

## How does family resilience develop among stroke survivors and their caregivers? A mixed-method study using a chain mediating model

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### ABSTRACT

**Background:** Walsh's family resilience theory indicated that families could foster resilient outcomes among their members when they are facing changes or crises. However, little is known about family resilience among Chinese stroke survivors and their caregivers.

**Objectives:** To explore the direct and indirect relationships between the family resilience of stroke survivors, perceived social support, self-perceived burden, self-efficacy, and the burden on their principal caregivers, and to examine the journey of adapting to family resilience among stroke survivors.

**Design:** An explanatory sequential mixed-method study.

**Methods:** A quantitative assessment of perceived social support, self-perceived burden, self-efficacy, and family resilience was conducted among a cohort of stroke survivors. For a deeper understanding of the family resilience formation process, semi-structured, in-depth interviews were undertaken with a purposefully selected subset of participants, consisting of 15 stroke survivors and their principal caregivers who met the study criteria. Data analysis encompassed descriptive statistics, mediation models, and content analysis to integrate and interpret both quantitative and qualitative data.

**Results:** In a comprehensive hospital in Guangdong Province, China, 379 participants—229 men (60.4%) and 150 women (39.6%)—completed a cross-sectional questionnaire survey. The quantitative phase revealed significant statistical differences ( $p < 0.05$ ) in total family resilience scores among stroke survivors related to various factors, such as age, marital status, educational level, occupational status, average monthly income per capita, first-time onset, and types of stroke. Self-perceived burden and self-efficacy partially mediate the relationship between perceived social support and family resilience, contributing to a sequential chain-mediated effect. During the qualitative phase, in-depth interviews revealed a progressive trajectory from the initial shock of diagnosis through the ongoing presence of stress and challenges to the ultimate development of family resilience and an adaptive perspective toward the future.

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**Conclusions:** Exploring the factors influencing family resilience in stroke survivors could assist healthcare professionals developing interventions to enhance family resilience and lessen the burden on principal caregivers from individual, family, and social perspectives.

### What is already known

- Family resilience is commonly acknowledged to be a critical factor in determining family adaptation among individuals with stroke.
- The vital factors influencing family resilience among stroke survivors include family cohesion, adaptability, and social support.

### What this paper adds

- Outline the process of family resilience adaptation among stroke survivors.
- Identifying the protective and inhibitory factors influencing family resilience among stroke survivors.
- Self-perceived burden and self-efficacy play a mediating role in the chain between perceived social support and family resilience.

## 1. Introduction

Stroke is a severe chronic non-communicable illness and presently ranks as the second foremost cause of mortality and the third principal source of disability globally (GBD 2019 Stroke Collaborators, 2021). This condition can lead to various complications, such as hemiplegia and speech disorders, often necessitating long-term rehabilitation care (Le Danseur, 2020). These health issues not only cause profound suffering for patients but also impose a heavy burden on families and society, severely affecting the quality of life of patients and their relatives (Caro et al., 2018; Mei et al., 2018).

Stroke poses a significant health challenge with far-reaching implications for patients and their caregivers. It is reported that 68.4% of stroke patient caregivers in China experience a moderate to severe caregiving burden (Hu et al., 2018), highlighting the severity of the burden on caregivers. Caregivers face not only economic pressures but also societal stress and emotional distress (Ashghali Farahani et al., 2021). Despite these challenges, some families manage to overcome them, with family resilience playing a crucial role. Family resilience refers to a family's ability to adapt and respond in the face of adversity (Walsh, 1996), facilitating adjustment by strategically utilizing both internal and external resources (Jiang et al., 2023). This capability helps alleviate family members' fears of disease recurrence, reduces negative emotional states (Hu et al., 2021), and enhances family communication as well as caregivers' positive attitudes (Shin et al., 2019). Studies have shown that higher levels of family resilience can reduce negative impacts on families, promote patients' recovery, improve family quality of life, and alleviate family hardships (Okwori, 2022).

### 1.1. The wash family resilience model

The framework of family resilience is the Walsh Family Resilience Model (Walsh, 2003), which emphasizes three key domains in the resilience process: a shared belief system, family organization patterns, and family communication and problem-solving.

