding, bathing, grooming, dressing, bowel control, bladder control, toilet use, transfer, mobility, and stairs). Each item is scored on a 2–4 point scale, with total scores ranging from 0 (total dependence) to 100 (complete independence). Interpretation: 80–100 = independent; 60–79 = minimal assistance; 40–59 = moderate dependence; 20–39 = severe dependence; <20 = total dependence. The scale demonstrated excellent reliability in this study (Cronbach's $\alpha = 0.98$).

2. Post-Stroke Depression

Depression was assessed using the 17-item Hamilton Depression Rating Scale (HDRS-17) (Hamilton, 1960). Items cover symptoms experienced over the past week, scored on 0–2, 0–3, or 0–4 scales. Total scores range from 0 to 54, with higher scores

indicating greater severity: no depression (0–7), mild (8–16), moderate (17–23), and severe (≥24). Internal consistency in this study was good (Cronbach's α = 0.92).

3. Stroke Self-Efficacy

Stroke self-efficacy was measured using the Stroke Self-Efficacy Questionnaire (SSEQ) (Jones et al., 2008). The Chinese version contains 13 items across two dimensions: activity function (8 items) and self-management (5 items). Each item is rated from 0 ("no confidence") to 10 ("complete confidence"). Total scores range from 0 to 130, with higher scores indicating greater self-efficacy (Cronbach's α = 0.90 in this study).

4. Social Support

Social support was assessed using the Social Support Rating Scale (SSRS) (Xiao, 1994), comprising 10 items across three dimensions: subjective support (4 items), objective support (3 items), and support utilization (3 items). Total scores range from 12 to 66, with higher scores indicating stronger perceived social support (Cronbach's α = 0.867 in this study).

5. Body Mass Index (BMI)

BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). Weight and height were measured by trained nurses during the hospital stay. Categories included: underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), and obese (≥30.0).

Data Collection Procedure

After obtaining institutional ethical approvals, eligible patients were identified with assistance from rehabilitation clinicians. The researcher explained the study purpose and procedures, obtained written informed consent, and administered questionnaires in a private, quiet setting to ensure confidentiality. Questionnaire completion took approximately 30–40 minutes. Participants were assured of their right to withdraw at any time without penalty.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Burapha University (G-HS016/2567) and the Second Affiliated Hospital of Wenzhou Medical University (2024-k-233-01). Written informed consent was obtained from all participants. Data were anonymized and stored securely, accessible only to the research team.

Statistical Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized participant characteristics and study variables. Pearson's correlation coefficients examined bivariate relationships among BMI, depression, stroke self-efficacy, social support, and ADL. Standard multiple linear regression (enter method) was conducted to test the predictive effects of the four independent variables on ADL. Prior to regression analysis, assumptions were checked: normality of residuals (Q-Q plots), homoscedasticity (scatter plots), and multicollinearity (Variance Inflation Factor, VIF). A VIF threshold of <10 was considered acceptable. Statistical significance was set at $p < .05$ (two-tailed).

Results

Participant Characteristics

A total of 192 young and middle-aged stroke survivors participated. As shown in Table 1, the majority were male (65.6%) and middle-aged (45–59 years, 73.4%). Most participants were married (87.0%) and had completed junior high school or lower education (72.4%). The most common occupations were workers (44.8%) and farmers/others (34.4%). Nearly half (48.4%) reported monthly family income exceeding 5,000 RMB. Regarding clinical characteristics, 39.6% were within 1 month post-stroke, and 59.4% had a history of hypertension. Spouses served as primary caregivers for 63.5% of participants. The demographic characteristics of the participants are detailed in Table 1.

