

ผลของโปรแกรมการปรับระบบการดำเนินชีวิตโดยการตั้งเป้าหมายและ
ประสบการณ์ใหม่ต่อพฤติกรรมเสี่ยงการเกิดโรคหลอดเลือดสมอง
ระดับความดันโลหิตและระดับแอลดีเอลโคเลสเตรอรอลในผู้ป่วยหลังจาก
ภาวะสมองขาดเลือดชั่วคราว

THE EFFECTS OF A SYSTEMCHANGE™-TIA PROGRAM ON STROKE RISK
BEHAVIORS, BLOOD PRESSURE, AND LDL-CHOLESTEROL IN THAI ADULTS
FOLLOWING TRANSIENT ISCHEMIC ATTACK

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Abstract

The purpose of this study was to test the effects of the SystemCHANGE™-TIA program and compare the differences in stroke risk behaviors, systolic blood pressure, diastolic blood pressure, and LDL-cholesterol of adults following TIA among individuals receiving a SystemCHANGE™-TIA program and those receiving usual care at 6 weeks and 12 weeks. The research design was a Randomized Controlled Trial (RCT) which tested the effects of providing a set of activities in a SystemCHANGE™-TIA program on process improvement theory. Forty two TIA adults who lived in Phetchaburi, Thailand, were recruited as the sample using simple random sampling. The participants were then randomly assigned into the SystemCHANGE™-TIA and control groups. Starting from July, 2014 to January, 2015, the SystemCHANGE™-TIA group received a six-week- program and the control group received routine care only. The instruments of this study included 1) a SystemCHANGEM program, 2) the demographic data form, 3) a modified stroke risk behaviors scale, 4) an automated sphygmomanometer OMRON HEM-7203, and 5) a Cobas 6000 analyzer series module 6c501. Data were analyzed using repeated measures MANOVA.

The results revealed the SystemCHANGE™-TIA group to have significantly lower stroke risk behaviors level and lower mean scores on systolic blood pressure, diastolic blood pressure, and LDL-cholesterol than the control group. There were significant differences over time for all outcomes.

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Interaction effects between time and group of all outcomes were significantly different. The System CHANGE™-TIA was a nursing intervention to help TIA adults to focus on changing the daily systems in their lives affecting stroke risk behaviors and improved physiological outcomes on blood pressure and LDL-cholesterol. Therefore, the program might be used in nursing practice for changing stroke risk behaviors in TIA patients.

Keywords: Stroke risk behaviors, blood pressure, LDL-cholesterol, Transient Ischemic Attack

บทคัดย่อ

การวิจัยครั้งนี้ศึกษาผลของโปรแกรมการปรับระบบการดำเนินชีวิตโดยการตั้งเป้าหมายและประสบการณ์ใหม่ในผู้ไทยหลังจากภาวะหลอดสมองขาดเลือดชั่วคราวและเปรียบเทียบพุทธิกรรมเสี่ยงการเกิดโรคหลอดเลือดสมอง ระดับความดันโลหิตและระดับแอลดีแอลโคเลสเตอรอล ระหว่างกลุ่มที่ได้รับโปรแกรม กับกลุ่มที่ได้รับการพยาบาลตามปกติ ในระยะ 6 สัปดาห์ และ 12 สัปดาห์ เป็นการวิจัยการทดลองแบบสุ่มและมีกลุ่มควบคุม ซึ่งเป็นการศึกษาผลของโปรแกรมบนพื้นฐานของทฤษฎีขั้นการพัฒนา กลุ่มตัวอย่างจำนวน 42 คน ซึ่งอาศัยอยู่จังหวัดเพชรบุรี ประเทศไทย ได้มาจากการสุ่มอย่างง่าย หลังจากนั้นสุ่มเข้ากลุ่มทดลองและกลุ่มควบคุม ระหว่างเดือนกรกฎาคม พ.ศ. 2557 ถึงเดือนมกราคม พ.ศ. 2558 กลุ่มทดลองจะได้รับโปรแกรมจำนวน 6 สัปดาห์ ระยะที่ 1 การพัฒนาความคิดเชิงระบบและทักษะ (สัปดาห์ที่ 1) ระยะที่ 2 การปรับเปลี่ยนระบบชีวิต (สัปดาห์ที่ 2 และ 4), ระยะที่ 3 การพัฒนาระบบชีวิตอย่างต่อเนื่อง (สัปดาห์ที่ 6) โดยกลุ่มควบคุมได้รับการดูแลตามปกติ เครื่องมือที่ใช้ในการวิจัยในการวิจัย ได้แก่ 1) โปรแกรมการปรับระบบการดำเนินชีวิตโดยการตั้งเป้าหมายและประสบการณ์ใหม่ในผู้ไทยหลังจากภาวะสมองขาดเลือดชั่วคราว, 2) แบบสอบถามข้อมูลส่วนบุคคล, 3) แบบสัมภาษณ์พุทธิกรรมเสี่ยงโรคหลอดเลือดสมอง, 4) เครื่องวัดความดันโลหิต รุ่น an automated sphygmomanometer OMRON HEM-7203, และ 5) เครื่องวัดทางเคมี รุ่น a Cobas 6000 analyzer series module 6c501 วิเคราะห์ข้อมูลโดยการวิเคราะห์วัดช้าหลายตัวแปร

