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Online education program, communication effectiveness, and communication self-efficacy among family caregivers of people with post-stroke aphasia: A non-randomized clinical trial

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Keywords

Stroke; Aphasia; Self-Efficacy; Caregivers

Abstract

Background: To enhance the quality of care provided to people suffering from post-stroke aphasia, it is crucial for family caregivers (FCs) to possess a comprehensive understanding of the speech impairments associated with aphasia and to develop appropriate communication skills. This study aimed to examine the effects of an online educational program on the communication effectiveness and communication self-efficacy (CSE) of FCs of people with post-stroke aphasia (PWA).

Methods: This study was a non-randomized clinical

trial involving a total of 50 participants, with 25 individuals assigned to each of the control group (CG) and intervention group (IG). FCs were specifically chosen because they were caring for PWA. The intervention involved an online educational program where the researcher taught FCs about aphasia and various methods of communication with PWA.

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Data collection involved the use of a demographic information form, the Communicative Effectiveness Index (CETI), and the Communication Self-Efficacy Scale (CSES). Data analysis was conducted using SPSS software.

Results: The two groups had similar demographics among FCs and PWA, as well as similar communication effectiveness and CSE at baseline. Following the intervention, a statistically significant difference was observed between the two groups in relation to communication effectiveness ($P < 0.001$) and CSE ($P < 0.001$).

Conclusion: The implementation of an online educational program has the potential to improve communication effectiveness and CSE among FCs of PWA. By utilizing this approach, communication between FCs and PWA can be enhanced, ultimately leading to improved care for PWA.

Introduction

Aphasia, a speech disorder, is a significant consequence of stroke or cerebrovascular accidents. It is a communication disorder characterized by a patient's inability to understand, express, read, write, and create words. Different forms of aphasia, such as Broca's aphasia, Wernicke's aphasia, global aphasia, or conductive aphasia, are caused by the affected area of the brain and vascular blood flow disorder in different brain regions.¹ Aphasia is more prevalent in ischemic stroke than hemorrhagic stroke and affects 21%-38% of patients with acute stroke.² This problem persists in 60% of these patients for up to 12 months after the stroke and becomes a chronic condition.³

Aphasia significantly impacts patients' communication abilities and functioning in various areas of their lives, including at home, in the community, and at work.² This condition is associated with the development of mental disorders, such as depression and social isolation, which can greatly disrupt patients' lives. In addition, aphasia presents a range of challenges, including limitations in daily activities, reduced agency, social stigma, loss of friendships, anxiety when interacting with unfamiliar people, and reluctance to engage in conversations.⁴ Although significant time and effort are dedicated to rehabilitating people with post-stroke aphasia (PWA), complete restoration of language function is often not achievable.⁵ Aphasia poses challenges to patients' communication and interactions, particularly within their own families,⁶ and has

adverse effects on family caregivers (FCs). Notably, research supports the negative consequences of aphasia on FCs, including physical impairments, depression, mental health issues, and difficulties in coping with the demands of caring for these patients. This issue is mentioned under the title of third-party disability, which is caused by the health conditions of loved ones and dependents.⁴ The FCs of PWA not only bear the responsibility of providing care for them, but they also play a crucial role in facilitating their communication. However, this situation also exposes FCs to changes in their personal and social lives.⁷ The findings of a qualitative study aimed at describing the impact of aphasia on FCs revealed that FCs often struggled to cope with the challenges imposed by aphasia. As a result, they may experience feelings of fatigue due to the stress and strain caused by this situation. Communication between FCs and PWA undergoes various changes, including differences in communication methods, shifts in conversational topics, and a decrease in their own speaking ability. These changes in communication also affected how FCs interacted with each other, often requiring additional support for PWA.⁶