Table 1 Demographic and Clinical Characteristics of Participants (N = 192)

Characteristics	Frequency (*n*)	Percentage (%)
Age (years) (Min =26, Max =59, Mean = 50.06, SD = 7.68)		
Young (18–44)	51	26.6
Middle-aged (45–59)	141	73.4
Gender		
Male	126	65.6
Female	66	34.4
Marital Status		
Married	167	87.0
Unmarried/Divorced/Others	25	13.0
Education		
Primary school or below	71	37.0
Junior high school	68	35.4
Senior high school or above	53	27.6
Time since stroke		
<1 month	76	39.6
1–3 months	80	41.7
>3 months	36	18.8
History of hypertension	114	59.4

Descriptive Statistics of Study Variables

Table 2 presents descriptive statistics for the continuous variables. Participants reported moderate levels of ADL (Barthel Index: 51.73 ± 24.34), indicating partial dependence in daily activities. Mean depression scores were 13.08 ± 6.04 (mild range). Stroke self-efficacy (85.52 ± 22.22) and social support (33.97 ± 6.58) were at moderate levels. Mean BMI was 24.88 ± 3.18 kg/m², within the normal-to-overweight range.

Table 2 Descriptive Statistics of Study Variables (N = 192)

Variables	Possible Range	Actual Range	Mean	SD	Interpretation
ADL (Barthel Index)	0–100	5–100	51.73	24.34	Moderate dependence
Depression (HDRS-17)	0–54	3–31	13.08	6.04	Mild depression
Stroke Self-Efficacy	0–130	10–130	85.5	22.22	Moderate level

(SSEQ)			2		
Social Support (SSRS)	12–66	18–47	33.97	6.58	Moderate level
BMI (kg/m²)	–	18.4–32.7	24.88	3.18	Normal range

Correlation Analysis

Table 3 displays the Pearson correlation matrix. ADL demonstrated a strong positive correlation with stroke self-efficacy ($r = .842$, $p < .01$) and a strong negative correlation with depression ($r = -.714$, $p < .01$). Social support showed a moderate positive correlation with ADL ($r = .416$, $p < .01$). BMI exhibited a weak but statistically significant positive correlation with ADL ($r = .158$, $p < .05$). Depression was negatively correlated with self-efficacy ($r = -.787$, $p < .01$) and social support ($r = -.564$, $p < .01$).

Table 3 Correlation Matrix of Study Variables (N = 192)

Variables	1	2	3	4	5
1. ADL	1				
2. Depression	−.714**	1			
3. Stroke Self-Efficacy	.842**	−.787**	1		
4. Social Support	.416**	−.564**	.501**	1	
5. BMI	.158*	−.153	0.076	−.134	1

Multiple Regression Analysis

Multiple linear regression analysis was conducted to examine the predictive effects of BMI, depression, stroke self-efficacy, and social support on ADL. Prior to analysis, assumptions of linearity, normality, and homoscedasticity were verified through residual plots. The Durbin-Watson statistic (1.622) indicated independence of residuals. However, Variance Inflation Factor (VIF) values ranged from 8.84 to 42.26, suggesting moderate multicollinearity among predictors, particularly involving BMI and social support.

The overall regression model was statistically significant ($F_{(4, 187)} = 119.430$, $p < .001$) and explained 71.9% of the variance in ADL ($R^2 = .719$, Adjusted $R^2 = .713$).

As shown in Table 4, stroke self-efficacy emerged as the strongest positive predictor (β= .740, p< .001), indicating that higher confidence in stroke management was associated with significantly better functional independence. Depression significantly negatively predicted ADL (β=−.153, p= .023), suggesting that greater depressive symptoms were associated with poorer daily functioning.

Contrary to bivariate correlations, social support did not significantly predict ADL (β= −.045, p= .343) when controlling for other variables. The negative standardized coefficient suggests a possible suppression effect, whereby the influence of social support on ADL may be mediated through stroke self-efficacy. Similarly, BMI did not significantly predict ADL (β= −.034, p= .395) after accounting for psychological factors, indicating that body weight may affect functional outcomes indirectly through psychological pathways rather than direct physical limitations in this sample.