Although previous research has examined factors influencing family resilience in stroke survivors (Zhang et al., 2023), studies on the development of family resilience among stroke survivors and their caregivers are limited. Therefore, this study, grounded in the Walsh Family Resilience Model, aims to: (1) identify the factors influencing family resilience and (2) examine their mechanisms, focusing on the links between family resilience, perceived social support, self-efficacy, and self-perceived burden in Chinese stroke survivors and caregivers, and (3) investigate the adaptation process for family resilience among stroke survivors.

Based on the literature review, we hypothesized that: (1) perceived social support may positively predict family resilience in Chinese stroke survivors; (2) self-perceived burden and self-efficacy may play a chain mediating role in the association between perceived social support and family resilience.

## 2. Methods

### 2.1. Study design

We used an explanatory sequential mixed-methods approach. The quantitative phase examined the degree of family resilience and its contributing factors. Based on the quantitative findings, we further explored the family's adaptive process of resilience during the qualitative phase. Lastly, we integrated the findings from both phases to identify consistency and discrepancies. The study design diagram appears in Fig. 1.

2.2. Quantitative phase

2.2.1. Participants

The study was performed at a comprehensive medical facility in Guangdong Province, China. During the quantitative phase, participant recruitment employed a convenience sampling methodology, resulting in the inclusion of 379 inpatient stroke survivors. Inclusion criteria comprised confirmation of stroke diagnosis via CT or MRI, consistency with the “Diagnosis of Major Types of Cerebrovascular Diseases in China” (Chinese Society of Neurology and Chinese Stroke Society, 2019), age of 18 years or older, provision of voluntary informed consent, fluency in Chinese, and stable health devoid of recent acute deterioration or substantial medical intervention. The exclusion criteria encompassed serious ailments accompanied by consciousness impairment and conditions such as multi-organ failure or other grave systemic diseases.

2.2.2. Sample size

According to the statistical method (Ni et al., 2010), the sample size is typically 5 to 10 times that of the study variables, with 26 variables (including demographic data and disease-related variables) in this study. Considering accounting for invalid questionnaires, a 10% sample increase was necessary. Thus, the sample size ranged from 143 to 286, with 379 cases ultimately included.

2.2.3. Outcome measurements

This study used a questionnaire package to collect data, including a self-designed social demographic questionnaire, the Perceived Social Support Scale (PSSS), the Stroke Self-Efficacy Questionnaire (SSEQ), the Self-Perceived Burden Scale (SPBS) and the Family Hardiness Index (FHI). We chose the Family Hardiness Scale over the Family Resilience Scale due to its emphasis on positive traits such as optimism and self-efficacy, essential for families dealing with stroke challenges. This scale effectively assesses and elucidates these complex psychological mechanisms.

Perceived social support was measured using the PSSS (Jiang, 2001). The scale has 12 items. In this study, Cronbach’s alpha for the PSSS was 0.923.

Stroke self-efficacy was assessed using the SSEQ (Li et al., 2015). The scale has 11 items, including two dimensions: daily activity efficacy and self-management. The scale’s Cronbach’s  $\alpha$  was 0.969, and the validity coefficients ranged from 0.95 to 0.90. In this study, the Cronbach’s alpha was 0.961.

Self-perceived burden was measured using the SPBS (Wu and Jiang, 2010), comprising 10 items across 3 dimensions rated on a 5-point Likert scale. In this study, the Cronbach alpha value was 0.904.

Family resilience was assessed using the FHI (Liu et al., 2014). The FHI is a 20-item scale, including three dimensions: responsibility, control, and challenge, with a Cronbach’s alpha coefficient of 0.803. In this study, the Cronbach’s alpha was 0.922.

2.2.4. Data analysis

This study employed descriptive statistics, calculating frequencies and percentages for stroke survivors’ data. We presented scores

