

CLINICAL AND POPULATION SCIENCES

Factors Associated With Participation in the Chronic Disease Self-Management Program

Findings From the SUCCEED Trial

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BACKGROUND AND PURPOSE: Self-management programs may improve quality of life and self-efficacy for stroke survivors, but participation is low. In a randomized controlled trial of a complex, multidisciplinary, team-based secondary stroke prevention intervention, we offered participants Chronic Disease Self-Management Program (CDSMP) workshops in addition to clinic visits and home visits. To enhance participation, workshops were facilitated by community health workers who were culturally and linguistically concordant with most participants and scheduled CDSMP sessions at convenient venues and times. Over time, we implemented additional strategies such as free transportation and financial incentives. In this study, we aimed to determine factors associated with CDSMP participation and attendance.

METHODS: From 2014 to 2018, 18 CDSMP workshop series were offered to 241 English and Spanish-speaking individuals (age ≥ 40 years) with recent stroke or transient ischemic attack. Zero-inflated Poisson regression was used to identify factors associated with participation and attendance (ie, number of sessions attended) in CDSMP. Missing values were imputed using multiple imputation methods.

RESULTS: Nearly one-third (29%) of intervention subjects participated in CDSMP. Moderate disability and more clinic/home visits were associated with participation. Participants with higher numbers of clinic and home visits (incidence rate ratio [IRR], 1.06 [95% CI, 1.01–1.12]), severe (IRR, 2.34 [95% CI, 1.65–3.31]), and moderately severe disability (IRR, 1.55 [95% CI, 1.07–2.23]), and who enrolled later in the study (IRR, 1.12 [95% CI, 1.08–1.16]) attended more sessions. Individuals with higher chaos scores attended fewer sessions (IRR, 0.97 [95% CI, 0.95–0.99]).

CONCLUSIONS: Less than one-third of subjects enrolled in the SUCCEED (Secondary Stroke Prevention by Uniting Community and Chronic Care Model Teams Early to End Disparities) intervention participated in CDSMP; however, participation improved as transportation and financial barriers were addressed. Strategies to address social determinants of health contributing to chaos and engage individuals in healthcare may facilitate attendance.

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Key Words: quality of life ■ secondary prevention ■ self-efficacy ■ self-management

Hypertension, smoking, abdominal obesity, poor diet, and low physical activity account for $>80\%$ of stroke risk.¹ Few stroke survivors, however, successfully

control these risk factors, and their risk for stroke recurrence remains high.² A significant barrier to stroke risk factor control is behavior change, which is complicated

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Nonstandard Abbreviations and Acronyms

CHW	community health worker
CDSMP	Chronic Disease Self-Management Program
PRAISE	Prevent Recurrence of All Inner-City Strokes Through Education
SUCCEED	Secondary Stroke Prevention by Uniting Community and Chronic Care Model Teams Early to End Disparities
SUSTAIN	Systemic Use of Stroke Averting Interventions

by physical and cognitive challenges in stroke survivors.³ People of low socioeconomic status and minority populations often face additional barriers such as low health literacy, unsafe neighborhoods limiting options for physical activity, food insecurity, inadequate transportation, and poor access to care and preventive services.⁴

We previously conducted the SUSTAIN study (Systemic Use of Stroke Averting Interventions), a randomized control trial that used a chronic care model approach to improve blood pressure control among mostly minority stroke survivors in a safety-net setting.⁵ The SUSTAIN study included clinic visits and group education sessions in the healthcare setting. However, few participants attended the group education sessions, and clinic visits did not provide sufficient time to address lifestyle change. The SUCCEED (Secondary Stroke Prevention by Uniting Community and Chronic Care Model Teams Early to End Disparities) intervention built upon SUSTAIN, by adding a community component that included home visits and Chronic Disease Self-Management Program (CDSMP) workshops.⁶

Self-management programs, such as CDSMP, are intended to educate and empower individuals to address the medical, physical, emotional, and relational challenges to behavior change.^{7,8} CDSMP uses face-to-face, peer-led, small group sessions over a 6-week period. Although CDSMP has been applied to and adapted for stroke survivors, participation is low, and little is known about predictors of participation in CDSMP.^{9,10} In this analysis, we aimed to determine factors associated with participation and attendance in CDSMP among enrollees in the intervention arm of the SUCCEED trial.