Effective communication between FCs and PWA is crucial for reducing these issues. To address this problem, it is important to decrease the communication burden and improve the effectiveness and self-efficacy of FCs when communicating with PWA.⁸ Communication effectiveness refers to an individual's ability to successfully communicate and exchange messages in their home and community environments in order to fulfill their life roles.⁹ For PWA, effective communication involves creating an engaging environment for them to interact with others, while also providing strategies for other FCs to communicate with them.^{10,11} Furthermore, FCs need to possess sufficient communication self-efficacy (CSE) to effectively communicate. Self-efficacy is one of the factors that influences FCs' ability to persist in their efforts to communicate with someone with aphasia.⁸ CSE refers to an individual's belief in their ability to communicate effectively in specific situations.¹² Individuals' self-efficacy beliefs can vary in terms of dimensionality, level, generality, and strength. Some individuals believe they can only communicate effectively to a limited extent, while others possess full confidence and can communicate effectively across all levels, even in

the most challenging situations.¹² Self-efficacy, as a psychological factor, significantly influences the communication skills of FCs of PWA. It greatly enhances motivation and reduces levels of depression, anxiety, and hopelessness among FCs.^{5,13} CSE represents the FCs' expectations regarding their ability to communicate with PWA. When FCs have higher levels of CSE, they can better understand the speech disorders of PWA and acquire appropriate communication skills.⁵ The studies on the CSE of FCs or caregivers of PWA are considerably limited. In 2012, a research study was conducted in Japan with the aim of constructing a questionnaire to assess the CSE of caregivers of PWA.⁸ Subsequently, in 2016, utilizing the same questionnaire, the researchers examined the correlation between CSE, communication burden, and the psychological well-being of life partners of PWA. The outcomes revealed that a higher level of CSE was linked to a decreased caregiving burden, diminished communication burden, and enhanced mental well-being among caregivers.⁵

Given the importance of communication effectiveness and CSE in FCs of PWA, it is crucial to provide caregivers with appropriate training to enhance positive treatment outcomes for PWA.¹⁴ Furthermore, interventions that address the communication needs of FCs of PWA are of utmost importance.¹⁵ However, the existing literature review indicates a limited number of studies that have focused on promoting communication effectiveness and CSE. Many studies primarily describe these concepts or concentrate on alternative intervention approaches for PWA.^{5,16-18} In China, a study was conducted in 2019 involving the education and training of six FCs of PWA. The findings revealed that following the intervention, FCs demonstrated an improved understanding of aphasia care and displayed increased confidence in utilizing communication strategies.¹⁶ In another pilot study conducted in 2018, the impact of a communication partner training (CPT) program on the knowledge and communication abilities of caregivers of PWA was investigated. The results indicated positive changes in their perceived ability to communicate with PWA following the training program.¹⁹ Although the impact of the educational or training program was examined in these two studies, it is important to note that the sample size was quite limited. A systematic review investigated the effects of CPT on language, communication activity, psychological

adjustment, and quality of life (QOL), and concluded that training should be implemented to enhance communication skills in PWA. It is recommended that future studies be conducted in a variety of complex settings, with a particular focus on the acute phase of aphasia.²⁰ This is crucial because patients in the acute stage have distinct treatment needs compared to those in the chronic stages. They often experience confusion and distraction in the early days following their diagnosis of aphasia. Therefore, it is imperative to prioritize caregiver education and provide them with training as early as possible.¹⁴

Given the significant presence of nurses in the healthcare system, they play a critical role in educating families of PWA about effective communication. This educational process starts during the patient's hospitalization and continues until their discharge, including home care instruction. Various methods exist for instructing FCs, but most studies recommend face-to-face education and training. However, it is essential to consider the feasibility and simplicity of implementing any education or training. In this context, online education is a valuable alternative because it allows FCs to participate from home and at times that do not conflict with their daily responsibilities. Regardless of the chosen approach, online education is a form of learning that uses electronic systems and emphasizes interaction between the instructor and participants, as well as the dissemination of educational materials. This study aims to assess the impact of an online educational program on the effectiveness of communication and the CSE of FCs of PWA.

Materials and Methods

Trial Design: This study was a non-randomized clinical trial conducted from October 2021 to July 2022. Due to practical and ethical considerations, including the necessity to minimize contamination between groups and logistical constraints within clinical settings, a non-randomized design was implemented. This methodological approach was designed to inhibit the exchange of information among participants, as such exchanges could potentially introduce bias into the intervention effects if both groups were recruited from the same hospital.

