Effects of Trajectory-based Support Via WeChat in Reducing Burden and Depression among Carers of People after Stroke: A Randomized Controlled Trial

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Abstract: The lack of preparation among carers in providing care for survivors of stroke leads to increased caregiver burden and depression. Studies on trajectory-based support addressing phase-specific needs for essential knowledge and skills to support caregiving preparedness are limited. This randomized controlled trial involved eighty participants from a Chinese tertiary hospital, randomly assigned to an experimental or control group (n = 40 each). The experimental participants received the 9-weeks of five sessions that included informational, emotional, instrumental, and appraisal support combined with trajectory-based support conducted via the WeChat platform. The control group received only usual care. Caregiver burden and depression were assessed at pre-test before the intervention and post-test at the end of the program. Instruments used to collect the data were a demographic questionnaire, the Chinese version of the Zarit Burden Interview, and the Chinese version of the Patient Health Questionnaire-9. Data were analyzed using descriptive statistics, paired and independent t-tests, Mann-Whitney U test, and Wilcoxon Signed Ranks Test.

The results indicated that after the program, the experimental group had significantly lower mean scores of caregiver burden and depression compared to before the program and the control group. However, no statistical differences were observed in the control group between pre- and post-test depression scores. These findings suggest that enhancing care preparedness through the trajectory-based support program reduces caregiver burden and depression among carers of people with stroke in China. Therefore, nurses can utilize trajectory-based support via WeChat to alleviate caregiver burden and depression in this population. However, further testing in other settings is necessary before widespread implementation.

Keywords: Caregiver burden, Caregivers, Depression, Stroke, Mobile applications, Preparedness, Social support

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Introduction

The high morbidity and long-term disability caused by stroke make it an urgent global health issue,[1] including in China. There are about 6-7 million survivors of stroke in China, and government statistics show that the number of new cases each year exceeds 3 million.[2] It is estimated that approximately 75-80% of survivors of stroke have varying degrees of disability.[3] Disabled survivors may require physical help with

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daily living activities and communication, feeding or personal hygiene, and emotional support.[4] Because family members must incorporate caring responsibilities into their daily lives, the impact of a stroke extends well beyond the person affected and has significant consequences for the larger family.[5] Family caregivers play a vital role in addressing the physical, cognitive, and emotional needs during recovery from stroke. They provide continuous support for daily activities and healthcare management.[6] However, caregivers often face complex situations due to the sudden assumption of caregiving responsibilities after an unexpected stroke event. They report compromised a social life, lack of professional, caring skills, difficulties managing functional impairments, emotional problems, and complex medication regimens.[6] Moreover, they also need to adjust their lifestyles according to the care trajectory.[4] These factors contribute to caregiver burden. Additionally, previous research has shown that caregiver burden is associated with depression.[7] Because of their incapacity to manage care demands, individuals have less time for self-care and healthy practices.[8] Caregivers who face high expectations are less likely to receive enough rest, and they frequently experience depressive symptoms, exhaustion, sleep difficulties, and a lack of motivation.[9] Previous studies suggest caregiving preparedness, including adequate knowledge and skills, is a predictor of less caregiver burden and depression.[10] However, caregivers of people with strokes (PW-ST) typically receive inadequate information and training for caregiving tasks, especially during hospital-to-home transitions,[11] leading to unpreparedness for home care provision.[12] Social support positively impacts preparedness, with higher levels correlating with better caregiver preparedness.[13]

Prior studies have identified that suitable support interventions encompass educational, supportive, self-care, peer support, and psychoeducational programs, which provide practical information and caregiving strategies to enhance caregivers' readiness.[14-21] However, these multi-component programs had a minor positive impact on reducing caregiver burden and depression. One possible reason is that previous programs did not address caregivers' needs at each recovery stage. Additionally, evaluations before discharge to gauge caregiving preparedness were excluded,[22] and traditional face-to-face or telephone support delivery models faced challenges like time constraints, transportation, and lack of respite services, preventing in-person support utilization.[23] Therefore, this study aimed to test the effect of Trajectory-based Support Via WeChat (T-BSVW) that could decrease the burden and depression by enhancing preparedness.

Conceptual Framework and Review of Literature

The Corbin and Strauss chronic illness trajectory framework[24] as applied to stroke rehabilitation by Burton,[25] and the concept of social support[26] were used to guide the intervention for this study. Burton[25] outlined five phases of the stroke trajectory corresponding to the stroke survivors faced: onset phase – the time when the signs of the stroke occur and medical and/or surgical treatments are performed; crisis phase – the time of hospitalization for stabilization and other measures such as antiplatelet and anticoagulation therapy; acute phase – focusing the time of preventive treatment and managing risk factors; stable phase – identifying the patient's readiness to discharge and planning for home rehabilitation; and recovery phase – a long-term process of regaining physical functioning. Each trajectory phase mirrors the carer's distinct needs and support requirements since they correspond to specific caregiving challenges and knowledge needs. Addressing each phase requires thorough preparation and a support system that enhances the caregivers' ability to manage the diverse and evolving needs of stroke survivors effectively. In the onset phase, the caregiver needs to understand the nature of the stroke, be provided with information on diagnosis and immediate treatment, and attend to the person's hygiene.[12] In the crisis phase, caregivers need information regarding medical management to aid with daily living tasks and fundamental rehabilitation exercises.[27] In the acute phase, the caregiver needs information on secondary prevention and rehabilitation methods, and recognizing complications and recurrences, especially during the transition period, is crucial.[22] In the stable phase, the caregiver may seek advice from others who have experienced the same caregiving situations and formal caregivers to address the diverse needs of survivors at home, including ensuring safety in-home care and ongoing rehabilitation resources.[12] In the recovery phase, the caregiver needs more information about re-engagement in societal participation.[23]

Given the psychological problems that caregivers will have during the heavy caring activities, they also need guidance to cope with the caregiving stress.[28] It is necessary to define caregivers' time, environment, and support needs at every stage with a particular focus on family. This framework stipulated the scope and timing of interventions for caregivers of PW-ST, highlights how support needs vary during these stages and suggests that caregivers gain the most from focused assistance during their most responsive times.

