Received: 3 May 2021 | Revised: 9 October 2021 | Accepted: 21 October 2021

DOI: 10.1111/cts.13195

ARTICLE

Effects of nurse-led home-based telephone support or home visits on cognitive function

Nanqi Mao | **Fangyuan Xue** | **Wanyu Cai** | **Jiahong Li**

Department of Vascular Surgery, the First Hospital of Quanzhou Affiliated to Fujian Medical University, Quanzhou, Fujian, China

Correspondence
Jiahong Li, Department of Vascular Surgery, the First Hospital of Quanzhou Affiliated to Fujian Medical University, Quanzhou 362000, Fujian, China.
Email: Ljh950115@163.com

Funding information
No funding was received for this work.

Abstract

Patients who have undergone carotid revascularization surgery have a high risk of postoperative cognitive decline, and home-based care is the major form of postoperative management. Here, we aimed to compare the nurse-led home-based telephone support (NLHBTS) and home visits as additional postoperative care for patients who have undergone carotid revascularization surgery. The study recruited 172 patients, and 131 patients were randomly assigned to receive combined telephone support and home visits (intervention group) or home visits alone (control group) during the study period of 12 weeks. At baseline, 1 month, and 3 months, cognitive function was assessed using the Trail Making Test, Processing Speed Index, Boston Naming Test, Working Memory Index, Controlled Oral Word Association Test, and Hopkins Verbal Test. Sixty-five patients in the intervention group and 66 in the control group completed the 1-month treatment, and 49 in the intervention group and 48 in the control group completed the 3-month treatment. The intervention group showed significant improvement in four of the six cognitive tests after the 3-month treatment, whereas the control group only showed significant improvement in the Controlled Oral Word Association Test. Compared to the control group, significantly higher scores were achieved by the intervention group at 3 months in the Trail Making Tests (113 ± 23 vs. 128 ± 18, $p = 0.001$), Processing Speed Index (115 ± 15 vs. 108 ± 14, $p = 0.020$), Controlled Oral Word Association Test (51 ± 11 vs. 45 ± 9, $p = 0.004$), and Hopkins Verbal Learning Test (9.0 ± 1.6 vs. 8.3 ± 1.8, $p = 0.046$). NLHBTS, in combination with home visits, could facilitate the improvement of cognitive function in patients with carotid artery stenosis after surgery.

Study Highlights

WHAT IS THE CURRENT KNOWLEDGE ON THE TOPIC?

Management of stroke is one of the most significant healthcare costs of the society. Carotid artery stenosis (CAS) is one of the major risk factors for stroke.

WHAT QUESTION DID THIS STUDY ADDRESS?

The aim of this study was to conduct a randomized controlled trial to evaluate the effects of nurse-led home-based telephone support (NLHBTS) in comparison to

conventional home visits on improving the cognitive functions of patients with CAS after surgery.

WHAT DOES THIS STUDY ADD TO OUR KNOWLEDGE?

Integrating the NLHBTS in postoperative care of patients with CAS can facilitate the improvement of cognitive function, implicating the utility of this form of telehealth in management of patients with CAS.

HOW MIGHT THIS CHANGE CLINICAL PHARMACOLOGY OR TRANSLATIONAL SCIENCE?

The NLHBTS, in combination with home visits, could facilitate the improvement of cognitive function in patients with CAS after surgery and NLHBTS is worth of being adopted more frequently as a new strategy for postoperative care of patients with CAS.

INTRODUCTION

Management of stroke is one of the most significant social healthcare costs.[1] Carotid artery stenosis (CAS) is one of the major risk factors for stroke.[2] Two carotid revascularization surgeries (i.e., carotid stenting and prophylactic carotid endarterectomy), are frequently adopted in the management of patients with CAS to prevent stroke.[3] Unfortunately, patients with CAS are subject to progressive cognitive decline after surgery, presumably due to micro embolic ischemia and hypoperfusion during surgical dissection, intravascular instrumentation, clamping, or balloon dilation.[4] Close monitoring and continual care are needed to improve the cognitive function of these patients.