Table 4 Multiple Regression Analysis Predicting ADL (N = 192)

Predictor	B	SE	Beta	t	p-value
Constant	2.496	13.414	–	0.186	.853
Stroke Self-Efficacy	0.811	0.069	.74	11.693	.001
Depression (HDRS-17)	-0.615	0.268	-.153	-2.298	.023
Social Support (SSRS)	-0.167	0.175	-.045	-0.952	.343
BMI	-0.257	0.301	-.034	-0.853	.395

Model Fit: R^2 = .719, Adjusted R^2 = .713, $F_{(4, 187)}$ = 119.430, p < .001

Discussion

This study investigated the predictive effects of biological, psychological, and social factors on activities of daily living (ADL) among young and middle-aged stroke survivors during rehabilitation. The findings revealed that psychological factors—specifically stroke self-efficacy and depression—were the primary determinants of functional independence, collectively explaining approximately 71.9% of the variance in ADL. Notably, stroke self-efficacy emerged as the strongest predictor, while depression demonstrated a significant negative impact. Contrary to expectations, social support and BMI did not exhibit significant independent

predictive effects when psychological variables were controlled, suggesting complex indirect pathways that warrant further exploration.

Stroke self-efficacy demonstrated the strongest positive association with ADL indicating that patients' confidence in managing stroke-related challenges is the most critical determinant of functional recovery in this population. This finding aligns with previous studies reporting that higher self-efficacy predicts better rehabilitation engagement, treatment adherence, and functional outcomes among stroke survivors. The mechanism underlying this relationship may involve motivational and behavioral pathways. Patients with high self-efficacy are more likely to perceive functional limitations as manageable challenges rather than insurmountable barriers, leading to greater persistence in rehabilitation exercises and proactive self-management behaviors. For young and middle-aged stroke survivors—who often face sudden disruptions to their occupational and family roles—maintaining strong beliefs in personal capabilities may buffer against the demoralizing effects of functional impairment. The moderate level of self-efficacy observed in this sample (85.52 ± 22.22)suggests that many patients lack optimal confidence in their recovery potential, highlighting a critical target for intervention (Pereira et al., 2025; Ruan et al., 2026).

Depression significantly negatively predicted ADL, supporting the well-established reciprocal relationship between psychological distress and functional impairment in stroke populations. This finding corroborates previous evidence that post-stroke depression impedes rehabilitation participation through reduced motivation, fatigue, and decreased engagement in therapeutic activities. The bidirectional nature of this relationship merits consideration: while functional limitations may precipitate depressive symptoms through loss of independence and role disruption, depression simultaneously hinders functional recovery by diminishing patients' willingness to participate in demanding rehabilitation tasks. For young and middle-aged adults, who typically face high societal expectations for rapid recovery to resume workforce participation, depressive symptoms may be particularly detrimental to functional outcomes. Early identification and treatment of depression should

therefore be prioritized as an integral component of rehabilitation nursing care (Zrelak et al., 2024).

Interestingly, social support did not significantly predict ADL in the multivariate model, despite showing a moderate positive correlation in bivariate analysis ($r = .416$, $p < .01$). This discrepancy suggests a suppression effect, whereby the variance in ADL explained by social support overlaps substantially with that explained by stroke self-efficacy. Conceptually, this pattern supports a mediation hypothesis: social support may influence functional recovery primarily by enhancing patients' self-efficacy beliefs rather than through direct assistance with daily activities. In other words, support from family and friends builds confidence, which in turn drives functional improvement. When self-efficacy is statistically controlled, the direct effect of social support diminishes. This interpretation aligns with the "enabling function" of social support described in stress-buffering theories, whereby support facilitates adaptive coping resources rather than directly affecting outcomes. For rehabilitation nurses, this suggests that family-centered interventions should focus on enhancing caregivers' ability to foster patients' self-confidence, rather than merely providing physical assistance (Wang et al., 2024; Yang et al., 2025).

BMI did not significantly predict ADL after accounting for psychological factors, despite previous research suggesting associations between obesity and functional limitations. This null finding may indicate that in the subacute rehabilitation phase, the impact of body weight on daily functioning is mediated through psychological and behavioral mechanisms rather than direct physical constraints. Specifically, higher BMI may be associated with lower self-efficacy or depression (through stigma, fatigue, or metabolic factors), which subsequently affect ADL. Alternatively, the relatively normal mean BMI in this sample (24.88 kg/m^2) may have limited variability, reducing statistical power to detect significant effects. Nevertheless, the findings suggest that for young and middle-aged stroke patients with moderate weight ranges, psychological interventions targeting self-efficacy and mood may yield greater functional benefits than weight-focused strategies alone (Bellinger et al., 2025; Oh et

al., 2020).