METHODS

Setting

The SUCCEED randomized controlled trial tested the efficacy of a complex, multidisciplinary, team-based intervention to improve vascular risk factor control after stroke in a safety-net setting. Subjects (n=487) were recruited from 5 sites in Los Angeles County: Rancho Los Amigos National Rehabilitation Center; Harbor–University of California, Los Angeles Medical

Center; Los Angeles County–University of Southern California Medical Center; Olive View–University of California, Los Angeles Medical Center; and Cedars-Sinai Medical Center (residents of Centinela Valley only). The study was registered at Clinicaltrials.gov, and results were posted on November 26, 2019. Subjects were eligible if they had a recent (<90 days) transient ischemic attack, ischemic stroke, or intracerebral hemorrhage, hypertension, were English- or Spanish-speaking, and were at least 40 years old. Individuals were excluded if they could not consent. Complete details of the SUCCEED study design have been published previously.⁶ In brief, intervention participants were offered at least 3 home visits by a community health worker (CHW), 3 clinic visits with an advanced practice provider, and the opportunity to participate in CDSMP. The advanced practice providers and CHWs addressed self-management skills, medication adherence, individual risk factor control (eg, blood pressure, dyslipidemia, diabetes mellitus, physical activity, diet, smoking), depression and social isolation, and social determinants of health. The CHWs, bridging communities and health systems, helped participants navigate the health system, linked participants to appropriate resources addressing social and behavioral determinants of health, and coached them on self-management skills and lifestyle change. If eligible, participants were enrolled in Los Angeles County's Coordinated Paratransit Plan (Access), which provides paratransit services to persons with disabilities. Access is a shared ride curb-to-curb service that operates seven days a week, 24 hours a day. Fares do not exceed \$3.50 for a 1-way trip, and personal care attendants ride for free.¹¹

Chronic Disease Self-Management Program

CDSMP is a community-based, peer-led patient self-management education workshop grounded in self-efficacy theory.⁷ The workshops are standardized and scripted, have been tested and validated in numerous patient populations, and are culturally tailored and translated into multiple languages. The workshops consist of 6 weekly 2.5 hour group sessions led by 2 trained peer leaders. Topics covered include exercise; use of cognitive symptom management techniques; nutrition, fatigue, pain, and sleep management; use of community resources; use of medications; dealing with fear, anger and depression; communication with others including health professionals; problem-solving; and decision-making.⁸ Participants in the workshops receive a book, *Living a Healthy Life with Chronic Conditions* or *Tomando Control de su Salud* and an audio relaxation CD, *Relaxation for Mind and Body*.

CHWs were chosen from a competitive process. First, 3 community organizations, the Los Angeles Healthcare Workforce Development Program/Worker Education and Resource Center, Esperanza Community Housing Corporation, and Watts Labor Community Action Committee advertised the opportunity for CHWs and community members to receive training in CDSMP. We selected bilingual (English- and Spanish-speaking) individuals to complete a 36-hour training workshop for CDSMP conducted by certified Master Trainers. It was critical for potential CHWs to speak Spanish given our safety-net system's demographic (≈two-thirds are Hispanic and speak Spanish at home). Few men volunteered for the training. Second, we invited graduates of the CDSMP training to participate in an 80-hour training on SUCCEED-specific topics,

including stroke and vascular risk factors. We selected the final CHWs from the second phase of training. Those who were selected and accepted the positions were Hispanic women.

Eighteen CDSMP workshop series were held between September 2014 and April 2018; 12 were held in Spanish and 6 in English. In this trial, an optional seventh session was offered to review material. Each CDSMP workshop was facilitated by 2 CHWs. Attendance at 4 or more sessions of the series was necessary to graduate from CDSMP. Subjects were allowed to attend sessions at multiple CDSMP series if desired.

Subjects and Recruitment

Institutional Review Board approvals were obtained at University of California, Los Angeles (University of California, Los Angeles; 12-001622) and at each of the 5 sites (or through reliance agreements with University of California, Los Angeles). All participants provided written informed consent. After baseline data collection, eligible participants were randomized 1:1 to control versus intervention, stratified by site, stroke type (transient ischemic attack/ischemic versus hemorrhagic), language (English versus Spanish), and study site. All 241 subjects randomized to the intervention arm of SUCCEED were invited to participate in CDSMP. Invitations were mailed, and subjects with at least one home visit were verbally invited by a CHW. The advanced practice providers encouraged subjects to participate during clinic visits.