ผลการศึกษาพบว่าทั้งกลุ่มควบคุมและกลุ่มทดลองลงสู่ผลต่อผลลัพธ์ที่แตกต่างกันในช่วงเวลาที่ต่างกัน ในสัปดาห์ที่ 6 และ 12 โดยกลุ่มทดลองมีพุทธิกรรมเสี่ยงโรคหลอดเลือดสมอง ระดับความดันชีสโตริลิค ระดับความดันโลหิตและระดับแอลดีแอลโคเลสเตอรอลลดลงมากกว่ากลุ่มควบคุม โปรแกรมการปรับระบบการดำเนินชีวิตโดยการตั้งเป้าหมายและประสบการณ์ใหม่ในผู้ไทยหลังจากภาวะหลอดสมองขาดเลือดชั่วคราวจะช่วยปรับการดำเนินชีวิตซึ่งช่วยในการปรับเปลี่ยนพุทธิกรรมเสี่ยงโรคหลอดเลือดสมอง ลดระดับความดันโลหิตและระดับแอลดีแอลโคเลสเตอรอล ดังนั้นโปรแกรมสามารถนำมาใช้ในการปฏิบัติการพยาบาลเพื่อปรับเปลี่ยนพุทธิกรรมเสี่ยงผู้ป่วยหลังจากภาวะหลอดเลือดสมองขาดเลือดชั่วคราว

คำสำคัญ: พุทธิกรรมเสี่ยงโรคหลอดเลือดสมอง, ความดันโลหิต, แอลดีแอลโคเลสเตอรอล, หลอดเลือดสมองขาดเลือดชั่วคราว

Introduction

A Transient Ischemic Attack (TIA) is a temporary episode of neurologic dysfunction (Sata & Minematsu, 2013). In Thailand, findings show the incidence of stroke in TIA patients during the first year to be 13–25.25% (Bureau of Policy and strategy, 2011). The recurrence of stroke in TIA patients is caused by stroke risk behaviors such as exercise behavior, eating behavior, and medication adherence behavior. Those are actions leading to risk for stroke in TIA patients. Previous interventions had shown that only interventions in the adults' actual lifestyles with no changes in patients' environments were not appropriate to help change Thai TIA patients' stroke risk behaviors (Ellis, Rodger, McAlpine, & Langhorne, 2005; Gillham & Endacott, 2009; Green, Haley, Eliasziw, & Hoyte, K, 2009; McManus, Craig, McAlpine, Langhorne, & Ellis, 2009).