Clinical Implications

The findings carry significant implications for rehabilitation nursing practice. Firstly, the dominant role of stroke self-efficacy (accounting for the largest portion of explained variance) suggests that nursing interventions should prioritize confidence-building strategies. Specific approaches include: (1) setting graduated, achievable functional goals to provide mastery experiences; (2) facilitating peer support groups to enable vicarious learning from successful recoveries; (3) providing specific, positive feedback on functional improvements to strengthen self-beliefs; and (4) involving patients in shared decision-making to enhance sense of control. Secondly, the significant negative impact of depression underscores the necessity of routine psychological screening in rehabilitation settings. Nurses should be trained to recognize depressive symptoms and collaborate with mental health professionals to provide integrated care. Cognitive-behavioral interventions targeting negative illness perceptions may be particularly beneficial for improving both mood and functional outcomes.

Conclusion

This study identified stroke self-efficacy and depression as significant predictors of ADL among young and middle-aged stroke patients during rehabilitation, while social support and BMI demonstrated non-significant direct effects when psychological factors were controlled. The findings underscore the primacy of psychological resources in determining functional recovery in this population. Rehabilitation nursing interventions should prioritize evidence-based strategies to enhance self-efficacy and alleviate depressive symptoms, while recognizing that social and biological factors may operate through psychological pathways. By adopting a biopsychosocial approach that targets modifiable psychological determinants, nurses can optimize functional outcomes and quality of life for young and middle-aged stroke survivors facing the challenges of long-term recovery.

References

Bandura, A. (2001). Social cognitive theory: an agentic perspective. *Annu Rev Psychol*, *52*, 1-26. https://doi.org/10.1146/annurev.psych.52.1.1

Bellinger, G. C., Roemmich, R. T., Psoter, K. J., Wegener, S. T., Keatley, E., & French, M. A. (2025). Temporal Relationships Between Depression, Self-Efficacy, and Physical Activity in Individuals With Stroke. *Arch Rehabil Res Clin Transl*, *7*(4), 100522. https://doi.org/10.1016/j.arrct.2025.100522

Feigin, V. L., Brainin, M., Norrving, B., Martins, S. O., Pandian, J., Lindsay, P., M, F. G., & Rautalin, I. (2025). World Stroke Organization: Global Stroke Fact Sheet 2025. *Int J Stroke*, *20*(2), 132-144. https://doi.org/10.1177/17474930241308142

Jones, F., Partridge, C., & Reid, F. (2008). The Stroke Self-Efficacy Questionnaire: measuring individual confidence in functional performance after stroke. *J Clin Nurs*, *17*(7b), 244-252. https://doi.org/10.1111/j.1365-2702.2008.02333.x

Leńska-Mieciek, M., Korczak-Kowalska, G., Bocian, K., & Fiszer, U. (2020). Pentosidine, advanced glycation end product, in acute ischaemic stroke patients with and without atrial rhythm disturbances. *Neurol Neurochir Pol*, *54*(4), 323-328. https://doi.org/10.5603/PJNNS.a2020.0042

Li, J., Yang, L., Lv, R., Kuang, J., Zhou, K., & Xu, M. (2023). Mediating effect of post-stroke depression between activities of daily living and health-related quality of life: meta-analytic structural equation modeling. *Qual Life Res*, *32*(2), 331-338. https://doi.org/10.1007/s11136-022-03225-9

Mahoney, F. I., & Barthel, D. W. (1965). FUNCTIONAL EVALUATION: THE BARTHEL INDEX. *Md State Med J*, *14*, 61-65.