Several strategies were used to facilitate participation. Workshops were offered at clinic sites and community venues close to the participants' homes. Additional factors taken into account when selecting venues included proximity to bus routes, parking, handicapped accessibility, and additional amenities (eg, library that could be used by participants' children). Workshops were scheduled around participants' schedules, though all workshops were held during normal working hours. During the course of the SUCCEED trial, several additional strategies were added to boost participation. Raffle prizes were offered during CDSMP sessions starting in April 2015, and participants were eligible for entry in the raffle after attending four sessions.

Although the SUCCEED trial included 80 hours of formalized training in addition to the 36 hours of CDSMP training and a CHW manual, we determined over the course of the trial that a formalized process was needed to plan the CDSMP workshops (eg, when, how, and how often to approach SUCCEED participants, lists of potential venues, when to book the venue, how often to remind participants of sessions, etc). A CDSMP planning manual was, therefore, developed for the CHWs in September 2015 to standardize the process of planning CDSMP workshops. Free transportation was offered to participants beginning in June 2016.

Bivariate Analyses

For this analysis, all SUCCEED subjects randomized to the intervention arm were classified as either participants (≥ 1 session) or nonparticipants (0 sessions) in CDSMP. Participants and nonparticipants were compared across a range of study variables (study site, assigned CHW, number of clinic and home visits, type of stroke), demographics (age, sex, race, ethnicity, primary language spoken, frequency of speaking English at home, place of birth, education level, living situation, employment status at 3 months poststroke, marital status, insurance

status), medical factors (National Institutes of Health Stroke Scale, modified Rankin Scale), and psychosocial factors (competing needs,^{5,12} life chaos,¹³ social support,¹⁴ Patient Health Questionnaire-9¹⁵). The competing needs scale was adapted from prior studies and included 8 yes/no questions (Appendix A in the [Data Supplement](#)).^{5,12} A variable representing the number of competing needs present was calculated by adding the number of yes responses. The life chaos scale, a 6-item scale, was designed to assess people's ability to plan for the future and level of life instability and was initially validated in an HIV-positive population in Los Angeles County.¹³ Subjects responded on a scale of 1 to 5 for each question, and a composite score between 6 (least chaos) and 30 (most chaos) was obtained. Social support was measured using an 8-item social support scale (Appendix C in the [Data Supplement](#)).¹⁴ Subjects responded on a scale of 1 to 5 and a composite score between 8 (least support) and 40 (most support) was obtained.

The *t* tests were used to compare continuous variables and χ^2 test for categorical variables. Fisher exact tests were used instead whenever the expected cell sizes were small. All statistical analyses were performed using SAS 9.4 statistical software (SAS Institute Inc, Cary, NC).

Multivariable Analysis

To select variables for the multivariable analysis, we selected factors that were significant on bivariate analysis, were hypothesized by the CHWs and advanced practice providers to be important, had a theoretical impact on participation based on the literature, and did not have a large number of missing values. Employment status was not included as a significant number of values were missing (nonparticipant $n=26$), and unemployment was significantly correlated with greater disability. The final model consisted of 7 variables (marital status, language, life chaos, level of education, number of home/clinic visits, disability [modified Rankin Scale], and date of enrollment in the study). Missing values were imputed using fully conditional specification multiple imputation repeated over 10 data sets. We then ran 4 models: logistic regression, Poisson, zero-inflated Poisson, and zero-inflated negative binomial. Based on the fit statistic, the Akaike Information Criterion, and leveraging both the participation and attendance data, the zero-inflated Poisson model out-performed the nonzero-inflated Poisson model. The negative binomial models produced similar results to the Poisson models. As the majority of SUCCEED subjects did not attend any sessions, a zero-inflated Poisson model was used to identify factors that predicted participation and the number of sessions attended.

The analysis described herein is an exploratory analysis conducted in addition to the main prespecified analyses of the SUCCEED trial. The data that support the findings of this study are available from the corresponding author upon reasonable request.