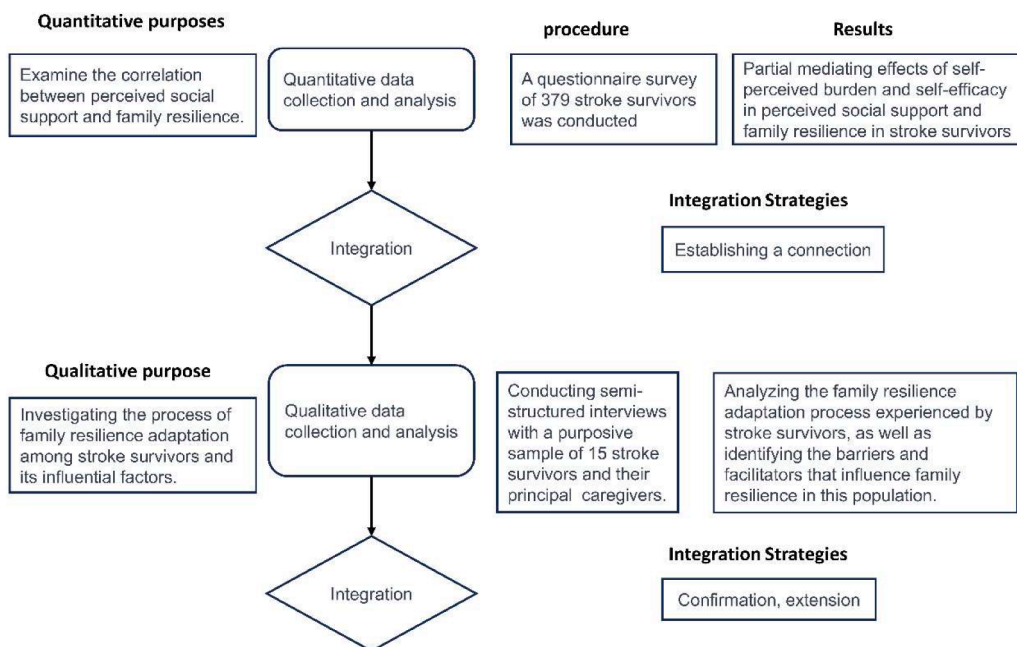


Fig. 1. Data integration and analysis strategies in the explanatory sequential mixed-method study.

on the FHI, PSSS, SSEQ and SPBS scales as mean  $\pm$  standard deviation. The Harman single-factor method was adopted for the common method deviation test. Pearson correlation analysis explored relationships among social support, self-perceived burden, self-efficacy, and family resilience. We assessed the mediating effects of self-perceived burden and self-efficacy between social support and family resilience using the bias-corrected nonparametric percentile Bootstrap method.

### 2.3. Qualitative phase

#### 2.3.1. Participants

In the qualitative phase, we selected 15 stroke survivors and their principal caregivers with family resilience scores above the 75th percentile from the quantitative study for in-depth interviews. This selection aimed to explore the mechanisms of family resilience during stroke recovery. Stroke survivor participants were chosen according to the quantitative phase criteria. Caregiver eligibility required being at least 18 years old, serving as principal caregivers (Wang, 2019), and providing informed consent. Caregivers with cognitive deficits or professional backgrounds were excluded.

#### 2.3.2. Data collection

Semi-structured interviews provided insights into factors affecting stroke survivor family rehabilitation. The interview framework addressed challenges faced by survivors and caregivers, informed by quantitative data. Conducted in a hospital setting for participant convenience, the interviewer explained objectives and ensured confidentiality. Joint discussions explored survivor-caregiver interactions and support systems, deepening our understanding of stroke's impact on family dynamics. Each interview lasted 30 to 60 min, aligning with participants' comfort. Consent for session recording was obtained for precise transcription, a standard qualitative approach for detailed analysis. The interviews occurred in a patient-doctor communication room, facilitating effective dialogue.

#### 2.3.3. Data analysis

Qualitative data were analyzed using Creswell and Connelly's three-dimensional narrative analysis framework, focusing on time, social interaction, and place (James, 2018). NVivo (version 11) was utilized for the study. Through meticulous line-by-line analysis of interview transcripts, themes were distilled and systematically organized until data saturation was achieved, ensuring a thorough thematic review.

### 2.4. Data integration

The study integrated qualitative and quantitative results to understand family resilience in stroke survivors. The data converged in a joint display to assess complementarity or inconsistencies (Trulsson et al., 2023). We explored inconsistencies to uncover the underlying reasons.

### 2.5. Ethics approval and consent to participate

The Ethical Review Committee approved the research proposal (Ethical Review Number: 2021-ZH-0099). Informed oral consent was obtained from all participants, who could withdraw at any time. The anonymity and confidentiality of participants and their data were assured.

## 3. Results

### 3.1. Characteristics of study participants

A total of 400 questionnaires were distributed, 379 of which were recovered. Patients who responded to the questionnaire were predominantly male (60.4%), married (81.8%); the predominant disease type was ischemic stroke (80.5%); most participants (65.2%) were 60 years or older (Supplementary Table 1).