Medeiros, G. C., Roy, D., Kontos, N., & Beach, S. R. (2020). Post-stroke depression: A 2020 updated review. *Gen Hosp Psychiatry*, *66*, 70-80. https://doi.org/10.1016/j.genhosppsych.2020.06.011

Northcott, S., Moss, B., Harrison, K., & Hilari, K. (2016). A systematic review of the impact of stroke on social support and social networks: associated factors and patterns of change. *Clin Rehabil*, *30*(8), 811-831. https://doi.org/10.1177/0269215515602136

Oh, S. Y., Hwang, S. Y., Chung, M. L., & Lennie, T. A. (2020). A Prediction Model of Rehabilitation Motivation in Middle-Aged Survivors of Stroke in Rehabilitation Facilities in Korea. *J Cardiovasc Nurs*, *35*(5), 475-482. https://doi.org/10.1097/jcn.0000000000000656

Pereira, C. M., Branco, D., Salvador, D., Dias, T. L., Carvalho, D., Matos, M., Rodrigues, S., Calheiros, J. M., Marques, A. M., & Jones, F. (2025). Effects of a Self-Management Program on Adults with Stroke: A Quasi-Experimental Study. *Healthcare (Basel)*, *13*(5). https://doi.org/10.3390/healthcare13050495

Platz, T., Schmuck, L., Roschka, S., & Burridge, J. (2021). Arm Rehabilitation. In T. Platz (Ed.), *Clinical Pathways in Stroke Rehabilitation: Evidence-based Clinical Practice Recommendations* (pp. 97-121). Springer

Copyright 2021, The Author(s). https://doi.org/10.1007/978-3-030-58505-1_7

Putaala, J. (2016). Ischemic stroke in the young: Current perspectives on incidence, risk factors, and cardiovascular prognosis. *Eur Stroke J*, *1*(1), 28-40. https://doi.org/10.1177/2396987316629860

Ruan, Z., Wang, D., Wang, W., Mei, Y., Wang, H., Chen, S., Zhang, Q., & Zhang, Z. (2026). Effectiveness of a stepped self-care program for stroke survivors: A quasi-experimental study. *Int J Nurs Sci*, *13*(1), 45-52. https://doi.org/10.1016/j.ijnss.2025.12.012

Sacks, D., Baxter, B., Campbell, B. C. V., Carpenter, J. S., Cognard, C., Dippel, D., Eesa, M., Fischer, U., Hausegger, K., Hirsch, J. A., Shazam Hussain, M., Jansen, O., Jayaraman, M. V., Khalessi, A. A., Kluck, B. W., Lavine, S., Meyers, P. M., Ramee, S., Rüfenacht, D. A.,…Vorwerk, D. (2018). Multisociety Consensus Quality Improvement Revised Consensus Statement for Endovascular Therapy of Acute Ischemic Stroke. *Int J Stroke*, *13*(6), 612-632. https://doi.org/10.1177/1747493018778713

Wang, S., Lu, Q., Zhang, D., Wang, L., Jin, H., Zhou, Y., & Ma, R. (2024). Mediation effect of self-efficacy on the relationship between perceived social support and resilience in caregivers of patients with first-stroke in China: a cross-sectional survey. *Top Stroke Rehabil*, *31*(6), 595-603. https://doi.org/10.1080/10749357.2024.2318087

Wu, S., Wu, B., Liu, M., Chen, Z., Wang, W., Anderson, C. S., Sandercock, P., Wang, Y., Huang, Y., Cui, L., Pu, C., Jia, J., Zhang, T., Liu, X., Zhang, S., Xie, P., Fan, D., Ji, X., Wong, K. L., & Wang, L. (2019). Stroke in China: advances and challenges in epidemiology, prevention, and management. *Lancet Neurol*, *18*(4), 394-405. https://doi.org/10.1016/s1474-4422(18)30500-3

Yang, J., Ma, F., Chen, Z., Wang, Y., Zhou, M., Zhang, Y., Bai, Y., & Hu, Q. (2025). Influencing factors of family resilience in stroke patients and family caregivers: a systematic review and meta-analysis. *Front Public Health*, *13*, 1716213. https://doi.org/10.3389/fpubh.2025.1716213

Zrelak, P. A., Seagraves, K. B., Belagaje, S., Dusenbury, W., García, J. J., Hadidi, N. N., Keigher, K. M., Love, M., Pucciarelli, G., Schorr, E., & Velasco, C. (2024). Nursing's Role in Psychosocial Health Management After a Stroke Event: A Scientific Statement From the American Heart Association. *Stroke*, *55*(10), e281-e294. https://doi.org/10.1161/str.0000000000000471