RESULTS

CDSMP Participation

Of the 241 eligible SUCCEED subjects, 71 (29%) participated in CDSMP. Of the 71 participants, 49 (69%) completed at least 3 sessions and 43 (61%) graduated

(ie, completed at least 4 sessions of one CDSMP workshop). Twenty-four people (34%) attended all 6 sessions of a CDSMP workshop. Some participants attended >1 CDSMP workshop. Of those who participated in >1 workshop, 13 attended sessions in 2 workshops, 2 attended 3 workshops, and 8 attended 4 workshops. The total number of CDSMP sessions attended by a single participant in all workshops ranged from 1 to 23. The median number of cumulative CDSMP sessions attended was 5 (interquartile range, 2–6). Compared with CDSMP-nonparticipants, CDSMP participants had a higher number of clinic visits (mean, 3.3 [SD, 1.6] versus 1.9 [1.8], $P<0.0001$) and home visits (mean, 3.6 [SD, 1.2] versus 2.5 [1.7], $P<0.0001$).

The Figure shows the percentage of subjects that participated in CDSMP during each 3-month period and the time of implementation of raffle prizes, CDSMP planning manual, and free transportation.

Enrollee Demographics and Study Characteristics

Bivariate comparisons of demographics and study characteristics for participants and nonparticipants are shown in Table 1. Unemployment at 3 months after stroke, being married or in a domestic partnership, speaking Spanish, and more home or clinic visits were associated with CDSMP participation by unadjusted analysis ($P<0.05$). CDSMP participants had an average of 6.9 (SD, 2.3) clinic and home visits over the course of the year, whereas nonparticipants had an average of 4.3 (SD, 3.0).

Multivariate Analyses

Results for the zero-Inflated Poisson model are shown in Table 2. An odds ratio <1 in the logistic portion of

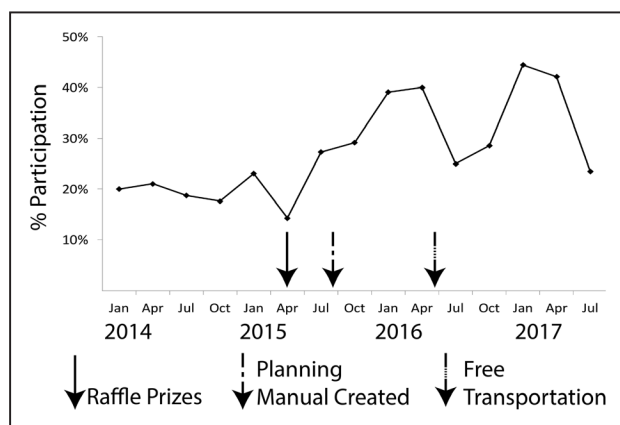


Figure. Percent participation in Chronic Disease Self-Management Program (CDSMP) over SUCCEED trial (Secondary Stroke Prevention by Uniting Community and Chronic Care Model Teams Early to End Disparities) enrollment by three month periods.

Raffle prizes were offered starting in April 2015. A CDSMP planning manual was developed in September 2015. Free transportation was offered beginning in June 2016.

the zero-inflated Poisson model indicates that people were more likely to participate in CDSMP. An incident rate ratio >1 for the count portion indicates that people were more likely to attend more sessions. People with a higher number of clinic visits were both more likely to participate in CDSMP and more likely to attend more sessions. Level of disability was another significant factor associated with participation. Compared with people with none/no significant disability, people with moderate disability were more likely to participate.

Regarding attendance (ie, how many sessions attended), those with moderately severe or severe disability attended more sessions than those with none or no significant disability. People with more life chaos attended fewer sessions. Enrollment later in SUCCEED was associated with attendance at more sessions.

DISCUSSION

In this analysis of participation in and attendance at CDSMP within a complex secondary stroke prevention intervention delivered in a safety-net setting, less than one-third (29%) participated in CDSMP, of whom nearly two-thirds (61%) graduated (ie, completed 4 or more sessions). Higher number of home/clinic visits was associated with both participation and greater attendance. Moderate disability was associated with participation whereas moderately severe and severe disability were associated with more attendance. Less life chaos and enrolling later in the study were also associated with greater attendance.