The qualitative study, involved interviews with 15 stroke survivors and their primary caregivers. Among the survivors, 11 were male and 4 were female. The caregivers comprised 4 males and 11 females (see Supplementary Table 2).

### 3.2. Quantitative results

Using the Harman single-factor test for factor analysis on 53 measured items revealed 9 factors with unrotated eigenvalues  $>1$ . The first common factor accounted for 31.11% of the total variance, below 40%. Thus, no significant common method bias was found in this study's data.

Family resilience, perceived social support, self-efficacy and Self-perceived burden scores

The total perceived social support score is  $(60.07 \pm 11.35)$ . while the total self-efficacy score is  $(80.69 \pm 22.43)$ . Additionally, the total self-perceived burden score is  $(27.59 \pm 8.18)$ . The total family resilience score is  $(61.17 \pm 10.69)$ , which was the medium level. Significant differences in family resilience scores ( $p < 0.05$ ) are associated with demographic and disease factors such as age, marital status, educational level, occupational status, average monthly income per capita, first-time onset, and types of stroke (see Supplementary Table 3).

### 3.3. Correlation analysis

The Pearson correlation analysis results showed that perceived social support and self-efficacy are positively correlated with family resilience, while self-perceived burden is negatively correlated with all three (Table 1).

### 3.4. Chain mediation analysis

Fig. 2 illustrates the mediating effects of self-perceived burden and self-efficacy on the relationship between perceived social support and family resilience. The percentile bootstrap method for bias correction was adopted to test the mediating effect at a 95% confidence interval. A total of 5000 samples were repeatedly and randomly selected from the original samples for model fitting. Table 2 presents the 95% confidence intervals for each path. Mediating effects are significant if zero is excluded. The direct effect value was 65.96% of the total, with self-perceived burden mediation at 12.03%, self-efficacy mediation at 19.92%, and the chained mediating effect of both at 2.07%.

### 3.5. Qualitative results

During in-depth interviews with stroke survivors and their primary caregivers, we used the three-dimensional framework of the Walsh Family Resilience Model to analyze and understand the adaptive processes in the families of stroke survivors. These processes are driven by the family's belief systems, organizational patterns, communication, and problem-solving strategies and unfold through a continuum of stages.

Family belief systems significantly shape the initial phase of adaptation. When faced with a stroke, family members often view the crisis as a collective challenge, fostering stability and initiating resilience. One stroke survivor shared her feelings: "We view this disease as a test of our unity and strength, and we are confident that we can overcome it together." Family members embraced a positive outlook, fostering optimism that combated despair and fortified their resolve to surmount challenges.

In the second stage, the family's adaptable structure and member cohesion are crucial for handling the stress and challenges post-stroke. Members reorganize their lives to equitably share caregiving duties. As one family member stated, "We have reorganized our daily routines to ensure that the care for our family member is not solely on one person." Simultaneously, the family's emotional ties and mutual support intensify, vital for enduring the crisis strain.

In the third stage, effective communication and problem-solving are key to navigating recovery complexities. Open expression of feelings fosters an environment for emotional processing and understanding. A family member said, "We make sure to talk about our fears and hopes, which helps us to address the challenges we face." Active, collaborative problem-solving boosts confidence and resilience in managing the situation.

In the final stage, looking at the future signifies the maturation of the adaptation process. Stroke survivors and families anticipate a return to pre-stroke roles and activities while embracing new realities. This stage is marked by heightened health awareness and a dedication to a positive, optimistic life view. A family member projected, "We are planning for the future with lifestyle changes and regular check-ups to prevent another stroke."

In conclusion, a family's adaptation post-stroke is a dynamic, multi-stage journey: enhancing beliefs, adjusting organizationally, refining communication, and looking forward with growth in mind.

#### Factors Affecting the Resilience of Families with Stroke Patients

In summary, the protective factors for family resilience in stroke patients include attributing meaning to adversity, maintaining a positive outlook, ensuring flexibility of family roles, fostering connectedness among family members, and leveraging the family's economic and social resources. The hindering factors include the impact of stroke as a disease on the entire family, uncertainty about the disease, family financial pressure, stigma, and limitations on family and social resources.