In order to overcome these challenges and effectively solve the problem, a new approach was developed based on process improvement theory. This theory provided the processes of understanding how systems affected the maintenance of habits encouraging people to systematically change their lives, understanding the real causes of behaviors, and creating a positive system that could lead to healthy behavior and give insight into habits (Alemi et al., 2009). Recently, process improvement theory was employed to develop a SystemCHANGE™ program (Systems Change Habits by Applying Systems Change Habits by Applying New Goals and Experiences) designed by Shirley Moore focusing on changing daily routines and redesigning the environment in what led to achieving specific goals for changing habits. As

previously mentioned, the SystemCHANGE™ program has been reported as very beneficial for patients with chronic illnesses, but such programs have not been undertaken in Thailand (Moore et al., 2011; Plow et al., 2013; Webel, Moore, Hanson, & Salata, 2013; Webel et al., 2013). The SystemCHANGE™ program would be appropriate for Thai people because this program emphasizes on a support from intimate person for changing patients' behaviors. Moreover, this method of behaviors changing can easily be applied to Thai's actual lifestyle. For those reasons, this study examined the effects of the SystemCHANGE™ -TIA program in modifying stroke risk behaviors among TIA Thai adults.

Objectives

To test the consequences of the SystemCHANGE™-TIA program and compare the differences in stroke risk behaviors, systolic blood pressure, diastolic blood pressure, and LDL-cholesterol among individuals were undergoing the SystemCHANGE™ -TIA program and those receiving only usual care for 6 weeks and 12 weeks after baseline.

Research framework

The research framework of the SystemCHANGE™-TIA program was developed from Process Improvement Theory (Alemi et al., 2005), systematic reviews, and pilot study. Process improvement theory described processes supporting of continuous behavior modification in a system. This theory specified that behavior modification occurred in a system (daily routines and environment) to achieve specific goals. The process improvement

theory composed of seven steps as follows: put together a team; decide what a person wants to accomplish; describe daily routines; determine where the person can make changes; make a change and see if it works; use small tests of change; and share a story. The strategies formed the active ingredients of three phases of the SystemCHANGE™-TIA program deriving from the seven steps of process improvement. This program consisted of three phases. First phase involved of thinking and skills systems development in order to prepare the basic knowledge and skills for reducing stroke risk behaviors. With the role of the participant's team, clarification of the problems

involved stroke risk behaviors, and development of the skill of systems thinking. Second phase has the purpose to change individuals' system in defining goals, analyzing causes and designing system for changing stroke risk behaviors, while implementing short trials, and evaluating changes. Third phase has the purpose to ongoing improvement of the patients' system by evaluating success and maintaining system change to achieve goals. Changing stroke risk behaviors involved exercise behavior, eating behavior, and medication adherence behavior. Those factors could affect the control of blood pressure and reduce LDL-cholesterol in Figure1.