Understanding the experiences of the caregiver is crucial for effectively supporting them. Social support has been defined as an asset with the potential to diminish the strain of providing care to PW-ST.[26] Social support has four common categories: informational, emotional, instrumental, or appraisal.[26] Each phase provides four types of support to address caregivers'dual needs, including caregiving knowledge and skills for stroke survivors; caregiver-related self-care and coping stress strategies: 1) informational support, which consists of knowledge and guidance, recommendation, and counsel; 2) emotional support, such as empathy, trust, care, encouragement, and peer discussion; 3) instrumental support, which incorporates skill-building; and 4) appraisal support, which may include praise or information for self-evaluation. Each stage integrates four types of social support elements, which promotes the concentration of phase-specific needs for useful knowledge and techniques to improve caregivers' readiness for PW-ST. Additionally, by breaking down the person's medical phenomena, the caregivers can prepare to be effective in their field of work. This approach lessens the negative effects, such as caregiver burden and depression, which diminishes their ability to manage their caregiving duties effectively.[10]

With hospital stays of PW-ST becoming increasingly shorter, the emergence of needs post-discharge has become significant.[12] According to earlier studies, caregivers have a heightened level of stress in the time immediately after the PW-ST returns home as increased responsibilities of caregivers, which essentially increases the stress level of a caregivers.[29] Another study[30] highlighted the importance of nurses utilizing a preparedness evaluation tool to identify and resolve the requirements and concerns of stroke caregivers before hospital discharge. Caregiver preparedness refers to feeling equipped to handle survivors' physical, emotional, and emergency demands and manage caregiving stress.[31]

WeChat, a mobile application, stands as the most popular instant messaging application in China Since 2017, it has accumulated over 900 million active users and has the ability to instantly share a variety of content, including voice messages, videos, photographs, and text messages.[32] The advantages of a WeChat-based intervention include reduced time consumption,[33] location limitations,[34] acquired medical knowledge,[35] and a lower drop-out rate.[36] A randomized controlled trial demonstrated that WeChat-based intervention could help community patients improve self-management through real-time health education and group chats providing peer support and encouragement.[31] Leveraging these features facilitates continuous communication and support, resulting in reduced psychological problems such as depression.[32]

Therefore, through the Trajectory-based Support via the WeChat platform, we argue that caregivers of PW-ST benefit from social support that is informational, emotional, instrumental, and appraisal support, which varies according to the different phases of stroke caregiving. By offering adequate care-related information, acknowledging emotional challenges, recognizing signs of recurrence, employing stress management strategies, and providing training in caregiving skills, the preparedness of caregivers of PW-ST can be significantly improved. By improving the preparedness of caregivers during the critical phases of their transition home, they can protect themselves from the detrimental effects of caregiving burden and depression at home and enhance their caregiving abilities. As a result, caregivers who are more adequately equipped can effectively mitigate the occurrence of adverse problems, including caregiver burden and depression.

Study Aim and Hypothesis

This study aimed to investigate the effect of Trajectory-based Support Via WeChat (T-BSVW) regarding the burden of caregiving and depression experienced by stroke caretakers. The hypothesis was that after receiving the T-BSVW, the experimental group would have lower mean scores of caregiver burden and depression than before the program and the control group.

Methods

Study Design: This study used a randomized controlled trial with a two-group pre-posttest design and a single-blind method (blinding the respondents). The report follows the CONSORT 2010 checklist for randomized trials.

Sample and Setting: The participants were PW-ST receiving treatment at stroke center in a tertiary hospital in Jiangsu Province, China. With an effect size of 0.84 based on a prior study,[37] the sample size was determined using G*Power 3.1.9.2 software with 95% power, an alpha value of 0.05, and t-tests for the difference between two independent means. A sample size of at least 64 individuals was needed. With a 25% dropout rate projected, 80 individuals were needed for the total sample.

The inclusion criteria for PW-ST were: 1) first-time acute stroke; 2) diagnosis of either ischemic or hemorrhagic stroke; and 3) moderate to severe physical impairment (Barthel Index score < 61 out of 100).[38] PW-ST were excluded from the study if they had been diagnosed with psychological disorders such as bipolar disorder, schizophrenia, or depression, as per documentation in the medical records.

The caregivers had to meet the following inclusion criteria: 1) first-time primary caregiver of PW-ST, 2) aged 20-59; 3) depression score from the Chinese Patient Health Questionnaire < 20;[39] 4) co-residing with the person; 5) possessing a smartphone and often utilizing WeChat; 6) not taking part in any support groups; and 7) being willing to take part in this study. The exclusion criteria for carers were that they could not attend all intervention sessions, the death of the PW-ST during the program, and the PW-ST being readmitted to the hospital before the end of the program.