### 3.6. Integration of the mixed-methods study

Key findings from the two studies were integrated using a Joint Display Table (Table 3), exploring family resilience in stroke survivors. It highlights three dimensions of the family resilience model: belief systems, organizational patterns, and communication and problem-solving processes. The second column lists mean  $\pm$  standard deviations from the Family Hardiness Index for the top ten items, providing a quantitative perspective to assess family resilience. The third column provides qualitative insights from in-depth interviews about family adaptation and influencing factors. Comparing qualitative and quantitative data reveals a deeper

**Table 1**  
Pearson correlations among variables.

	M	SD	Perceived Social Support	Perceived Burden	Self-efficacy	Family Resilience
Perceived Social Support	60.07	11.35	1			
Self-Perceived Burden	27.59	8.18	-0.347**	1		
Self-efficacy	80.69	22.43	0.610**	-0.343**	1	
Family Resilience	61.17	10.70	-0.458**	-0.308**	0.420**	1

\*\*  $p < 0.01$ .

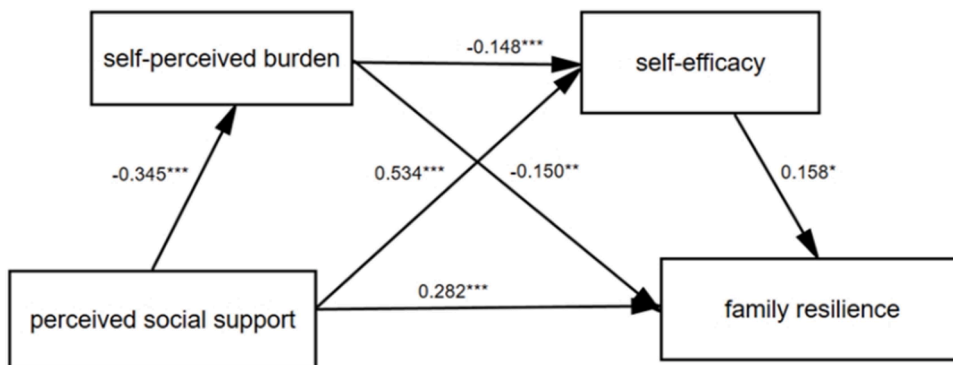


Fig. 2. Chain Mediating Effect of Self-Perceived Burden and Self-Efficacy.

**Table 2**  
 Bootstrap analysis of mediation effect significance test.

Effect Decomposition	Effect Value	Standard Error	95% LLCI/ULCI	Relative Mediating Effect
Total Effect	0.241	0.0027	0.185/0.293	–
Direct Effect	0.159	0.033	0.094/0.224	65.96%
Total Indirect Effect	0.081	0.025	0.033/0.132	33.61%
Path 1	0.029	0.011	0.010/0.052	12.03%
Path 2	0.048	0.021	0.007/0.090	19.92%
Path 3	0.005	0.003	0.001/0.011	2.07%

Note:  
 Path 1: Perceived social support–Self-perceived burden–Family resilience.  
 Path 2: Perceived social support–Self-efficacy–Family resilience.  
 Path 3: Perceived social support–Self-perceived burden–Self-efficacy–Family resilience.

**Table 3**  
 Joint Display Table of Findings: Integrating the Quantitative and Qualitative Phases of the Research Program.

Family Resilience Model	Quantitative phase (score, $\bar{x}\pm s$ )	Qualitative phase	Comprehensive inference
Belief Systems	Resilience in facing difficulties 3.42±0.55	Making Meaning of Adversity	consistent
	Optimistic belief in future improvement 3.32±0.51	Positive Outlook	consistent
	Collective effort and confidence in success 3.28±0.56	Positive Outlook	consistent
Organizational Patterns	Mutual support amidst disagreements 3.21±0.51	Flexibility	inconsistent
	Family unity and mutual assistance 3.21±0.51	Connectedness	consistent
	Innovation and planning 3.00±0.48	Social and Economic Resources	inconsistent
	Encouragement for new experiences 3.04±0.46		supplement
Communication / Problem solving	Emotional support and listening 3.06±0.50	Open Emotional Expression	consistent
	Positive living attitude and learning 3.15±0.45	Collaborative Problem-solving	inconsistent
	Cooperative problem-solving spirit 3.53±0.54	Collaborative Problem-solving	consistent

understanding of resilience, especially in family belief systems, where notable consistency occurs. Differences were noted in family organizational patterns and communication/problem-solving. This mixed-methods approach not only validates quantitative trends but also enhances our comprehension of family cohesion and adaptability in adversity.