Because patients with CAS who received surgery are usually discharged from the hospital, home-based care has been the major form of postoperative support. Potential limitations of conventional home-based care (i.e., home visits), include inadequate frequency, which unavoidably leads to delayed diagnosis of cognitive decline, and massive cost associated with the visits.[5] Nurse-led home-based telephone support (NLHBTS), like many other telehealth programs, is a relatively new remote method for elderly care, which enables the remote exchange of data between medical professionals and elderly adults to facilitate early diagnosis and responsive support.[6] Some recent studies have shown significant benefits of telehealth programs in enhancing health outcomes and saving costs. For example, telehealth has been shown to improve medication compliance in elderly patients with mild dementia.[7] Telephone support has shown advantages in convenience, cost-saving, increased frequency, and standardization of care compared to standard home visits. This telehealth program has comparable, if not superior, efficacy compared to conventional management of many human diseases, such as diabetes, cancer, heart failure, etc.[8,9] However, whether NLHBTS can improve the cognitive function of patients with CAS after surgery and whether it can achieve similar or superior efficacy compared to conventional home visits have not been studied.

The aim of this study was to conduct a randomized controlled trial to evaluate the effects of NLHBTS in comparison to conventional home visits on improving the cognitive functions of patients with CAS after surgery. Here, we focused on providing psychological and emotional support to patients with CAS, as previous studies have shown that psychological and emotional well-being is important to the cognitive function of patients who underwent carotid revascularization surgeries.[10,11] NLHBTS and home visits were provided every other week and cognitive tests were performed at baseline, 1 month, and 3 months. The findings of the study could guide the use of NLHBTS as a new form of postoperative care to improve the cognitive function of patients with CAS.

METHODS

Patient recruitment and randomization

This study was approved by the Ethics Committee of the First Hospital of Quanzhou Affiliated with Fujian Medical University. Between March 2015 and March 2020, a total of 172 patients with CAS who were asymptomatic and underwent elective carotid revascularization surgeries, including carotid stenting and prophylactic carotid endarterectomy, were recruited and assessed for eligibility. Inclusion criteria were: (1) the presence of carotid stenosis diagnosed according to the European Carotid Surgery Trial stenosis evaluation criteria and had no prior neurologic symptoms; and (2) had no brain ischemic lesion based on diffusion-weighted magnetic resonance imaging (MRI). Patients who: (1) did not meet inclusion criteria; (2) were not interested in the study; (3) too busy to participate (defined as those who were not able to follow the

whole procedure due to time conflicts or other reasons but did not have the intention to withdraw), or (4) unable to commit after learning of the study (defined as those who voluntarily withdrew from the study for reasons such as not living in the same city or traveling away) were excluded. All patients who were included in the study provided written consent forms. Patients were randomized to the intervention group and control group using a sequence generated by a computer program.

Interventions

The intervention group received home visits at weeks 0, 4, 8, and 12 and telephone support at weeks 2, 6, and 10, whereas the control group received all home visits at weeks 0, 2, 4, 6, 8, 10, and 12. The contents and goals of each visit are listed in Table 1. The NLHBTS program was conducted by the telephone support program in collaboration with primary care teams that consisted of five nurses, who have master's degrees in nursing and were experienced in providing care for patients with CAS. The nurses conducting the intervention were trained by an experienced psychotherapist and passed the evaluation for NLHBTS. A leading nurse who has over 10 years of experience working in the Department of Neurology supervised and ensured completion of all telephone sessions and home visits. Each telephone session lasted for 1 h and the conversation was broadcasted on a speaker to patients. Data from a heart rate monitor, a sphygmomanometer, a scale, a thermometer, and a glucometer were also collected and transmitted to the primary care team. Data were then entered into the hospital's electronic health record. Home visits were performed in a face-to-face manner and all physical parameters were measured on site. Cognitive tests, including Trail Making Tests A and B, Processing Speed Index, Boston Naming Test, Working Memory Index, Controlled Oral Word Association Test, and Hopkins Verbal Learning Test, were performed at three time points: baseline (T0), 1 month (T1), and 3 months (T2). Our study used those six standardized cognitive tests to comprehensively assess the memory, linguistic skills, and motor function of the patients. These tests have been previously adopted to evaluate the cognitive function of patients with carotid stenosis and vascular diseases.[12] All tests were presented in Chinese and were properly translated. All measurements in the cognitive tests were translated to scores.