Participants and Setting: The study participants consisted of 50 FCs of PWA. To be eligible for participation in the study, participants were required to meet specific criteria. These criteria

included being between the ages of 18 and 60, living with PWA throughout the study, having access to both the internet and a virtual space, and providing informed consent. The patients cared for by FCs had mild to moderate post-stroke acute aphasia according to the Language Screening Test (LAST) criteria.²¹ Individuals who self-reported psychological illness, vision or hearing impairment, or had prior experience in caring for a PWA were excluded from the study. Additionally, PWA who had a memory disorder and required surgery following to the stroke were not included. Participants were also given the option to withdraw from the study at their discretion or in the unfortunate event of the patient's death. The study was conducted within the neurology departments at Shariati and Imam Khomeini hospitals, both of which are affiliated with Tehran University of Medical Sciences, Tehran, Iran, and adhere to the same stroke patient care structure. In other words, both hospitals were supervised by Tehran University of Medical Sciences, and their treatment and care structures were similar. There was no discernible difference in patient care between Imam Khomeini Hospital and Shariati Hospital.

Moreover, authors carefully confirmed that treatment, rehabilitation, and discharge procedures for PWA were consistent across the two sites, minimizing systematic differences in patient care that could influence outcomes. Additionally, baseline demographic and clinical characteristics of FCs and PWA were collected and compared between groups, revealing no significant differences in key variables such as age, gender, aphasia severity, and caregiver relationship to the patient.

It is noteworthy that, in both research contexts, no specific measures were established for patients and FCs regarding aphasia during the hospitalization of patients. Furthermore, the

initiation of aphasia rehabilitation protocols was contingent upon referrals made by physicians to rehabilitation and speech therapy centers. Furthermore, it is noteworthy that none of the patients or FCs in this study had participated in any rehabilitation or speech therapy programs prior to the completion of the intervention.

Intervention: The intervention was implemented by authors through the following sequential steps:

Initially, educational content was sourced from databases and forums specifically focused on aphasia, the etiology and symptoms of aphasia, and strategies and resources for facilitating effective communication with patients diagnosed with aphasia. Key recommendations included engaging the patient in dialogue, employing a variety of communication methods and tools, practicing active listening and strategic pauses, maintaining a calm conversational flow, articulating language in a clear and simple manner, addressing the patient directly, utilizing closed-ended questions such as "yes" or "no", and allowing the patient periodic breaks during the interaction. Emphasis was placed on effective communication tools, including the use of blank paper for recording key terms, practical illustrations, flashcards, and images. FCs were also informed about the dos and don'ts of communicating with PWA (Table 1).

The materials were provided in various formats, including booklets, audio recordings, and videos. The instructional videos explained methods for verbal communication, the use of nonverbal cues, body language, and the integration of writing and visual aids to enhance communicative interactions. Before being made available, these materials were reviewed and approved by expert panel consisted of authors, two nurses, two neurologists, and speech therapists.

Table 1. The dos and don'ts of effective communication strategies imparted to family caregivers (FCs)

Ensure you have the person's attention before you begin.
Minimize or eliminate background noise (e.g., TV, radio, or other people).
Keep your voice at a natural level unless the person indicates otherwise.
Simplify your sentence structure and slow down your speech rate. Emphasize key words, and avoid speaking "down" to the person with aphasia.
Give them time to speak; do not complete their sentences or say the words they are trying to express.
Use drawings, gestures, writing, and facial expressions in addition to speech; employ a variety of communication methods.
Praise all attempts to speak and minimize errors; avoid insisting on perfect word usage.
Encourage independence and avoid being overprotective.
Attend therapy sessions when possible.
Include the person with aphasia in conversations.
Ask for and value the opinions of the person with aphasia on family matters.
Encourage the patient to communicate in any way, whether verbally, through gestures, pointing, or drawing.

In the second step, FCs in the intervention group (IG) received a comprehensive overview of the study's objectives and were asked to provide their contact information. They were then informed about the availability of online educational sessions, and were instructed on how to install and use Skype. Additionally, FCs were informed that the intervention would begin one week after their patients were discharged from the hospital.

In the third stage, online education was conducted through Skype sessions, where FCs received instruction and addressed their inquiries. Each of the FCs completed a minimum of four two-hour educational sessions within a month, with 2 to 6 FCs attending each session. The first two sessions covered the same content for all FCs, while the next two sessions were tailored to the specific type of aphasia observed in their PWA.

WhatsApp group was created for all participants of the IG to improve coordination and share information. In addition to providing educational materials through WhatsApp, FCs' questions about communication and aphasia were addressed, and were promptly attended to through online communication, and additional audio/video calls were arranged as needed for further clarification. The intervention was conducted over a duration of one month for each of the FCs. Figure 1 shows the steps of intervention.