Other trials of self-management programs for stroke survivors have reported higher participation but comparable completion rates.^{10,16} In a small phase II trial of 47 English-speaking, Australian stroke survivors randomized to CDSMP, 55% participated and 69% of participants completed at least 3 sessions.¹⁰ In a study of low socioeconomic status, English or Spanish-speaking, Black or Latino stroke and transient ischemic attack survivors (n=600) in New York City—the PRAISE trial (Prevent Recurrence of All Inner-City Strokes Through Education)—84% of individuals randomized to a CDSMP-based intervention participated and 71% attended at least 3 sessions.¹⁶ These studies differed from SUCCEED in that the self-management programs were the sole intervention in these studies, whereas SUCCEED was a multimodal intervention, with numerous components, including clinic visits, home visits, telephone calls, text messaging, and distribution of self-management tools. In the SUSTAIN trial, conducted in the same safety-net setting, a smaller proportion (28%) did not attend any of the group education sessions and 40% attended all 3. Although SUSTAIN also included clinic visits, the intervention did not include home visits. We hypothesize that SUCCEED enrollees may have chosen not to participate in CDSMP because they received enough information

Table 1. Bivariate Associations of Hypothesized Factors Related to CDSMP Participation (≥1 Session Attended)

Characteristic	Participants (n=71)		Nonparticipants (n=170)		P Value
	n		n		
Age, mean (SD)	71	55.9 (8.4)	170	57.7 (9.3)	0.17
Female, n (%)	71	24 (33.8)	170	54 (31.8)	0.76
Race, n (%)	68		169		0.27
Asian		2 (2.9)		13 (7.7)	
Black		11 (16.2)		34 (20.1)	
White		54 (79.4)		114 (67.5)	
Other		1 (1.5)		8 (4.7)	
Hispanic, n (%)	71	55 (77.5)	170	115 (67.6)	0.13
Born in the United States, n (%)	71	15 (21.1)	170	50 (29.4)	0.19
Living with at least one other adult, n (%)	71	66 (93.0)	169	145 (85.8)	0.13
Education ≥12th grade, n (%)	71	20 (28.2)	167	69 (41.3)	0.06
Not working 3 mo after stroke, n (%)	71	67 (94.4)	144	116 (80.6)	0.01
Not currently married/domestic partnership, n (%)	71	31 (43.7)	170	105 (61.8)	0.01
Insurance, n (%)	68		155		0.06
Medi-Cal		46 (67.6)		79 (51.0)	
Medicare/Medi-Cal		5 (7.4)		21 (13.5)	
Any private insurance		3 (4.4)		21 (13.5)	
No health insurance		14 (20.6)		34 (21.9)	
Spanish-speaking, n (%)	71	51 (71.8)	170	89 (52.4)	0.01
How often do you speak in English in your home?, n (%)	71		168		0.56
Almost never		29 (40.8)		61 (36.3)	
Sometimes/often/almost always		42 (59.2)		107 (63.7)	
NIHSS ≤5, n (%)	69	36 (52)	161	100 (62)	0.16
Modified Rankin Scale, n (%)	71		170		0.11
None/no significant disability		10 (14.1)		23 (13.5)	
Slight disability		8 (11.3)		24 (14.1)	
Moderate disability		20 (28.2)		21 (12.4)	
Moderately severe disability		19 (26.8)		54 (31.8)	
Severe disability		12 (16.9)		38 (22.4)	
Social support, mean (SD)	69	25.2 (7.5)	168	24.4 (8.0)	0.42
Chaos, mean (SD)	66	16.5 (5.2)	168	15.9 (5.0)	0.40
PHQ-9, mean (SD)	68	7.0 (5.4)	162	7.2 (5.8)	0.81
Type of stroke, n (%)	71		170		0.67
Ischemic stroke		58 (81.7)		130 (76.5)	
Intracerebral hemorrhage		11 (15.5)		31 (18.2)	
TIA		2 (2.8)		9 (5.3)	
No. of competing needs, n (%)	53		132		0.49
0		34 (64.2)		80 (60.6)	
1		10 (18.9)		33 (25.0)	
2		4 (7.5)		13 (9.8)	
3		3 (5.7)		5 (3.8)	
4		2 (3.8)		7 (0.8)	
Site, n (%)	71		170		0.30
Harbor-UCLA		12 (16.9)		25 (14.7)	
LAC-USC		14 (19.7)		19 (11.2)	
Olive View-UCLA		1 (1.4)		1 (0.6)	

(Continued)