TABLE 1 Schedule, contents, and goals of each intervention for patients with CAS of both the intervention and control groups

Time	Contents	Goals
Week 0	• Face-to-face counseling with the patients. • Explain the training method and teach patients how to receive home follow-up monitoring services delivered using telephone support.	• Establish a trusting relationship. • Record information, including medication control, education, and general risks of patients. • Introduction to the program and aims of the study.
Week 2	• Identify the patient's thought patterns and negative feelings, and give the patient proper guidance. • Encouragement to pursue goals and information given if needed.	• Create a harmonious way of life to transfer the patient's focus from illness. • Help patients to build positive thoughts and self-perception.
Week 4	• Ask patients' thoughts and feelings about illness. • Collect information about cognitive functions.	• Relieve the patient's tension and psychological pressure.
Week 6	• Encourage patients to express their feelings about stressful experience. • Guide patients on accepting themselves, and developing a positive self-concept. • Guide patients on finding positive coping methods.	• Correction of perceptions regarding body image and the self-concept. • Improve problem-solving strategies, reinforcing physical, emotional, and spiritual coping strategies.
Week 8	• Understand difficulties regarding family relationships and finding positive solutions. • Encourage patients to express their thoughts and feelings.	• Relieve the patient's tension and psychological pressure.
Week 10	• Ask their thoughts and feelings, and give advice to release pressure. • Share experiences with other patients. • Help patients to develop their own strategies.	• Avoid the accumulation of anxiety, tension, and other negative emotions.
Week 12	• Encourage patients to reflect on their gains and losses from the treatment. • Emphasize on what to be cautious of at a later stage. • Close the program.	• Collect information. • Statistical analysis.

Trail making test

The Trail Making Test A and B[13] is a two-part test to evaluate motor speed/coordination and executive function. In Trail Making Test A, subjects were required to draw lines to connect randomly arranged numbered circles in consecutive order. In Trail Make Test B, the subjects were asked to connect randomly arranged lettered and numbered circles using alternating order (1, A, 2, B, 3, C, etc.). The subjects were urged to complete the test as fast as possible without lifting the pencil from the paper and the scores were recorded as the total time used to complete the test.

Processing Speed Index

The Processing Speed Index[14] was used to measure psychomotor speed using Digital Symbol Coding, in which subjects were asked to copy and match symbols to numbers, and Symbol Search test, in which subjects were required to determine if a given target was present by assessing a series of stimuli. The number of tests completed by the subjects in 2 min was recorded and used as the score.

Boston Naming Test

The Boston Naming Test[15] was used to assess the linguistic capability to name pictured objects. The test consisted of 60 objects of increasing difficulty. The subjects were asked to name the object on the presented card with or without two prompting cues. The score of the test was the total number of correct answers without cues.

Working Memory Index

The Working Memory Index[16] was composed of the Spatial Span Test and the Letter-Numbering Sequencing Test to evaluate working memory/concentration. The Spatial Span Test required the subject to align a series of blocks in the same order as the examiner did and subsequently reversed the order. In the Letter-Number Sequencing Test, the subject was required to repeat a series of random numbers and letters in ascending value and alphabetical order. The score was given based on the difficulty of the test that the subject completed.

Controlled Oral Word Association Test

The Controlled Oral Word Association Test,[17] which consisted of three trials, examined verbal fluency using word production tests. In each 1-min trial, subjects were required to produce words beginning with a given letter and the test score was the sum of all acceptable words.

Hopkins Verbal Learning Test

The Hopkin Verbal Learning Test[18] assessed a subject's ability to recall a list of words after a delay. A 12-word list of three semantic categories was shown to the subjects, who were then asked to recall as many words as possible after a delay of 20 mins.