The control group (CG) received only the routine interventions of the ward, which mainly focused on home care for patients and did not address the topic of communicating with PWA. It is important to note that routine interventions were identical for both the CG and IG. During the acute phase and throughout the hospitalization of patients, the focus was primarily on therapeutic interventions. No specific measures were

implemented for PWA during this period. After the acute phase, patients were referred to rehabilitation and speech therapy centers according to the physician's diagnosis.

Outcomes: The outcomes of this study were the communication effectiveness and CSE of FCs. These were measured using the Communicative Effectiveness Index (CETI) and Communication Self-Efficacy Scale (CSES).

Data Collection: Demographic information about FCs included items such as age, gender, marital status, education level, occupation, and relationship with the patient, as well as the presence of an underlying disease and experience of mental distress such as depression.

The patients' information, including their age, gender, and type of aphasia, was collected from their documentation in the ward. The type of aphasia was determined in consultation with the neurologist. This information was obtained at the beginning of the patients' admission to the hospital.

The severity of aphasia was evaluated using the LAST criterion, which was designed specifically for assessing patients with acute stroke. This criterion comprises two components: expression and receptive. It consists of 5 subtests and a total of 15 items. The expression index measures naming of pictures, repetition of sentences and words, and automatic speech (counting from 1 to 10). On the other hand, the receptive index evaluates recognition abilities through word-picture matching and verbal instructions. The expression index is scored on an 8-point scale, the receptive index on a 7-point scale, and the total score on a 15-point scale. Scores below 15 suggest the presence of a language impairment. The LAST is suitable for application in bedside assessments within acute care environments.^{21,22} The psychometric properties of this tool were assessed in Iran in 2020.²³

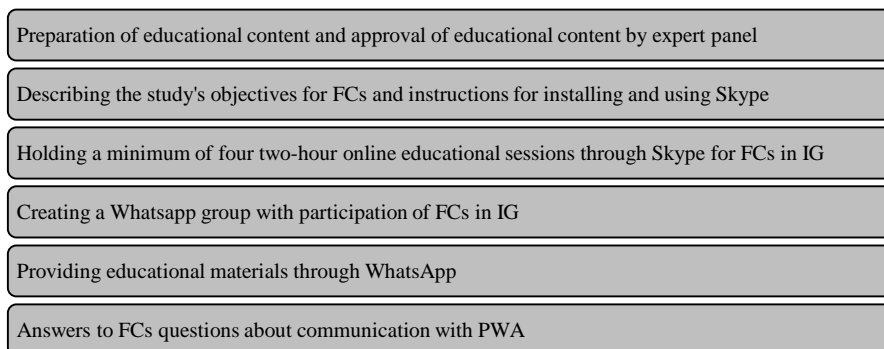


Figure 1. Steps of intervention

FCs: Family caregivers; PWA: Patients with post-stroke aphasia; IG: Intervention group

CETI, originally proposed by Lomas et al. in 1989, measures the effectiveness of communication. This index evaluates caregivers' ability to simplify communication with PWA and tracks changes over time. The index consists of 16 questions that assess caregivers' ability to assist PWA in different communication areas. Each question is rated on a 10 cm visual analog scale (VAS), ranging from "not at all" to "same as before the stroke". The minimum score for each question is 0, while the maximum score is 100. To calculate the mean score, the question scores are added up and divided by 16.⁹ The questionnaires were electronically prepared and distributed to FCs. They completed the questionnaires one week after the patients' discharge from the hospital prior to the commencement of the intervention, and subsequently following the completion of the intervention.

CSE refers to the confidence that FCs have in their ability to effectively communicate with PWA. It measures how competent individuals feel about their communication skills.¹² In this study, CSE was assessed using a questionnaire originally developed by Tatsumi et al. in Japan in 2012. The questionnaire was specifically designed to evaluate the CSE of caregivers of adults with aphasia and consisted of 16 questions. Respondents rated their answers on a scale from zero (indicating no confidence) to 10 (indicating complete confidence). The total score, ranging from 0 to 160, reflected the overall CSE, with higher scores indicating greater self-efficacy. The reliability of this instrument was assessed using Cronbach's alpha coefficient, resulting in a value of 0.938.⁸ In a study conducted in 2016, the questionnaire was administered, and its reliability was reported as satisfactory.⁵ FCs completed the questionnaire at two distinct time points: one week after the patients' discharge from the hospital, before the intervention began, and again after the intervention was completed.