Systematic random sampling was used to select the sample in hospital. The primary investigator (PI) set a regular interval by selecting every third PW-ST, starting with the fifth patient entering the hospital. From the 1,150 potential participants assessed for eligibility, 35 did not meet the criteria, resulting in 370 PW-ST recruited. Systematic random sampling selected 80 from 370 caregivers by choosing every third caregiver, starting with the second. Forty-three caregivers did not meet the inclusion criteria, resulting in a final sample of 80 caregivers (see **Figure 1**).

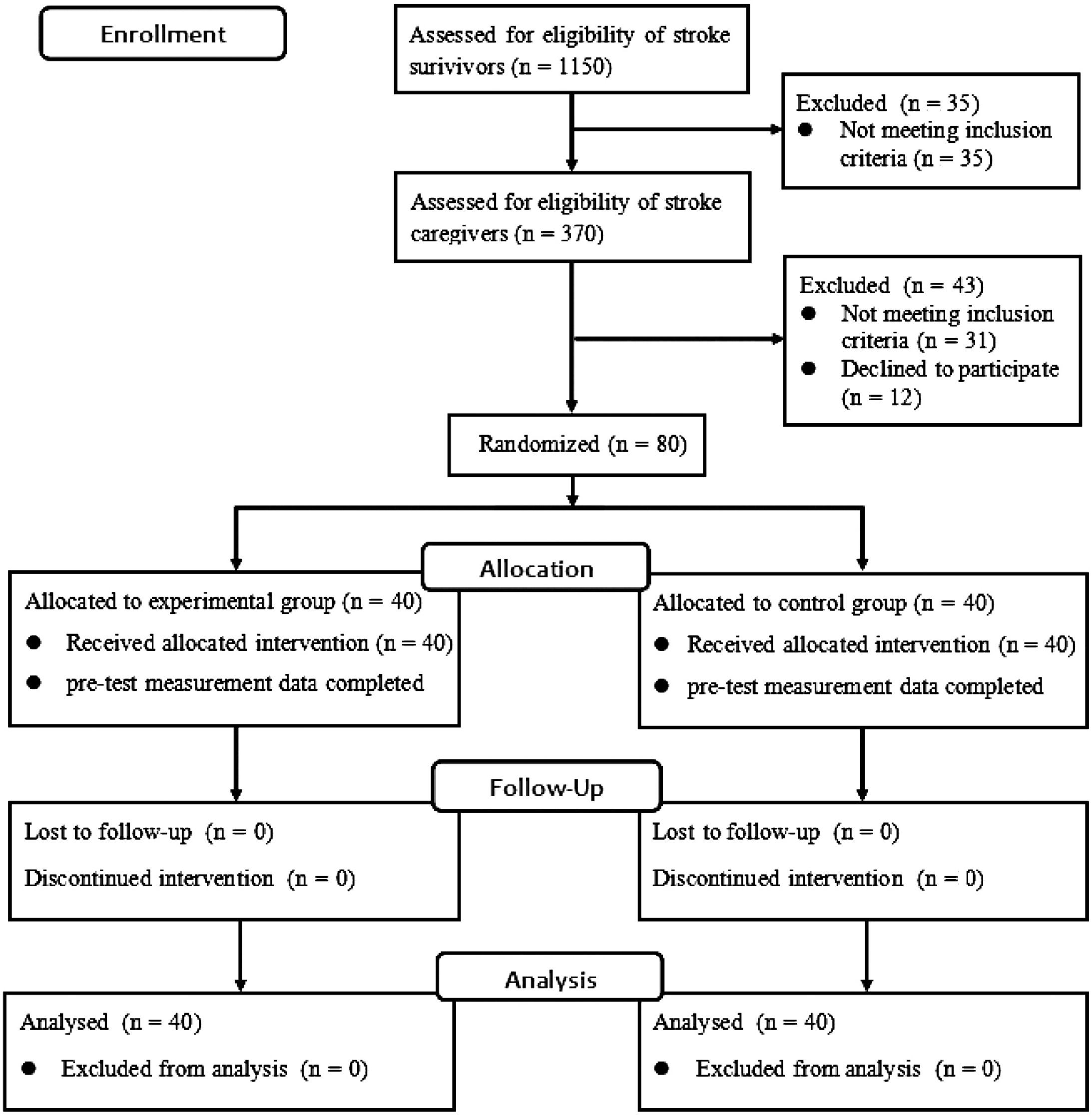

Figure 1. Participants' flow diagram based on CONSORT 2010

Randomization: Using permuted block randomization with a fixed block size of four, it consists of six possible patterns. Eighty respondents were randomly assigned to either the experimental (E) or the control (C) groups (40 persons each) by a research assistant using a computer program. The next step was to jot down the number and group assignment on paper, then place it in a sealed, opaque envelope bearing a serial number. After participants gave informed consent, the research assistant opened the envelope sequentially to maintain proper sequence generation and allocation concealment. Respondents were blinded to their group assignments by not being informed which intervention they would receive. The PI kept the allocation sequence numbers until unblinding. All participants in both groups completed the whole intervention. The flow of respondents is shown in **Figure 1**.

Ethical Considerations: This study got approval from the Research Ethics Committee of Chiang Mai University (study code: 2023-EXP036) and the studied hospital (project code: K-20240041-Y). Participants received details regarding the study objectives, procedures, potential risks and benefits, along with guarantees of anonymity and withdrawal from the study at any time without any effect. The participants voluntarily provided their informed consent to participate in the study. Upon the conclusion of the intervention, the control group received a booklet of T-BSVW based on their willingness and request. The Chinese Clinical Trial Registry (ChiCTR2400081392) has this trial registered.