Statistical analysis

Data were presented as mean (SD). The SPSS version 17.0 (SPSS Inc., USA) was used to perform all data analysis. Our study followed the per-protocol analysis as only the participants who finished the whole study were included in the statistical analysis. The chi-square test was used to assess baseline data, such as demographic and general risks. The Student's *t*-test was used to compare test scores between the intervention group and the control group, as well as T1 versus T0 and T2 versus T0, respectively. The *p* values (2-sided) of less than 0.025 were considered statistically significant.

RESULTS

This design and process of the study are illustrated in Figure 1. A total of 172 patients with CAS who underwent surgery were recruited in the study. After excluding ineligible patients, 131 patients were randomly assigned to the intervention group ($n = 65$) and the control group ($n = 66$). The intervention group received home visits at weeks 0, 4, 8, and 12 and telephone support at weeks 2, 6, and 10. The control group received home visits at weeks 0, 2, 4, 6, 8, 10, and 12. The contents and goals of each home visit and telephone support session are shown in Table 1. Both home visits and telephone support were provided to improve the psychological and emotional conditions of the patients, meanwhile providing guidance on physical recovery. Cognitive tests were performed at baseline (T0), 1 month (T1), and 3 months (T2) after surgery. Ten and nine patients in the intervention and control groups, respectively, withdrew at T1. Six and nine patients in the intervention and control groups, respectively, withdrew at T2.

The demographic and clinical characteristics of the two treatment groups at baseline are shown in Table 2. The mean ages of the intervention and the control group were