CETI and CSES were translated using the forward and backward translation methods. Initially, two translators, who were fluent in both Persian and English, translated the English instrument into Farsi. After a thorough review by the researchers and subsequent confirmation, it was further translated back into English by another translator. The translated version was then compared to the original version to ensure the preservation of the original concepts. Subsequently, the questionnaires were distributed to ten academic faculty members, as well as specialists in neurology and speech therapy, for

validation. Once the validity was confirmed, the questionnaires' reliability was assessed. The reliability was calculated using Cronbach's alpha method, resulting in a reliability coefficient of 0.71 for CETI and 0.73 for CSES.

Sample Size: To determine the sample size, the effect size method proposed by Cohen²⁴ was employed. A large effect size was assumed. Accordingly, a minimum sample size of 21 participants per group was determined, taking into account an anticipated dropout rate of 25 FCs in each group [Effect size (ES) = 0.86, power = 80, α = 0.05].

Sampling and Randomization: Sampling was performed using a convenience sampling, whereby all FCs of PWA who satisfied the inclusion criteria were included in the study. In order to minimize potential sample contamination, FCs of PWA were assigned to the IG at Shariati Hospital, while those at Imam Khomeini Hospital were designated as the CG.

Blinding: In this study, the only person who was unaware of the assignment of samples to the IG and CG was the statistician.

The study involved analyzing both quantitative (continuous) and qualitative (categorical) variables. Independent t-tests and paired t-tests were used to compare the mean scores of the CETI and CSES before and after the intervention between the IG and CG. Additionally, chi-square tests were applied to examine associations between the two groups and their demographic characteristics. To identify potential risk factors associated with communication effectiveness and self-efficacy, multiple linear regression was performed using a backward elimination method. Variables such as caregiver education, hours spent caregiving, marital status, age, and health status were initially included based on previous research. Variables entered the model if their P-value was less than 0.05 and were removed if their P-value exceeded 0.1, allowing us to retain the most significant predictors. Missing data due to participant loss to follow-up (3 in the CG and 4 in the IG) were excluded from the analysis. All statistical analyses were conducted using SPSS software (version 20, IBM Corporation, Armonk, NY, USA) with a significance level set at 0.05.

Results

Participants Flow: From October 2021 to July 2022, a comprehensive assessment was conducted on a total of 61 FCs in order to ascertain their eligibility for inclusion in the study.

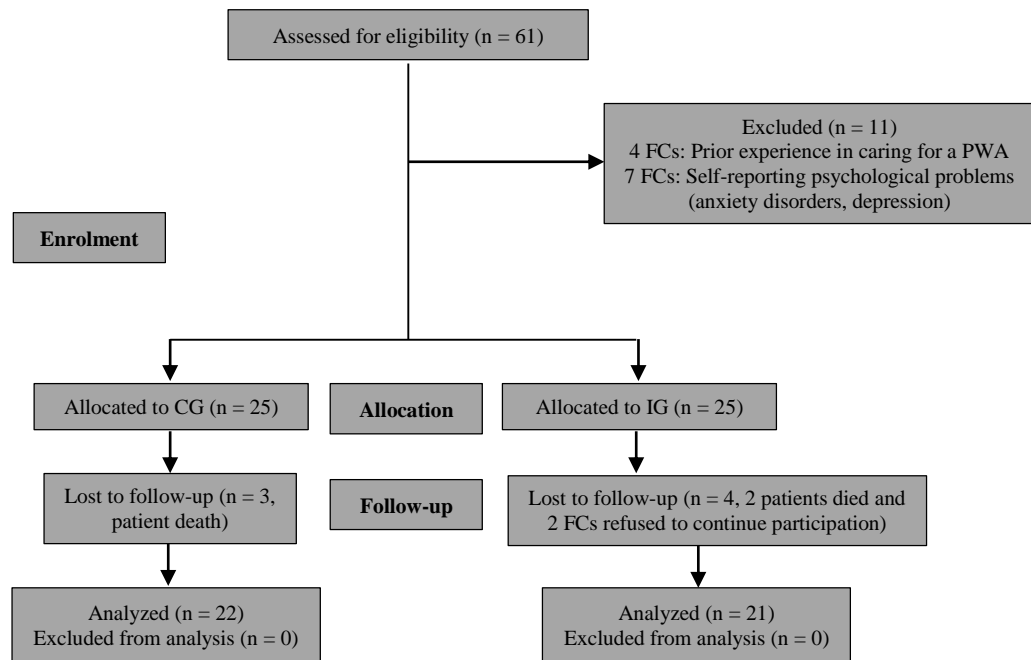


Figure 1. Consort flow diagram

FCs: Family caregivers; PWA: Patients with post-stroke aphasia; IG: Intervention group; CG: Control group