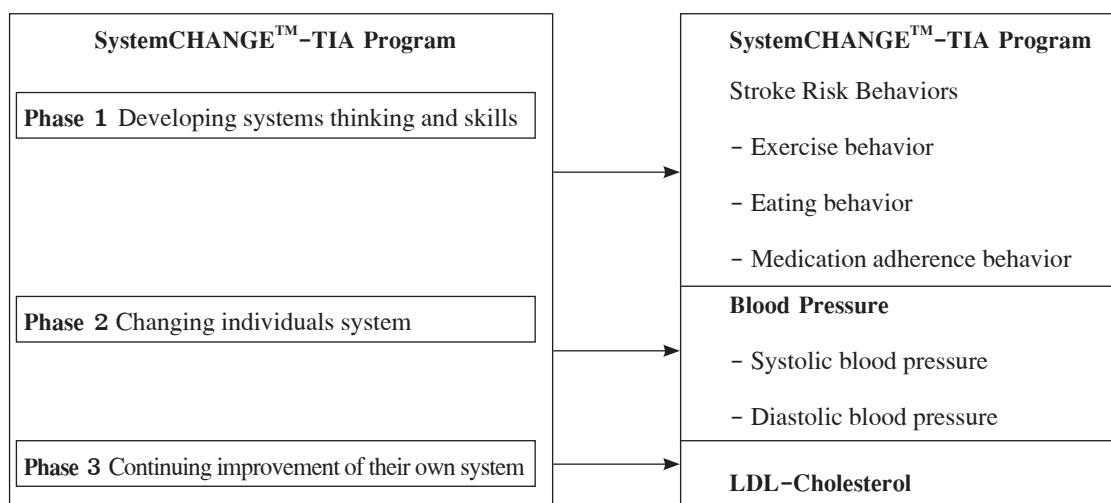


Figure 1 Research framework of a SystemCHANGE™-TIA program

Research Methodology

This study design was a randomized controlled trial.

Population and sample

Population

The population was composed of adults who had been diagnosed with TIA. Based on the estimation

from the health statistics in 2013, there were 130 TIA patients available in 2014 and roughly 10-15 cases per months.

Sample

The sample size calculation was based on effect size of .53 (Chanrungvanich, 2005), $\alpha=.05$, power = .80, repeated three times, and plus an

additional 10% for attrition. The participants were selected using simple random sampling through a computer-generated list of random number to yield a total of 42 participants. Chanrungvanich's study (2005) had the RCT design and intervention focusing on changing exercise behaviors together with intimate person. All 42 participants were randomly assigned to two groups, namely, the control group (21 participants) and the SystemCHANGE™-TIA group (21 participants) by using a sequentially numbered opaque sealed envelope (SNOSE) in order to allocate concealment. The inclusion criteria was as follows: being diagnosed with TIA; being 35–65 years of age; no cognitive impairment when completing the Chula Mental Test (CMT) with more than 14 points; no depression when completing the Thai version of the Patient Health Questionnaire-9 less than 6 scores; no co-morbidity which related to vision deficit, hearing loss, musculoskeletal problems, renal failure, congestive heart failure, ischemic heart disease; having less than 169/99 mmHg blood pressure; and having ability to read, speak and write Thai. Another criterion was each participant needed to have at least a family member or close friend who had ability to encourage the participants to find ways to modify behaviors.

Setting

This study was conducted with Thai post-TIA adults living in Phetchaburi province using health care services at Phrachomklao hospital. The hospital is a general hospital treating cerebrovascular disease and TIA. It provides a neurological outpatient department available for outpatients from 1:00 pm. to 4:00 pm.

on Mondays, and from 8:00 am. to 12:00 pm. on Tuesdays.

Ethical consideration

The researcher would explain the research objectives, benefits, and risks to the participants before obtaining their consents. The researcher would visit participants at their home when they were available. The participants would be informed that the participation was voluntary, and that they had rights to stop participating in the study at any time. Especially, the participants would be assured that refusal to participate or withdrawal would not affect or compromise any of their care receiving from nurses or doctors. Written consent would be employed after the objectives and expectations of the study were explained. An approval of The Institutional Review Board for graduate study of Faculty of Nursing, Burapha University, Thailand was received on July 7, 2013 (Number of IRB approval 03-06-2557). Also, this study had received permission from Prof. Dr. Moore who originally developed the SystemCHANGE™ program

The SystemCHANGE™-TIA Program

This program was developed based on process improvement theory. The program focused on re-designing daily routines and the environment in order to achieve goals to change stroke risk behaviors in Thai adults undergoing TIA. The program comprised the following three phases:

Phase 1: Developing thinking skills systems

First Meeting (Week 1: Approaching the participants and team by visiting them at homes, 120 minutes).

The first session focused on the provision of information about TIA such as signs and symptoms, risk for stroke, exercise behavior, eating behavior, medication adherence behavior, systems thinking, and team's role in helping the participants modify stroke risk behaviors.