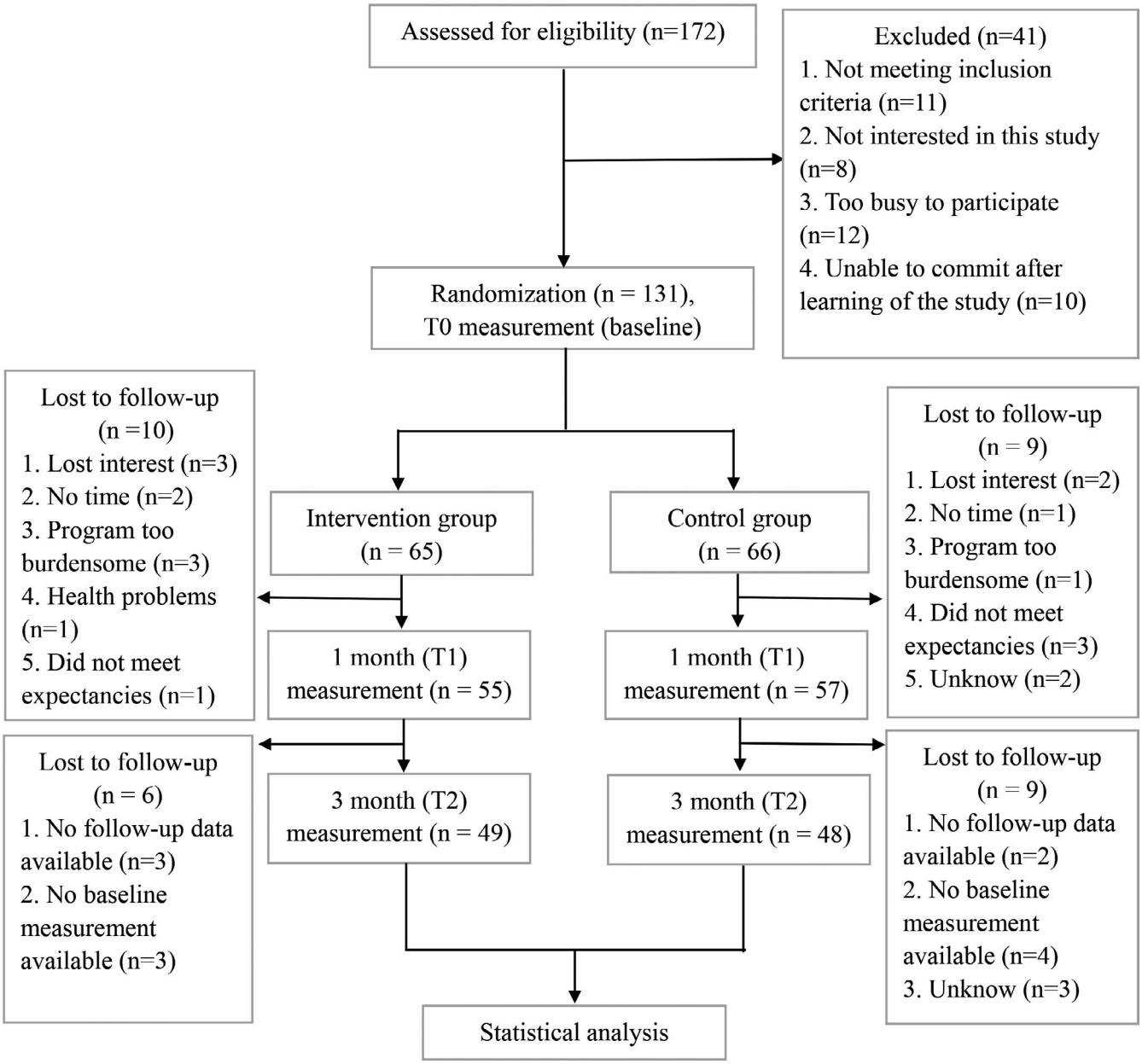

FIGURE 1 Flow diagram of the study

73 ± 8.9 and 68 ± 7.6 years ($p = 0.475$), respectively. There were 64.27% of the patients in the intervention group and 70.84% of the patients in the control group that were men. Most of the patients had an educational level of middle or high school (65.31% of the intervention group and 60.42% of the control group). Among all general risks of neurologic disorder, hypertension (83.67% in the intervention group and 81.25% in the control group), and hyperlipidemia (77.55% in the intervention group and 83.33 in the control group) accounted for the two major risk factors. No characteristics were significantly different between the two groups (Table 2).

Cognitive tests were performed using the Trail Making Test, Processing Speed Index, Boston Naming Test, Working Memory Index, Controlled Oral Word Association Test, and Hopkins Verbal Learning Test at T0, T1, and T2. As shown in Table 3, the intervention group demonstrated significant improvement at T1 and T2 (vs. T0 $p = 0.020$ and 0.002, respectively) in Processing Speed Index, T1 and T2 (vs. T0, $p = 0.050$ and 0.003, respectively) in the Working Memory Index, T1 and T2 in the Controlled Oral Word Association Test (vs. T0, $p = 0.008$ and <0.001, respectively), and T2 in the Hopkins Verbal Learning Test (vs. T0, $p = 0.002$). In contrast, the control group only showed significant improvement in the Controlled Oral Word Association Test (vs. T0, $p = 0.03$). In addition, pronouncedly higher scores were observed in the intervention group in Trail

TABLE 2 Demographic and clinical characteristics in the two treatment groups

	Intervention group ($n = 49$)	Control group ($n = 48$)	p value
Demographic characteristics			
Age, years, mean (SD)	73 (8.9)	68 (7.6)	0.475
Gender, *n* (%)			0.428
Male	31(63.27)	34 (70.83)	
Female	18 (36.73)	14 (29.17)	
Educational level, *n* (%)			0.618
Middle or high school	32 (65.31)	29 (60.42)	
≥College	17 (34.69)	19 (39.58)	
General risks, *n* (%)			
History of smoking	21 (42.86)	23 (47.92)	0.617
Hypertension	41 (83.67)	39 (81.25)	0.754
Hyperlipidemia	38 (77.55)	40 (83.33)	0.473
Atrial fibrillation	2 (4.08)	2 (4.17)	0.983
Diabetes	10 (20.41)	12 (25.00)	0.589
Obesity	9 (18.37)	10 (20.83)	0.760
PVD	14 (28.57)	12 (25.00)	0.691
COPD	5 (10.20)	5 (10.42)	0.973
Contralateral occlusion	1 (2.04)	4 (8.33)	0.161

Note: Data were shown as *n* (%) or mean (SD).