Throughout the study period, the researcher conducted visits to the designated study environment to enroll patients diagnosed with stroke who were admitted to the participating hospitals. Following a comprehensive review of the inclusion criteria, family members of these patients were also incorporated into the study if they met the inclusion criteria. However, after evaluation, it was determined that 11 of these FCs did not meet the specified criteria and were, therefore, excluded from the study. Consequently, a final sample of 50 FCs was included in the study, with 25 FCs assigned to the IG and an additional 25 FCs assigned to the CG (Figure 2).

Baseline Data: The mean age of PWA in the IG was 65.05 ± 12.50 , whereas in the CG, it was 65.32 ± 11.83 years ($P = 0.942$). Both the IG (90.5%) and CG (95.5%) exhibited a higher prevalence of ischemic stroke type ($P = 0.607$). The mean PWA' LAST score in the IG and CG was 10.81 ± 1.50 and 10.86 ± 1.55 , respectively ($P = 0.70$). The mean age of FCs in the IG was 40.38 ± 12.55 , as opposed to 41.00 ± 10.73 in the CG ($P = 0.863$). There was no statistically significant difference between the IG and CG concerning the basic variables (Table 2).

Outcomes: Initially, there was no statistically significant difference in the mean score of communication effectiveness between the IG and the CG ($P = 0.597$). However, after the online education program implementation, the mean score of communication effectiveness in the IG

(7.75 ± 0.47) was significantly higher compared to the CG (5.52 ± 0.53) ($P < 0.001$). Additionally, there was a statistically significant increase in communication effectiveness within both the IG and the CG when comparing scores before and after the intervention ($P < 0.001$). This suggests that there was an improvement in communication effectiveness in both groups (Table 3).

Before the intervention, there was no statistically significant difference between the IG and CG in terms of the mean score of CSE ($P = 0.666$). However, after the online education program implementation, the IG showed a higher mean score of CSE (137.57 ± 5.42) compared to the CG (102.68 ± 8.56) ($P < 0.001$). When comparing within each group, both the IG and CG exhibited a statistically significant difference in mean scores before and after the intervention ($P < 0.001$). It is important to note that the CSE score increased in both groups (Table 3).

By controlling (modifying/eliminating) the influence of other variables, it became evident that there was a significant difference in the mean score of communication effectiveness between the two groups. Specifically, the mean score of communication effectiveness in the IG was higher than in the CG ($P < 0.001$). It is also worth noting that married FCs tended to have a lower mean score of communication effectiveness compared to FCs whose spouse had died or they had got divorced ($P = 0.037$).

Table 2. Baseline demographics of patients with post-stroke aphasia (PWA) and family caregivers (FCs)

Variable	PWA			FCs			
	IG (n = 21)	CG (n = 22)	P	IG (n = 21)	CG (n = 22)	P	
Age* (year)	65.05 ± 12.50	65.32 ± 11.83	0.942	40.38 ± 12.55	41.00 ± 10.73	0.863	
LAST score*							
Gender**	Men	11 (52.4)	11 (50.0)	0.876	6 (28.6)	7 (31.8)	0.817
	Women	10 (47.6)	11 (50.0)		15 (71.4)	15 (68.2)	
Marital status**	Single	0 (0)	0 (0)	0.284	9 (42.9)	7 (31.8)	0.625
	Married	12 (57.1)	16 (72.7)		10 (47.6)	11 (50.0)	
	Death of a spouse or divorce	9 (42.9)	6 (27.3)		2 (9.5)	4 (18.2)	
Educational level**	Under diploma	8 (38.1)	11 (50.0)	0.730	-	-	0.897
	Diploma	8 (38.1)	7 (31.8)		12 (57.1)	13 (59.1)	
	Academic	5 (23.8)	4 (18.2)		9 (42.9)	9 (40.9)	
Type of stroke**	Ischemic	19 (90.5)	21 (95.5)	0.607	-	-	-
	Hemorrhagic	2 (9.5)	1 (4.5)		-	-	
Involved side of the brain**	Right	1 (4.8)	1 (4.5)	0.900	-	-	-
	Left	20 (95.2)	21 (95.5)		-	-	
Job**	Employee	-	-	-	8 (38.1)	7 (31.8)	0.828
	Housewife	-	-		8 (38.1)	8 (36.4)	
	Retired	-	-		5 (23.8)	7 (31.8)	
Relative to the patient**	Spouse/sibling	-	-	-	8 (38.1)	9 (40.9)	0.850
	Child/grandchild	-	-		13 (61.9)	13 (59.1)	
Underlying disease	Yes	-	-	-	9 (42.9)	9 (40.9)	0.897
	No	-	-		12 (57.1)	13 (59.1)	
Hours of patient care*	-	-	-	14.76 ± 5.39	16.32 ± 5.34	0.348	