Instruments: The instruments used in this study are as follows.

A Demographic Data Form was developed by the PI. Data on the caregiver included age, gender, employment status, educational level, relationship with the survivor, and monthly household income. Data collected for the PW-ST included age, type of stroke, and scores of the Barthel Index.

The Barthel Index (BI), developed by Mahoney,[38] assesses functional disability in stroke survivors by evaluating their ability to perform 10 daily living activities. The BI has a 5-point Likert scale with a possible total score of 100. The scores vary from complete dependence (0-20), severe dependence (21-40), moderate (41-60), slight dependence (61-100) and 100 for independence. This tool is quite popular in the context of stroke, and Cronbach's alpha was recorded at 0.90.[38] The Cronbach's alpha coefficient was 0.81 in the pilot study with 10 PW-ST, and 0.83 in the main study.

The Chinese version of the *Zarit Burden Interview* (ZBI-C) was used to measure caregiver burden.[40] This scale was developed originally in English by Zarit et al. and translated and back-translated into Chinese by Wang et al.[40] With 22 items on the scale, each with a Likert scale score that varies from 0 (never) to 4 (nearly always), the total range of scores is 0 to 88. A higher score suggests a greater caregiver burden. It achieved a Cronbach's alpha coefficient of 0.8 in the pilot study with 10 caregivers and 0.84 in the main study.

The Chinese version of the *Patient Health Questionnaire-9* (PHQ-9-C) was used to evaluate depression.[39] The PHQ-9 is a widely used depression detection instrument based on DSM-IV criteria for diagnosis of depression and back-translated into Chinese by Lu et al.[39] There are nine items in all, with ratings spanning 0 to 3, and the overall scores range from 0-27 with higher scores indicating higher depression. Cronbach's alpha coefficient was 0.82 in the pilot study with 10 caregivers and 0.86 in the main study.

The Preparedness for Caregiving Scale (PCS) was used to evaluate how well-prepared caregivers feel across eight domains of caregiving and was developed by Archbold et al.[31] The scale was translated into Chinese by the PI using standard back-translation techniques based on the Brislin translation model. Each item is rated from 0 (not ready) to 4 (very well-prepared), with total scores ranging from 0 to 32. Higher scores indicate greater preparedness. The total score was categorized into three levels: lower (0-10.66), moderate (10.67-21.33), and higher (21.34-32.00) perceived preparedness with a Cronbach's alpha coefficient of 0.83 in the pilot study with ten stroke carers and 0.87 in the main study.

Trajectory-based Support Via WeChat (T-BSVW)

This program, developed by the PI, was a trajectory-based support intervention delivered via the mobile phone application WeChat, providing participants with informational, emotional, instrumental, and appraisal support. It consists of five sessions over nine weeks aligned with the five stroke recovery phases, addressing the varying caregiving needs at each stage (**Appendix, Table A1**). The T-BSVW program's content validity was assessed by a panel of five experts, including a neurosurgeon, psychologist, nutritionist, rehabilitation physician, and an advanced practice nurse in neurosurgery. The program was refined based on the experts' feedback.

The PI conducted the program, and all the informational support content, including the introduction of each phase of emotional support content, was shown in the form of text messages through WeChat to caregivers. Online Q&A via audio message to participants to get feedback on how they understood the stroke knowledge and performed their skills through video calls. Participants were instructed to read the content of each session within two hours of its release and could review it as often as needed. The PI held the peer sharing sessions via the function of WeChat group chat. The Preparedness for Caregiving Scale (PCS) was used after the completion of session 3 of the T-BSVW to assess caregivers' preparedness. If the scores indicated caregivers were not well-prepared, additional information and skills training were provided to improve their preparedness. This approach ensured that by sessions 4 and 5, caregivers had achieved a high level of readiness to handle caregiving tasks. The scores measured in session 3 were used to tailor the content and support in the subsequent sessions, focusing on areas where caregivers needed more guidance and practice.

Usual care practices

The General Office of the Stroke Prevention and Treatment Project of the National Health Commission established the Guidelines for Stroke Care in China (2021 edition),[41] which is the basis for standard care practices. These practices included stroke-related treatment and rehabilitation information and one follow-up telephone call within seven days of discharge by hospital nurses. Participants in both groups received information on these usual care practices.

Data Collection: The study was conducted from July to November 2023. Two research assistants (RAs) (facilitator and data collector), both nurses working in the stroke center, were trained by the PI on their responsibilities for the study. After obtaining permission to collect data, the first RA recruited eligible participants. The PI implemented the 9-week 5-session T-BSVW for the experimental group, in addition to usual care, from being diagnosed with stroke to two months post-discharge. In contrast, the control group received only usual care practices. For the experimental group, at the end of the 3-session program, the second RA measured the participants' preparedness using the PCS. If any preparedness level was not high, the PI provided additional information to clarify misunderstandings or unskilled performances. Caregiver burden and depression in both groups were assessed by RAs, who did not know the group status of the participants, using the ZBI-C (before and after the intervention) and the PHQ-9-C (before and after 1-month post-intervention), respectively.