Table 1. Continued

Characteristic	Participants (n=71)		Nonparticipants (n=170)		P Value
	n		n		
Rancho Los Amigos		43 (60.6)		120 (70.6)	
Cedars-Sinai		1 (1.4)		5 (2.9)	
CHW, n (%)	71		170		
1		7 (9.9)		23 (13.5)	0.36
2		21 (29.6)		42 (24.7)	
3		30 (42.3)		68 (40.0)	
4		11 (15.5)		21 (12.4)	
5		2 (2.8)		16 (9.4)	
Clinic visits, mean (SD)	71	2.3 (1.8)	170	1.9 (1.8)	<0.0001
Home visits, mean (SD)	71	3.6 (1.2)	170	2.5 (1.7)	<0.0001

CDSMP indicates Chronic Disease Self-Management Program; CHW, community health worker; LAC-USC, Los Angeles County-University of Southern California Medical Center; NIHSS, National Institutes of Health Stroke Scale; PHQ-9, Patient Health Questionnaire-9; TIA, transient ischemic attack; and UCLA, University of California, Los Angeles.

and support through clinic and home visits. Additionally, there were differences in time since stroke. In PRAISE, participants were included if they had a stroke within the past 5 years and in the Australian study, participants were included if they had a stroke >3 months prior, whereas SUCCEED only included individuals with stroke within the prior 3 months. The optimal time for CDSMP engagement poststroke is unknown. Some stroke survivors have preferred to participate as soon as possible, and others have preferred later.^{17,18} Ideally, CDSMP should be made available at all stages of recovery to support stroke survivors whenever they feel ready for self-management workshops. The significant association between later enrollment and participation was likely attributable to the additional incentives we offered as the trial progressed.

People with greater disability were more likely to be unemployed, which could have made it easier for them to attend the CDSMP workshops, which were held during the day. Additionally, they may have been more motivated to prevent another stroke due to the more severe disability from their stroke. They may also have derived more benefit from the supportive group environment. Although some studies exclude stroke survivors with severe disability, a small study in South Australia among 56 people with moderate-severe global disability found that these stroke survivors were able to participate in a stroke self-management program.¹⁹

While participants likely have intrinsic motivation to participate,¹⁷ external factors also influence participation in self-management programs. In fact, increased life chaos was associated with lower attendance. Perhaps individuals who perceived their life to be chaotic were less likely to add another commitment. Alternatively, their schedules may have not been able to accommodate another weekly event. Prior studies have identified transportation and scheduling conflicts as barriers to CDSMP participation.^{10,20} Initially, we addressed transportation by enrolling patients in public transportation programs for

those with disability; however, as the study progressed, we also provided free transportation for those who did not qualify for the transportation programs. We saw an increase in participation after we instituted free transportation, and individuals randomized later in the study were more likely to participate in CDSMP, suggesting this is an effective strategy. Stroke survivors may have been unable to attend CDSMP due to work obligations. In fact, being unemployed was associated with participation in bivariate analysis and was not included in the multivariable analysis due to large numbers of missing values. Holding workshops in the evenings and weekends in addition to business hours may have improved attendance.

The finding that people with more clinic and home visits were more likely to participate and attend more sessions may reflect that these people were more intrinsically motivated to engage, had greater capacity to be involved, had established a rapport with the intervention team, or may have received more encouragement to attend CDSMP at the clinic and home visits.

Although we did not find that language was associated with attendance or participation in CDSMP after adjusting for other variables, ensuring race/ethnic, gender, and cultural congruence between facilitators and participants could increase participation. Other strategies that could potentially increase participation include offering guaranteed incentives or larger incentives for participation,²¹ addressing other barriers to participation (eg, childcare), and engaging in more targeted and persistent strategies to encourage participation.

LIMITATIONS

This study has several limitations. First, we could not control for how CHWs personalized recruitment based on their interactions with study enrollees. However, allowing staff to personally tailor recruitment strategies

Table 2. Zero-Inflated Poisson Model (With Imputed Data)