Abbreviations: COPD, chronic obstructive pulmonary disease; PVD, peripheral vascular disease.

Making Test at T2 (113 vs. 128, $p = 0.001$), Processing Speed Index at T1 (113 vs. 106, $p = 0.05$) and T2 (115 vs. 108, $p = 0.02$), Controlled Oral Word Association Test at T2 (51 vs. 45, $p = 0.004$), and the Hopkins Verbal Learning Test at T2 (9 vs. 8.3, $p = 0.046$).

DISCUSSION

With the growing elderly population, society and healthcare systems are faced with mounting challenges to provide effective intervention and care to support the quality of life of the elderly. Preventative home visits have been studied for decades to improve the physical, cognitive, and emotional functions of the elderly.[19,20] The management of chronic conditions requires complex and lengthy care. The present study investigates NLHBTS as an alternative form of care for patients with CAS after surgery, focusing on the efficacy of NLHBTS in improving the cognitive function of patients using conventional home visits as a control. Our study is based on the established notion that CAS and carotid revascularization surgeries are prominent risk factors for cognitive dysfunction.[10] However, knowledge on the optimal postoperative care to enhance the clinical outcome of CAS treatment is still limited.

Consistent with many previous studies, we also showed that home visits could improve the cognitive function of patients, although the effect was quite limited over a period of 1–3 months (significant improvement of test score was only seen in the Controlled Oral Word Associate Test). Because previous studies have reported that patients with CAS who underwent surgery would likely show a decline in cognitive function,[21] the cognitive improvement by home visits was presumably attributable to psychological and emotional support provided by home visits. Comparatively, the intervention group, which received both NLHBTS and home visits, showed significant improvement in four of the six tests in the study, clearly indicating the benefit of this form of intervention in improving the cognitive function of patients with CAS. In our study, the tests in which the intervention group did not show improvement were the Trail Making Test and the Boston Naming Test. Interestingly, a previous study also showed that carotid revascularization surgeries did not result in significant changes in the scores of the Boston Naming Test.[12]

The success of this NLHBTS-home visit combined intervention is likely attributed to several reasons. First, the telephone-based support team consisted of uniformly trained professionals and the intervention was delivered as standardized as possible by multiple team members. Therefore, the contents were likely easier to deliver, and goals were better achieved in each visit. However, home visits were delivered by only one nurse for each patient. Second, telephone-based visits might be less stressful for elderly patients.

TABLE 3 Change in cognitive functioning between intervention group and control group

		Research group			
		Intervention group ($n = 49$)	**Control group ($n = 48$)**	***p* value**	**Effect size**
Trail Making Test A and B	Baseline (T0)	120 (18)	125 (22)	0.224	0.23
	1 month (T1)	116 (21)	122 (26)	0.215	0.23
	3 months (T2)	113 (23)	128 (18)	0.001*	0.83
	p value (T0 and T1)	0.314	0.543		
	p value (T0 and T2)	0.097	0.467		
Processing Speed Index	Baseline (T0)	106 (13)	107 (8)	0.649	0.13
	1 month (T1)	113 (16)	106 (18)	0.050	0.39
	3 months (T2)	115 (15)	108 (14)	0.020*	0.5
	p value (T0 and T1)	0.020*	0.726		
	p value (T0 and T2)	0.002*	0.669		
Boston Naming Test	Baseline (T0)	52 (8)	53 (9)	0.565	0.11
	1 month (T1)	53 (7)	54 (6)	0.452	0.17
	3 months (T2)	55 (8)	56 (10)	0.588	0.1
	p value (T0 and T1)	0.512	0.524		
	p value (T0 and T2)	0.067	0.126		
Working Memory Index	Baseline (T0)	101 (12)	104 (15)	0.280	0.2
	1 month (T1)	106 (13)	105 (12)	0.694	0.08
	3 months (T2)	108 (11)	105 (10)	0.163	0.3
	p value (T0 and T1)	0.050	0.719		
	p value (T0 and T2)	0.003*	0.702		
Controlled Oral Word Association Test	Baseline (T0)	40 (8)	41 (9)	0.565	0.11
	1 month (T1)	45 (10)	43 (11)	0.352	0.18
	3 months (T2)	51 (11)	45 (9)	0.004*	0.67
	p value (T0 and T1)	0.008*	0.332		
	p value (T0 and T2)	<0.001*	0.030		
Hopkins Verbal Learning Test	Baseline (T0)	7.9 (1.8)	8.1 (1.7)	0.575	0.12
	1 month (T1)	8.3 (2.0)	8.2 (1.9)	0.801	0.05
	3 months (T2)	9.0 (1.6)	8.3 (1.8)	0.046	0.39
	p value (T0 and T1)	0.301	0.786		
	p value (T0 and T2)	0.002*	0.577		