Data Analysis: Data were analyzed using SPSS version 27. Descriptive statistics, including mean and standard deviation, median and interquartile range, percentage, and frequency, were used to describe demographic data and scores of the BI and depression. The Shapiro-Wilk test indicated a normal distribution for caregiver burden but a non-normal distribution for depression. Therefore, an independent sample t-test was used to compare the differences in mean caregiver burden scores between the groups after the program, and a paired sample t-test was employed to compare the pretest and post-test scores of caregiver burden within both groups. A Mann-Whitney U test was used to compare the differences in median depression scores between both groups one-month post-program, and a Wilcoxon signed ranks test was employed to compare the pretest and posttest depression scores within both groups.

Results

Baseline characteristics of caregivers and PW-ST are shown in **Table 1**. In the experimental group, the caregivers' median age was 50 years (IQR = 10.50), while in the control group, it was 49.50 years (IQR = 10.75). Most caregivers in both groups were female, had completed secondary school, and were children of the survivors of stroke. Regarding employment status, 47.5% of caregivers in the experimental group, including retirees and housewives/househusbands, were not working, compared to 50% in the control group. Half the household monthly income ranged between 5,000-10,000 CNY (685-1370 USD) in the experimental and control groups (50% and 52.5%, respectively). The mean age of PW-ST was 67.23 years (SD = 13.54) in the experimental group and 69.40 years (SD = 10.45) in the control group. The median scores of the Barthel Index in the experimental group were 45.00 (IQR =18.75), while in the control group they were 50.00 (IQR = 15.00). The majority of PW-ST in both groups were diagnosed with ischemic stroke. No significant differences were observed in the demographic data between the two groups.

Table 1. Demographic characteristics of participants and survivors (n = 80)

Demographic characteristics	Experimental group	Control group	Statistic value	p-value
	Median (IQR)/ n (%)/Mean (SD)	**Median (IQR)/ n (%)/Mean (SD)**		
Caregivers' demographic characteristics				
Age (year)*	50.00 (10.50)	49.50 (10.75)	-0.680[a]	0.497
Gender				
Male	10 (25.00%)	9 (22.50%)	0.069[b]	0.793
Female	30 (75.00%)	31(77.50%)		
Employment status				
Full-time job	10 (25.00%)	9 (22.50%)	0.050[b]	0.823
Part-time job	11 (27.50%)	11 (27.50%)		
Retired	12 (30.00%)	14 (35.00%)		
Housewife/househusband	7 (17.50%)	6 (15.00%)		
Educational level				
Primary school	5 (12.50%)	4 (10.00%)	0.134[b]	0.935
Secondary school	21 (52.50%)	22 (55.00%)		
Certificate/Diploma	14 (35.00%)	14 (35.00%)		
Relationship with the survivors				
Spouse	11 (27.50%)	13 (32.50%)	0.299[b]	0.861
Children	24 (67.50%)	23 (57.50%)		
Brothers/sisters	5 (12.50%)	4 (10.00%)		
Monthly household income (CNY) (USD)				
< 5,000 (< 685 USD)	7 (17.50%)	5 (12.50%)	0.395[b]	0.821
5,000-10,000 (685-1,370 USD)	20 (50.00%)	21 (52.50%)		
> 10000 (> 1,370 USD)	13 (32.50%)	14 (35.00%)		
Depression (scores)*	10.50 (5.00)	11.00 (4.00)	-0.165[a]	0.869
Stroke survivors' demographic characteristics				
Age (year)**	67.23 (13.54)	69.40 (10.45)	-0.804[c]	0.424
Types of strokes				
Ischemic	37 (92.50%)	38 (95.00%)	0.213[b]	0.644
Hemorrhagic	3 (2.50%)	2 (5.00%)		
Barthel Index (scores)*	45.00 (18.75)	50.00 (15.00)	-0.133[a]	0.894

Note. Variables marked with *are presented as Median (Interquartile Range: IQR), indicating that the distribution is not normally distributed; [a] = Mann-Whitney U test;
Variables marked with **are presented as Mean (Standard Deviation: SD);
[c]= independent sample t-tests;
All others are presented as n (%); [b] = Chi-square test

Effectiveness of T-BSVW

Prior to discharge, results indicated that caregivers in the experimental group had a moderate level of preparedness (mean = 19.93, SD = 2.59, range = 13-25), with 11 caregivers achieving a high level of preparedness (range = 22-25). The PI provided additional information and skills training for those who did not initially reach a high level of preparedness until their scores improved.

At baseline, the mean scores for caregiver burden and depression were not significantly different between the two groups. However, after the program, there was a significant difference in caregiver burden scores between the groups (t = 4.336, p < .001). The experimental group had lower caregiver burden scores (mean = 32.80, SD = 3.37) than the other group (mean = 36.58, SD = 4.36) at the end of the program. Significant differences were found in the experimental group (t = 5.955, p < .001), as well as significant differences in the other group (t = 3.488, p = .001) (see **Table 2**).

Table 2. Comparison of the caregiver burden between groups and comparison of the caregiver burden before and after receiving the T-BSVW within groups

Caregiver burden	Experimental group Mean (SD)	Control group Mean (SD)	t^a	p-value
Pre-test	37.13 (4.00)	38.68 (4.72)	1.584	0.117
Post-test	32.80 (3.37)	36.58 (4.36)	4.336	< 0.001
t^b	5.955	3.488		
p-value	< 0.001	0.001		

Note. t^a= independent t-test
t^b= paired t-test

After the program, the experimental groups' median depression scores were markedly lower than those of the control group (Z = -6.161, p <.001). Compared to this group (median = 10.00, IQR = 4.50), carers in the experimental group exhibited reduced depression scores one-month post-intervention (median = 6.00, IQR = 3.50). They exhibited significant differences (Z = -5.406, p <.001), whereas the control group did not (Z = -0.523, p =.601) (**Table 3**).