Variable	Logistic Portion		Count Portion	
	OR (95% CI)	P Value	IRR (95% CI)	P Value
Not married/domestic partner*	1.59 (0.81–3.12)	0.18	0.93 (0.75–1.16)	0.54
Language†	1.62 (0.68–3.83)	0.27	1.26 (0.92–1.71)	0.15
Chaos‡	0.97 (0.91–1.04)	0.42	0.97 (0.95–0.99)	0.01
Education§	0.96 (0.40–2.28)	0.93	1.26 (0.93–1.71)	0.13
No. of Clinic/home visits	0.73 (0.63–0.84)	<0.0001	1.06 (1.01–1.12)	0.02
Modified Rankin Scale¶				
Slight	1.12 (0.34–3.75)	0.85	1.17 (0.74–1.85)	0.51
Moderate	0.29 (0.10–0.88)	0.03	1.40 (0.99–1.99)	0.06
Moderately Severe	0.89 (0.33–2.38)	0.82	1.55 (1.07–2.23)	0.02
Severe	1.40 (0.47–4.24)	0.55	2.34 (1.65–3.31)	<0.0001
Time#	1.00 (0.91–1.10)	0.94	1.12 (1.08–1.16)	<0.0001

IRR >1 indicates more likely to attend more sessions; and OR <1, more likely to participate. IRR indicates incidence rate ratio; and OR, odds ratio.

*Reference group: married.

†Ref: Spanish speaking.

‡Scale from 6 (least chaos) to 30 (most chaos). For one unit increase in chaos.

§Ref: at least a 12th grade education.

||For one more clinic/home visit.

¶Ref: none or no significant disability.

#Date of study enrollment was analyzed in 3-month blocks.

to participants potentially optimized participation. Second, we do not have details of specific recruitment strategies or intensity of recruitment efforts (eg, how many times SUCCEED subjects were contacted or approached about participation). Third, although bivariate analysis did not note any significant differences in participation by race, ethnicity, or sex, having CHWs who were all Hispanic women may have limited participation of other ethnicities and men. Language, though significant in bivariate analysis did not remain significant after adjustment. Fourth, SUCCEED was held in an urban safety-net setting, which may not be generalizable to other settings. However, an analysis of 100 000 individuals enrolled in CDSMP workshops revealed no differences in class attendance in metro versus nonmetro areas.²² This study may have benefited from qualitative interviews with participants and nonparticipants to develop a deeper understanding of barriers to participation. Finally, we did not collect data from caregivers, so we could not assess caregiver competing needs or burden. Strengths of this study include the racial and ethnic diversity of participants, numerous strategies for enhancing participation, and data collected on multiple potential confounders. Next steps may include gathering qualitative data from participants, caregivers of participants, nonparticipants, and CDSMP workshop leaders to determine barriers and facilitators to participation.

ARTICLE INFORMATION

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Affiliations

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Supplemental Materials

Appendix A: Competing Needs Survey

Appendix B: Life Chaos Survey

Appendix C: Social Support Survey

REFERENCES

- O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, Rangarajan S, Islam S, Pais P, McQueen MJ, et al; INTERSTROKE Investigators. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. *Lancet*. 2010;376:112–123. doi: 10.1016/S0140-6736(10)60834-3
- Lin AM, Lin MP, Markovic D, Ovbiagele B, Sanossian N, Towfighi A. Less than ideal. *Stroke*. 2019;50:5–12.