Data are presented as mean ± standard deviation (SD) or number and percent.

*Independent t-tests; **Chi-square test

PWA: Patients with post-stroke aphasia; FCs: Family caregivers; LAST: Language Aphasia Screening Test; IG: Intervention group; CG: Control group

Table 3. Comparing outcomes between intervention group (IG) and control group (CG)

	IG	CG	P*
CETI			
Before	4.80 ± 0.65	4.70 ± 0.55	0.597
After	7.75 ± 0.47	5.52 ± 0.53	< 0.001
P**	< 0.001	< 0.001	
CSE			
Before	96.76 ± 12.15	95.31 ± 9.48	0.666
After	137.57 ± 5.42	102.68 ± 8.56	< 0.001
P**	< 0.001	< 0.001	

Data are presented as mean ± standard deviation (SD).

*Independent t-tests; **Paired t-tests

CETI: Communicative Effectiveness Index; CSE: Communication self-efficacy; IG: Intervention group; CG: Control group

Additionally, FCs whose patients did not have an underlying disease showed a higher mean communication effectiveness score compared to those whose patients had an underlying disease ($P = 0.032$). Furthermore, there was a noticeable and significant difference in the mean score of CSE between the IG and CG. Specifically, the mean score of CSE in the IG was higher than that in the CG ($P < 0.001$). As the LAST score increased, there was

an accompanying increase in CSE ($P = 0.04$) (Table 4).

Discussion

The results revealed that the online education program effectively improved communication effectiveness and CSE of FCs of PWA. A study found that caregiver educating significantly increased interactive communication between caregivers and PWA.¹⁶ Berry also reported that implementing a CPT aimed at enhancing knowledge and communication skills in adults improved understanding of effective communication strategies with PWA.¹⁹ Additionally, another study showed that training spouses of PWA improved communication quality and coping skills.¹⁵ Finally, a study exploring the benefits of caregiver education and training programs in enhancing communication between caregivers and PWA indicated that participating in training courses resulted in improved communication effectiveness, increased understanding of patients' conditions, greater knowledge of the disease, and enhanced confidence in caregivers' interactions with patients.²⁵

Table 4. Results of multiple linear regression on factors associated with communication effectiveness

Variable	Coefficients	SE	95% CI		P
			Lower	Upper	
CETI ^a					
CETI before	0.669	0.061	0.545	0.793	< 0.001
Group (CG vs. IG)	-2.111	0.073	-2.259	-1.962	< 0.001
Patient marriage (death of a spouse or divorce vs. married)	0.188	0.087	0.012	0.365	0.037
Underlying disease (No vs. Yes)	0.248	0.112	0.022	0.475	0.032
CSE ^b					
CSE before	0.506	0.065	0.375	0.637	< 0.001
Group (CG vs. IG)	-34.110	1.391	-36.927	-31.293	< 0.001
LAST score	0.976	0.460	0.045	1.907	0.040

^aDependent variable: CETI after; backward method in multiple linear regression

^bDependent variable: CSE after; backward method in multiple linear regression

CETI: Communicative Effectiveness Index; CSE: Communication self-efficacy; CI: Confidence interval; SE: Standard error; IG: Intervention group; CG: Control group; LAST: Language Aphasia Screening Test

Effective communication is closely tied to social relationships, emotional expression, and personal identity. When FCs can effectively communicate with PWA, it can help mitigate the negative effects of communication disorders on both patients and caregivers. Providing emotional, psychological, and financial support is important, but it is equally crucial for FCs of PWA to have comprehensive information on aphasia and effective communication strategies.²⁶ Implementing an educational program for FCs can enhance communication effectiveness, leading to improved safety, independence, and the overall quality of care.