Table 3. Comparison of the depression between the groups and comparison of depression between, before, and after receiving the T-BSVW at 1-month post-program

Depression	Experimental group Median (IQR)	Control group Median (IQR)	Z^a	p-value
Pre-test	10.50 (5.00)	11.00 (3.75)	-0.165	0.869
Post-test	6.00 (3.50)	10.00 (4.50)	-6.161	< 0.001
Z^b	-5.406	-0.523		
p-value	< 0.001	0.601		

Note. Z^a = Mann-Whitney U test
Z^b = Wilcoxon signed-ranks test

Discussion

The results of this study demonstrated that the T-BSVW effectively reduced caregiver burden and depression by enhancing caregiving preparedness for Chinese participants. Utilizing WeChat, a popular mobile phone application in China, as the delivery tool, the program provided sufficient preparedness using a digital and agile support system. Due to the longitudinal nature of the study, which was over three months, the PI had to maintain contact with the caregivers. Compared to conventional methods such as face-to-face gatherings or vocal communications, WeChat was found to be superior in prompting adults to seek information and learn new knowledge.[32] All the caregivers were able to complete the whole program with no dropout rates compared to the expected rates, hence conforming with an earlier study that stated that mobile application-based programs are convenient and engaging.[36] A Cochrane review and meta-analysis provided evidence that technology-based interventions are useful for informal, time-poor caregivers of PW-ST who have limited time for caregiving tasks.[33] WeChat can provide timely and relevant information that fits perfectly in the framework of intervention design in supporting the needs of caregivers and placing health support beyond geographical boundaries.[34] Our findings support those of another study[32] that found a WeChat-based continuity educational program reduced depression. Similarly, carers of family stroke survivors benefitted from diverse, immediate information and support during the transitions from one phase to another, which increased their real-time preparedness and had a positive effect on the state of their mental health.[34]

The findings supported the study's conceptual framework and research hypotheses. Interventions that were aimed at decreasing the burden by a form of training fostered self-efficacy among the caregivers. When caregivers were more confident, they possessed better competence in attending to caregiving demands after going home. The trajectory framework helped the support program to identify and focus on particular concerns and requirements of caregivers concerning their perceived preparedness for various caregiving tasks. Enhanced stroke knowledge given earlier is useful in informing treatment interventions; diversified caregiving roles at each stage are also beneficial in decision-making by the caregivers.[13] According to a study, greater caregiving know-how and expertise are associated with less burden.[10] Thus, during the hospital stay, the participants acquired knowledge and skills to prevent stroke complications, understand various types of disability, caregiving approaches, and early exercise programs to address the physical needs of PW-ST. Also, the informational and emotional support that concerns the caregiver's part - giving directions and talking through - promoted better self-management. This type of support enables caregivers of PW-ST with chronic diseases to be more confident in caregiving.[28] The results corroborated earlier research suggesting that enhancing caregivers' self-management preparedness can potentially decrease caregiver burden.[15-16] Our findings also support those in another study[20] that found a psychoeducation intervention improved the caregiving competence, problem-solving and coping abilities of caregivers of PW-ST. Similarly, another study[18] revealed that a 10-week multi-component problem-solving program, including problem-solving skills, relaxation training, reframing negative thoughts, stress management techniques, self-care, and adequate resources for recognizing the recurrent stroke, together diminished the depression and burden experienced by caregivers of PW-ST.

The transfer of the rehabilitative care of PW-ST from the hospital to home considerably changes the role of the caregivers and presents health risks. The caregivers have to master caregiving activities, especially before discharge. During this phase, caregivers were educated on secondary prevention, signs of stroke recurrence, and activities of daily living. Choi et al.[16] established that training in daily activities, home safety modifications, and performing muscle exercises decreases the burden among caregivers. Meanwhile, skill development to meet the person's physical requirements quickly can go a long way in easing the burden of care work. Training videos via WeChat also helped caregivers better understand stroke-related disabilities and cope with caregiving difficulties.

The reduction in caregiver burden might also result from evaluation after each session correcting caregivers' perceptions and improper caregiving skills. During the intervention, the PI encouraged practice and reflection on stroke knowledge and skills. By improving stroke-related care knowledge and ability in each stage, caregivers are well-equipped to prepare for care, thus perceiving less care burden.

Importantly, a preparedness evaluation tool identified caregivers' perceived readiness before hospital discharge. Participants' preparedness was evaluated using the Preparedness for Caregiving Scale before discharge, with reinforcement provided until high preparedness levels were achieved. Higher preparedness reduces caregiver burden.[10] Prior studies examined caregiving preparedness post-intervention, but this study used it as a monitoring variable to enhance the intervention's effectiveness during the transition period. Our study confirmed the findings of a previous study that interventions including educational, supportive, self-care, and psychoeducational programs conducted by a nurse-led or interdisciplinary team can increase the readiness among caregivers. Caregivers of PW-ST need to be sufficiently prepared to meet caregiving demands by improving competence and reducing stress.[17] This leads to a decrease in the caregiver burden.