3. Damush TM, Plue L, Bakas T, Schmid A, Williams LS. Barriers and facilitators to exercise among stroke survivors. *Rehabil Nurs*. 2007;32:253–60. doi: 10.1002/rj.2048-7940.2007.tb00183.x
4. Cruz-Flores S, Rabinstein A, Biller J, Elkind MS, Griffith P, Gorelick PB, Howard G, Leira EC, Morgenstern LB, Ovbiagele B, et al; American Heart Association Stroke Council; Council on Cardiovascular Nursing; Council on Epidemiology and Prevention; Council on Quality of Care and Outcomes Research. Racial-ethnic disparities in stroke care: the American experience: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2011;42:2091–2116. doi: 10.1161/STR.0b013e3182213e24
5. Cheng EM, Cunningham WE, Towfighi A, Sanossian N, Bryg RJ, Anderson TL, Barry F, Douglas SM, Hudson L, Ayala-Rivera M, et al. Efficacy of a chronic care-based intervention on secondary stroke prevention among vulnerable stroke survivors: a randomized controlled trial. *Circ Cardiovasc Qual Outcomes*. 2018;11:e003228. doi: 10.1161/CIRCOUTCOMES.116.003228
6. Towfighi A, Cheng EM, Ayala-Rivera M, McCreath H, Sanossian N, Dutta T, Mehta B, Bryg R, Rao N, Song S, et al. Randomized controlled trial of a coordinated care intervention to improve risk factor control after stroke or transient ischemic attack in the safety net: Secondary stroke prevention by Uniting Community and Chronic care model teams Early to End Disparities (SUCCEED). *BMC Neurol*. 2017;17:24. doi: 10.1186/s12883-017-0792-7
7. Lorig KR, Sobel DS, Stewart AL, Brown BW Jr, Bandura A, Ritter P, Gonzalez VM, Laurent DD, Holman HR. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. *Med Care*. 1999;37:5–14. doi: 10.1097/00005650-199901000-00003
8. Lorig KR, Sobel DS, Ritter PL, Laurent D, Hobbs M. Effect of a self-management program on patients with chronic disease. *Eff Clin Pract*. 2001;4:256–262.
9. Kendall E, Catalano T, Kuipers P, Posner N, Buys N, Charker J. Recovery following stroke: the role of self-management education. *Soc Sci Med*. 2007;64:735–746. doi: 10.1016/j.socscimed.2006.09.012
10. Cadilhac DA, Hoffmann S, Kilkenny M, Lindley R, Lalor E, Osborne RH, Batterby M. A phase II multicentered, single-blind, randomized, controlled trial of the stroke self-management program. *Stroke*. 2011;42:1673–1679. doi: 10.1161/STROKEAHA.110.601997
11. Access Services. Access – Riding Access – Overview. https://accessla.org/riding_access/overview.html. Accessed February 7, 2020.
12. Cunningham WE, Andersen RM, Katz MH, Stein MD, Turner BJ, Crystal S, Zierler S, Kuromiya K, Morton SC, St Clair P, et al. The impact of competing subsistence needs and barriers on access to medical care for persons with human immunodeficiency virus receiving care in the United States. *Med Care*. 1999;37:1270–1281. doi: 10.1097/00005650-199912000-00010
13. Wong MD, Sarkisian CA, Davis C, Kinsler J, Cunningham WE. The association between life chaos, health care use, and health status among HIV-infected persons. *J Gen Intern Med*. 2007;22:1286–1291. doi: 10.1007/s11606-007-0265-6
14. Wong ST, Nordstokke D, Gregorich S, Pérez-Stable EJ. Measurement of social support across women from four ethnic groups: evidence of factorial invariance. *J Cross Cult Gerontol*. 2010;25:45–58. doi: 10.1007/s10823-010-9111-0
15. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16:606–613. doi: 10.1046/j.1525-1497.2001.016009606.x
16. Kronish IM, Goldfinger JZ, Negron R, Fei K, Tuhim S, Arniella G, Horowitz CR. Effect of peer education on stroke prevention: the prevent recurrence of all inner-city strokes through education randomized controlled trial. *Stroke*. 2014;45:3330–3336. doi: 10.1161/STROKEAHA.114.006623
17. Hirsche RC, Williams B, Jones A, Manns P. Chronic disease self-management for individuals with stroke, multiple sclerosis and spinal cord injury. *Disabil Rehabil*. 2011;33:1136–1146. doi: 10.3109/09638288.2010.523103
18. Clark E, Bennett K, Ward N, Jones F. One size does not fit all - Stroke survivor's views on group self-management interventions. *Disabil Rehabil*. 2018;40:569–576. doi: 10.1080/09638288.2016.1268653
19. Cadilhac DA, Kilkenny MF, Srikanth V, Lindley RI, Lalor E, Osborne RH, Batterby M. Do cognitive, language, or physical impairments affect participation in a trial of self-management programs for stroke? *Int J Stroke*. 2016;11:77–84. doi: 10.1177/1747493015607522
20. Lo SHS, Chang AM, Chau JPC. Stroke self-management support improves survivors' self-efficacy and outcome expectation of self-management behaviors. *Stroke*. 2018;49:758–760. doi: 10.1161/STROKEAHA.117.019437
21. Patel MS, Asch DA, Rosin R, Small DS, Bellamy SL, Heuer J, Sproat S, Hyson C, Haff N, Lee SM, et al. Framing financial incentives to increase physical activity among overweight and obese adults: a randomized, controlled trial. *Ann Intern Med*. 2016;164:385–394. doi: 10.7326/M15-1635
22. Smith ML, Ory MG, Jiang L, Lorig K, Kulinski KP, Ahn S. Workshop characteristics related to chronic disease self-management education program attendance. *Front Public Health*. 2015;3:19. doi: 10.3389/fpubh.2015.00019