Note: Data were shown as mean (SD).

Abbreviations: COPD, chronic obstructive pulmonary disease; PVD, peripheral vascular disease.

*Indicates statistically significant *p* values.

We have included many in-home visits in both the intervention and control groups, as the in-home visit is the major established form of supportive care that we have for patients with CAS. The lack of negative control, in which patients received no home visits or NLHBTS, could be a confounding factor in our study. We designed the study to at least provide sufficient care in adherence to our previous protocol, meanwhile testing if NLHBTS would have added benefits in improving the cognitive function of patients. Another limitation of our study is that we were unable to blind the patients of the study and caregivers due to the nature of this study. In addition, we did not take concomitant medications into consideration in this study. Moreover, we did not estimate sample size before carrying out the study and because of limited sample size, the present study was intended to examine the feasibility of a new form of supportive care (i.e., NLHBTS), in improving the cognitive function of patients with CAS, and a larger-scale study is warranted. Our study was also limited by only performing a comparison between T1 or T2 versus T0, but potentially multiple-group

comparisons could be performed. Currently, in China, where the study was conducted, there is not a certification system for NLHBTS in place. However, it can be expected that the findings of the current study could have a higher impact if certified personnel adopt our approach to ensure the delivery of consistent services. Based on the promising effects of the intervention in improving cognitive function, it is important to investigate if a longer intervention would be beneficial. Additionally, we only focused on psychological and emotional support in our study, and other support (e.g., guidance on physical exercise), might also be beneficial. Due to the limited sample size, our study could serve as a pilot study for a larger-scale study to investigate the benefit of NLHBTS in improving the cognitive function of patients with CAS with increased statistical power.

CONCLUSIONS

In conclusion, our study showed that integrating the NLHBTS in the postoperative care of patients with CAS can facilitate the improvement of cognitive function, supporting the utility of this form of telehealth in the management of patients with CAS.

CONFLICT OF INTERESTS

The authors declare no competing interests for this work.

AUTHOR CONTRIBUTIONS

All authors wrote the manuscript. N.M. and J.L. designed the research. All authors performed the research. All authors analyzed the data.