Post-discharge, caregivers faced unique stroke caregiving challenges. The PI organized peer support discussions and daily counseling to provide practical and emotional support, enriching the structured health information with personalized advice. This approach helped participants apply knowledge and skills to manage complex caregiving needs, consistent with studies showing that peer support-based online education reduces the caregiving burden.[21]

The post-program reduction in caregiver burden may also relate to participant demographics. Most participants did not have full-time jobs but had a secondary education level or higher, allowing them time and the ability for self-learning. This is in line with findings indicating that caregivers with no employment and higher education levels have lower care burdens.[10] Based on the conceptual framework, it was hypothesized that caregivers with lower burden will have more time for sleep, leisure, self-care, and healthy behaviors, hence, less depression. A previous study has also established a positive correlation between the caregiver burden and depression.[7]

Besides, concerning the needs, it is crucial to mention that the caregivers tend to disregard themselves in the initial stages of caregiving, which is why self-care was included in the intervention. Education focused on self-care strategies, stress management, relaxation techniques, and decision-making also benefited the respondents as it helped them re-orient and manage caregiving difficulties. The results of this study are consistent with those of previous studies that highlighted how self-care and stress management can help alleviate depression.[15]

What we found out was that there was a significant decrease in the depression scores of the caregivers in the experimental group one month after the program as compared with those in the control group; however, no statistical differences were observed in the control group's pre- and post-test of depression scores, which further supports previously published data.[17] Family caregivers' mental health is determined not only by caregiver burden but also by various factors, including the severity level of functional disability of care recipients and their behavior problems.[8] The results of this study reflected the effect of the T-BSVW in reducing caregiver burden and depression among caregivers of PW-ST.

Limitations

This study was performed in a selected setting in China, so generalizability to other settings with diverse contexts is a noteworthy limitation. We measured outcomes only post-intervention, and one-month follow-ups may be insufficient to maintain the psychological problem. Subsequent research should assess the longer follow-up period, such as three or six months. Additionally, given that dyadic outcomes to stroke care are critical, including stroke survivors' outcomes, such as readmission and emergency department visits, further research should assess the program's effect on both the stroke survivors and the family caregivers.

Conclusions and Implications for Nursing Practice

This study investigated whether the T-BSVW, which used the trajectory framework combined with social support as a conceptual framework, can reduce caregiver burden and depression in stroke carers. The findings showed that T-BSVW was feasible and effective at increasing caregiving preparedness and decreasing caregiver burden and depression in the experimental group. Thus, clinical nurses and other health professionals should be trained to utilize this well-designed supportive program to assist caregivers of PW-ST, particularly during the transition period. The development and implementation of more relevant applications are also expected to enhance stroke care support and provide caregivers with comprehensive services.

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Appendix

Table A1. Content of the Trajectory-based Support Via WeChat

Session/ Trajectory phase/ Commencement time/ Time spent	Objectives	Social support (activities)			
		Informational support (via text messages)	**Emotional support (via text messages)**	**Instrumental support (via short video messages)**	**Appraisal support (via video call)**
Session 1/ Onset phase/ Start time: Once the patient was diagnosed with a stroke. / One hour	To help caregivers understand the caregiver role and boost their disease knowledge and skills to meet the survivors' needs	Giving stroke-related information about the disease's pathophysiology and diagnosis and emergent treatment options	1. Giving overview information of the onset phase about understanding and how to perform the caregiving role 2. Encouraging the participants to share stress 3. Encouraging the respondents' online Q&A with the researcher in terms of disease	Providing techniques for hygiene skills	Each participant was asked about what they had learned. Assessing needs and capacities to perform the caregiving skills
Session 2/ Crisis phase/ Commencement time: within 12 hours after vital signs have stabilized. / Two hours	To assist caregivers in addressing the physical and emotional needs of the survivors	Providing information on preventing complications, categories of stroke disabilities, coping methods during caregiving tasks, self-care guidance, and strategies for stress management	Offering a comprehensive overview of understanding the patient's forthcoming treatment options and the caregiver's responsibilities during the crisis phase Encouraging participants to discuss their stress Encouraging the participants to conduct online Q&A to the researcher in terms of disease	Providing techniques for early rehabilitation exercise skills	1. Each participant was asked about what they had learned. 2. Assessing needs and capacities to perform the caregiving skills
Session 3/ Acute phase/ Commencement time: on the third day, once vital signs have stabilized. / Two hours	To foster caregivers' knowledge and skills to meet the survivors' physical, emotional, and emergent needs and cope with the caregiving stress	Giving stroke-related information about secondary prevention, signs of stroke recurrence and caregiver-related information about coping with the caregiving stress	1. Providing an overview of the acute phase, including understanding the preparations for going home and the responsibilities of the caregiving role at home 2. Encouraging the participants to share stress 3. Encouraging the participants to conduct online Q&A with the researcher in terms of disease	Providing techniques about activities of daily living skills: feeding, combing, putting on and taking off the cloths, pants, socks, turning over on both the affected and healthy sides, and moving while in bed	Each participant was asked about what they had learned. Assessing needs and capacities to perform the caregiving skills After the third session, the data collector sent the Preparedness for Caregiving Scale electronic questionnaire to evaluate perceived preparedness level.

Table A1. Content of the Trajectory-based Support Via WeChat (Cont.)