The findings of the study indicate that the online education program positively impacted the CSE of FCs who cared for PWA. In a study conducted by Tatsumi et al., it was demonstrated that there was a significant improvement in mental well-being by enhancing CSE.⁵ It has been discovered that self-efficacy plays a role in various health outcomes. For instance, research suggests that increasing FCs' self-efficacy is associated with improved mental and physical health outcomes.²⁷ Hinckley and Packard argued that educating families of PWA could lead to enhanced social engagement for these patients.²⁸ A study conducted in Canada aimed to determine the impact of a group intervention program on quality of communication and coping skills of spouses of patients with primary progressive aphasia. The results of the study showed that this program led to an improvement in outcomes.¹⁵ In a study conducted in China, the benefits of education and group training of FCs in improving communication between FCs and PWA were assessed. The results demonstrated that

educational opportunities led to increased interactive communication, including the sending and receiving of messages.¹⁶ In another study investigating the effects of a CPT on the knowledge, ability to identify effective and ineffective communication strategies, and communication abilities of caregivers of aphasia sufferers, the researchers concluded that CPT might be effective in improving caregivers' ability to communicate with PWA.¹⁹

Based on the findings of this study, it is clear that using online educational programs can bring significant benefits to FCs of PWA, especially during critical situations like disease epidemics when FCs have a major role in patient care. Furthermore, implementing online education programs can lead to cost savings compared to in-person education. This includes expenses related to creating educational materials, organizing training sessions, and paying staff to facilitate classes. Additionally, this approach allows more FCs to receive training without having to physically go to the hospital, resulting in reduced expenses for both PWA and FCs.

The clinical significance of this study lies in its potential to enhance communication between family members and patients with stroke, which may positively impact the overall quality of care. Effective communication is essential for understanding patients' needs and concerns; thus, FCs can serve as empathetic intermediaries, bridging communication gaps with medical personnel to facilitate optimal treatment and care. This dynamic empowers patients to participate in care decisions, thereby enhancing their sense of satisfaction. Furthermore, improved communication is critical in promoting patient

safety. The cultivation of effective communication fosters emotional connections, alleviating feelings of loneliness and isolation among patients. The implications of these findings extend beyond the enhancement of patients' QOL; they may also contribute to an improved QOL for FCs.^{29,30}

Considering that effective communication can improve individual and social functioning, as well as the QOL for PWA, the online educational program can be applied in diverse situations, especially during crises or pandemics triggered by unknown diseases. By offering essential training to FCs and ensuring ongoing support after the patient's discharge, nurses can effectively enhance communication between patients and their FCs, ultimately benefiting the patients' overall well-being.

Limitations: This study was conducted using a small sample size and a small ES. We recommend that future research should involve larger and more diverse samples to validate these findings and to identify smaller, yet clinically significant effects. Additionally, the online education program was specifically implemented for FCs of people with mild to moderate acute post-stroke aphasia. In the future, research could explore conducting similar studies involving patients with chronic aphasia or severe aphasia to allow for a comparison of the results obtained in this study. Although randomization was not feasible, we implemented convenience sampling with hospital-based allocation to mitigate the risk of contamination. To address potential baseline imbalances, we conducted multiple linear regression analyses controlling for demographic and clinical factors, which substantiated the robustness of the intervention's effects on communication effectiveness and self-efficacy. While propensity score matching was not conducted due to sample size limitations, we acknowledge it as a valuable methodology for future studies involving larger cohorts. Another limitation

of this study is the lack of long-term follow-up on outcomes, such as evaluations at 3 months, 6 months, or 1 year post-intervention. Future research can explore the long-term effectiveness of the interventions assessed in this study.

Conclusion

The online education program has been proven to effectively enhance communication effectiveness and CSE in FCs dealing with PWA. One notable benefit of this method is its simplicity and accessibility, as FCs are not required to physically attend education sessions at the hospital. By involving hospitals and participating of nurses, neurologists, and speech therapist, this approach can be effectively utilized to provide educational services to FCs, leading to significant time and cost savings.

Conflict of Interests

The authors declare no conflict of interest in this study.

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