**4. Discussion**

An integrated analysis of quantitative and qualitative data revealed key factors influencing family resilience in stroke survivors, focusing on chain mediation effects. The model showed that self-perceived burden and self-efficacy partially mediate the link between perceived social support and family resilience, highlighting complex family system interactions and aligning with global research on psychosocial influences in family resilience (Kim et al., 2019; Qureshi et al., 2023).

This study differs from Han et al.’s study (Han et al., 2024) and Chong’s study (Chong, 2024) in the integration part, which puts more emphasis on the trend of family resilience at different points in time and how specific factors predict such changes. Haiyan Chong’s integrative analysis is more inclined to analyze the influencing factors of family resilience from multiple perspectives and at a deeper level. In contrast, this study brings to light the consistencies and differences that exist across various data sets by separately presenting and comparing quantitative and qualitative results. This approach significantly enhances our understanding of the formative factors and multidimensional characteristics of family resilience. Furthermore, it sheds light on the adaptive processes

families undergo when confronting adversity.

The study aligns with prior research (Lu, 2024; Zhang et al., 2022), highlighting resources and age as key factors in family resilience. Qualitative findings suggest younger individuals exhibit lower resilience under stress, whereas older individuals, leveraging their life experiences, demonstrate greater resilience and less stress. Unlike earlier studies, this research broadens the definition of “resources” to encompass intangible elements such as family communication, problem-solving skills, and social and economic support, all vital for families facing adversity. These aspects significantly enhance overall family resilience, offering a deeper insight into the concept.

The significance of medical insurance in enhancing family resilience through economic and social support is noteworthy. The recovery from a stroke imposes substantial financial, psychological, and caregiving strains on families. Qualitative study participants highlighted that escalating medical expenses often led families to skip treatments, jeopardizing recovery. Health insurance alleviates financial strain, ensures prompt access to crucial services and rehabilitation, and enables families to recover from illnesses. Therefore, it is vital for governmental bodies to maintain medical insurance policies for severe conditions, develop relevant healthcare strategies, and promote employment support for family caregivers to mitigate financial pressures and enhance job conditions.

Quantitative research indicates a positive link between perceived social support and family resilience, aligning with previous studies (Chen et al., 2021; GBD 2019 Stroke Collaborators, 2021). Huang et al. (Huang et al., 2020) argued that social support enhances emotional health and resilience, enabling stroke patients to tackle challenges effectively. Self-efficacy, essential for family resilience, impacts the quality of life and perceived value among stroke survivors (Zhang et al., 2022). Qualitative studies reaffirm this, emphasizing self-efficacy’s role in fostering a proactive mindset and adaptability, as noted by family members. Conversely, a significant negative correlation exists between family resilience and self-perceived burden, highlighting the effects of caregiving and financial strains (Fitryasari et al., 2018). Qualitative findings also illustrate how this burden hampers family adaptability, reinforcing the quantitative study’s identification of self-perceived burden as a negative predictor of resilience. Given these findings, individuals should engage in self-directed psychological support. Families must encourage patients to strengthen their self-efficacy and self-worth, while caregivers prioritize self-regulation to protect their physical and emotional health, which is crucial for sustaining family resilience.

This study has several limitations. Firstly, this study used convenience sampling, which might limit the range of experiences of stroke survivors and caregivers. Future research should employ stratified or random sampling for more representative outcomes and explore mediating effects within families. Additionally, the cross-sectional design limits capturing long-term family resilience dynamics, impeding insights into adaptation to stress and environmental changes. Future studies should implement a longitudinal design to monitor the evolution of family resilience.

## 5. Conclusion

In summary, Chinese stroke survivors demonstrate moderate levels of family resilience, influenced by variables such as age, monthly income, disease onset, perceived burden, self-efficacy, and social support. Assessing and bolstering this resilience is key to reducing caregiver stress and enhancing survivors’ strengths. Tailored interventions for families and survivors can alleviate the principal caregiver’s burden. Additionally, healthcare professionals should comprehend the adaptive journeys of stroke survivors’ families, pinpoint factors that promote or impede resilience, and craft holistic strategies across personal, familial, societal, and clinical aspects to bolster families’ illness management capabilities.

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## CRedit authorship contribution statement

**Qin Ye:** Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Conceptualization. **Yang Yang:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Jingling Li:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Ting Wang:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Ning Liu:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.ijnsa.2024.100246](https://doi.org/10.1016/j.ijnsa.2024.100246).

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