Session/ Trajectory phase/ Commencement time/ Time spent	Objectives	Social support (activities)			
		Informational support (via text messages)	Emotional support (via text messages)	Instrumental support (via short video messages)	Appraisal support (via video call)
					The researcher provided additional information and skills training to participants who did not meet the high-level preparedness until their scores reached a high level.
Session 4/ Stable phase/ Commencement time: on the 1st day of the 1st month after leaving hospital/ Two hours	Assisting caregivers in dealing with the demands of physical and emotional of PW-ST and self-management	Providing information on ensuring a safe home environment, maintaining rehabilitation, and caregiver-related health management	1. Offering an overview of the stable phase, including home caregiving and guiding family members to perform daily living activities independently 2. Encouraging participants to discuss their stress 3. Encouraging the participants to conduct online Q&A with the researcher in terms of disease 4. Organizing peer group discussions to share caregiving experiences through Group Chat	Providing techniques about daily living skills activities: transferring, using the bedside toilet, moving from sitting to standing	1. Each participant was asked about what they had learned. 2. Assessing needs and capacities to perform the caregiving skills
Session 5/ Recovery phase/ Commencement time: on the 1st day of the 2nd month after leaving hospital/ Two hours	Assisting caregivers in dealing with the demands of physical and emotional of PW-ST and reintegrating into society	Giving information about the symptoms of chronic disability, reintegrating into society and maintaining a healthy lifestyle	1. Giving overview information of the recovery phase about adapting the caregiver role 2. Encouraging the participants to share stress 3. Encouraging the participants to conduct online Q&A to the researcher in terms of disease 4. Organizing peer group discussion to share the caregiving experiences via Group Chat	Providing techniques about activities of daily living skills: going up and down stairs	1. Each participant was asked about what they had learned. 2. Assessing needs and capacities to perform the caregiving skills

ผลของการสนับสนุนตามวิถีทางความเจ็บป่วยผ่านแพลตฟอร์มวีแชทในการลดภาระการดูแลและภาวะซึมเศร้าในผู้ดูแลผู้ป่วยโรคหลอดเลือดสมอง : การทดลองแบบสุ่มและมีกลุ่มควบคุม

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บทคัดย่อ: การขาดการเตรียมความพร้อมของผู้ดูแลในการให้การดูแลผู้รอดชีวิตจากโรคหลอดเลือดสมองนำไปสู่การเพิ่มขึ้นของภาระการดูแลและภาวะซึมเศร้า การศึกษาเกี่ยวกับการสนับสนุนตามวิถีทางความเจ็บป่วยที่เน้นความต้องการในด้านความรู้และทักษะในการดูแลของผู้ดูแลในแต่ละระยะของการเจ็บป่วยยังมีจำกัด การทดลองแบบสุ่มและมีกลุ่มควบคุมกับกลุ่มตัวอย่างชาวจีนจำนวน 80 คน จากโรงพยาบาลระดับตติยภูมิของสาธารณรัฐประชาชนจีน และสุ่มเข้ากลุ่มทดลองและกลุ่มควบคุมกลุ่มละ 40 คน กลุ่มทดลองได้รับการสนับสนุนในด้านข้อมูล ด้านอารมณ์ ด้านทรัพยากร และด้านการประเมินค่าตามวิถีทางการเจ็บป่วยด้วยการใช้แพลตฟอร์มวีแชท ส่วนกลุ่มควบคุมได้รับการดูแลตามปกติ ภาระในการดูแลและภาวะซึมเศร้าประเมินก่อนและหลังการทดลอง เครื่องมือที่ใช้ในการเก็บข้อมูลประกอบด้วยแบบสอบถามข้อมูลส่วนบุคคล แบบสัมภาษณ์ภาระในการดูแลของซาริท ฉบับภาษาจีน และแบบสอบถามสุขภาพผู้ป่วยฉบับภาษาจีน-9 วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา การทดสอบทีแบบคู่และการทดสอบทีแบบอิสระ การทดสอบแมน-วิทนีย์ ยู และการทดสอบวิลคอกซัน

ผลการวิจัยพบว่าหลังจากสิ้นสุดโปรแกรม กลุ่มทดลองมีคะแนนเฉลี่ยภาระการดูแลและภาวะซึมเศร้าลดลงอย่างมีนัยสำคัญเมื่อเทียบกับก่อนการเข้าร่วมโปรแกรมและกลุ่มควบคุม อย่างไรก็ตาม ในกลุ่มควบคุมไม่พบความแตกต่างทางสถิติระหว่างคะแนนภาวะซึมเศร้าก่อนและหลังการทดลอง ผลการศึกษาเหล่านี้ชี้ให้เห็นว่าการเสริมสร้างความพร้อมในการดูแลผ่านโปรแกรมสนับสนุนตามวิถีทางความเจ็บป่วยช่วยลดภาระในการดูแลและภาวะซึมเศร้าในผู้ดูแลผู้ป่วยโรคหลอดเลือดสมองในประเทศจีน ดังนั้นพยาบาลสามารถใช้การสนับสนุนตามวิถีทางความเจ็บป่วยผ่านแพลตฟอร์มวีแชทเพื่อบรรเทาภาระการดูแลและภาวะซึมเศร้าในกลุ่มประชากรนี้ได้ อย่างไรก็ตาม จำเป็นต้องมีการทดสอบเพิ่มเติมในสถานบริการสุขภาพระดับอื่น ๆ ก่อนที่จะดำเนินการใช้งานอย่างแพร่หลาย

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คำสำคัญ: ภาระผู้ดูแล ผู้ดูแล ภาวะซึมเศร้า โรคหลอดเลือดสมอง แอปพลิเคชันบนมือถือ การเตรียมความพร้อม การสนับสนุนทางสังคม

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