REFERENCES

1. Kunz WG, Hunink MGM, Sommer WH, et al. Cost-effectiveness of endovascular stroke therapy: a patient subgroup analysis from a US healthcare perspective. *Stroke*. 2016;47:2797-2804.
2. Lehtola H, Airaksinen KEJ, Hartikainen P, et al. Stroke recurrence in patients with atrial fibrillation: concomitant carotid artery stenosis doubles the risk. *Eur J Neurol*. 2017;24:719-725.
3. Naylor AR. Which patients with asymptomatic carotid stenosis benefit from revascularization? *Curr Opin Neurol*. 2017;30(1):15-21.
4. Capoccia L, Sbarigia E, Rizzo A, Mansour W, Speziale F. Silent stroke and cognitive decline in asymptomatic carotid stenosis revascularization. *Vascular*. 2012;20:181-187.
5. Michaud TL, Zhou J, McCarthy MA, Siahpush M, Su D. Costs of home-based telemedicine programs: a systematic review. *Int J Technol Assess Health Care*. 2018;34:410-418.
6. Rai M, Sharma KK, Seth S, Pathak P. A randomized controlled trial to assess effectiveness of a nurse-led home-based heart failure management program. *J Pract Cardiovascular Sci*. 2017;3:28.
7. Al-Azzawie HF, Alhamdani M-S. Hypoglycemic and antioxidant effect of oleuropein in alloxan-diabetic rabbits. *Life Sci*. 2006;78:1371-1377.
8. Hanlon P, Daines L, Campbell C, McKinstry B, Weller D, Pinnock H. Telehealth interventions to support self-management of long-term conditions: a systematic metareview of diabetes, heart failure, asthma, chronic obstructive pulmonary disease, and cancer. *J Med Internet Res*. 2017;19:e172.
9. Larson JL, Rosen AB, Wilson FA. The effect of telehealth interventions on quality of life of cancer patients: a systematic review and meta-analysis. *Telemed J e-Health*. 2018;24:397-405.
10. Berman L, Pietrzak RH, Mayes L. Neurocognitive changes after carotid revascularization: a review of the current literature. *J Psychosom Res*. 2007;63:599-612.
11. Norkienė I, Samalavičius R, Ivaškevičius J, Budrys V, Paulauskiene K. Asymptomatic carotid artery stenosis and cognitive outcomes after coronary artery bypass grafting. *Scandinavian Cardiovascular J*. 2011;45:169-173.
12. Lal BK, Younes M, Cruz G, Kapadia I, Jamil Z, Pappas PJ. Cognitive changes after surgery vs stenting for carotid artery stenosis. *J Vasc Surg*. 2011;54:691-698.
13. Tombaugh T. Trail making test A and B: normative data stratified by age and education. *Archives Clin Neuropsychol*. 2004;19:203-214.
14. Oliveras-Rentas RE, Kenworthy L, Roberson RB, Martin A, Wallace GL. WISC-IV profile in high-functioning autism spectrum disorders: impaired processing speed is associated with increased autism communication symptoms and decreased adaptive communication abilities. *J Autism Dev Disord*. 2012;42:655-664.
15. Mack WJ, Freed DM, Williams BW, Henderson VW. Boston Naming Test: shortened versions for use in Alzheimer's disease. *J Gerontol*. 1992;47:P154-P158.
16. Haatveit BC, Sundet K, Hugdahl K, Ueland T, Melle I. The validity of d prime as a working memory index: results from the "Bergen n-back task". *J Clin Exp Neuropsychol*. 2010;32:871-880.
17. Ross TP. The reliability of cluster and switch scores for the Controlled Oral Word Association Test. *Arch Clin Neuropsychol*. 2003;18:153-164.
18. Benedict RHB, Schretlen D, Groninger L, Brandt J. Hopkins verbal learning test–revised: normative data and analysis of inter-form and test-retest reliability. *Clin Neuropsychol*. 1998;12:43-55.
19. Seiger Cronfalk B, Fjell A, Carstens N, et al. Health team for the elderly: a feasibility study for preventive home visits. *Primary Health Care Res Dev*. 2017;18:242-252.
20. Liimatta H, Lampela P, Laitinen-Parkkonen P, Pitkala KH. Effects of preventive home visits on older people's use and costs of health care services: a systematic review. *Eur Geriatric Med*. 2016;7:571-580.
21. Takaiwa A, Hayashi N, Kuwayama N, Akioka N, Kubo M, Endo S. Changes in cognitive function during the 1-year period following endarterectomy and stenting of patients with high-grade carotid artery stenosis. *Acta Neurochir*. 2009;151:1593-1600.

How to cite this article: Mao N, Xue F, Cai W, Li J. Effects of nurse-led home-based telephone support or home visits on cognitive function. *Clin Transl Sci*. 2022;15:741–748. doi:10.1111/cts.13195