Phase 2 Changing individuals' system

Second Meeting (Week 2: Approaching individual and team at the participants' homes; 90 minutes)

The second session involved defining goals for changing stroke risk behaviors, describing routines, understanding causes, developing ideas to modify the system, understanding the Plan-Do-Study-Act (PDSA) cycle to evaluate success, and getting familiar with using a storyboard to tell about the participant's experiments. The participants and their team members would brainstorm ideas for setting their goals, understanding their routine and how it interconnected with others' in the team, and recording the routine flow chart in order to learn the patterns of the participants' lifestyles. By doing so, we would be able to analyze causes of stroke risk behaviors, create several ideas to cope with stroke risk behavior by changing participant's routines and environment, and try each created idea per week in order to find a way that leads to a modification in stroke risk behaviors.

Third Meeting (Week 4: individual and team at participants' homes, 60 minutes)

The third session emphasized on using the PDSA process. The activities included sharing the progress of experiments using a storyboard and reflecting on the storyboard under the researcher's

supervision. The participants and teams brainstormed to evaluate success based on whether or not the participants achieved their goals and whether or not they could maintain the plan. If participants failed to achieve their goals, they could make different changes or plans to help themselves to fulfill the goals.

Phase 3 Sustaining Improvement of Their Own Systems

Fourth Meeting (Week 6: individual and team at participants' homes, 45 minutes)

The fourth session emphasized on evaluation of the progress of achieving goals and sustaining improvement in modifying stroke risk behaviors. The activities included the experiences sharing by participants using a storyboard, testing the PDSA cycles and discussing the problems encountered during the study. Here, the researcher would have a duty to explain about learning and ways to stay on track, continually encourage the participants and their teams to improve their stroke risk behaviors in order to reduce chances or prevent future strokes.

Usual care: The usual activities and services such as regular check-ups, medication, and unstructured health education provided by nurses or physicians in response to needs of outpatient and family were deemed to be a routine care.

Instrument for data collection

1. The personal data form was developed by the researcher. This form contained 13 questions aimed to collect data on gender, age, marital status, religion, occupation, educational level, family income, amount of TIA, comorbidity, smoking, alcohol intake, medicine usage, and use of alternative medicines.

2. The Modified Stroke Risk Behaviors Scale (MSRB) was modified by the researcher based on the Stroke Risk Behaviors Scale (SRBS). The SRBS was developed by Kanyamee (2010) for Thai adults with hypertension in order to prevent stroke. The RBS was a 25-item questionnaires with a 4-level Likert scale that had total scores of 100. The content validity index (CVI) of the SRBS was determined by a panel of five experts at 0.92 and the reliability in Thai patients with hypertension was 0.84 (Kanyamee, 2010). When the MSRBS was used by 30 participants, the Cronbach's Alpha coefficient was .85. High scores meant low stroke risk behaviors levels. The scores could be divided into four levels: 76–100 meant low stroke risk behaviors, 51–75 meant moderate stroke risk behaviors, 26–50 meant high stroke risk behaviors, and 1–25 meant very high stroke risk behaviors.

3. The automated sphygmomanometer OMRON HEM-7203 met the standards for measurement set by the Thai Industrial Standards Institute.

4. Cobas 6000 analyzer series module c501 at Prachomklao hospital measured LDL-cholesterol levels and met the Thai Industrial Standards Institute.

Data collection

After permission had been granted, the researcher visited the director, deputy director, and head nurse of the out-patients department, Phrachomklao hospital to provide information. The researcher screened the post-TIA Thai adults for eligibility from medical record and assessed patients at the out-patient department, Phrachomklao hospital. Next, the researcher performed random selection by a simple random sampling. Before seeking consent

from potential participate, the researcher would approach them to introduce herself and clearly explain the objectives of the research study, the potential benefits, and harm of the study. The researcher then obtained written informed consent and the participants were randomly assigned to a SystemCHANGE™-TIA group or the control group by a sequentially numbered opaque sealed envelope. The researcher performed each session at the participants' home, and the SystemCHANGE™-TIA program was tailored for each individual participant during a 6-week-program. The stroke risk behaviors, blood pressure, and LDL-cholesterol of both groups were collected by two research assistants (RAs) at the baseline and at six and twelve week's intervals after program implementation.

Data analysis

Data were analyzed by using descriptive statistic and repeated measures Multivariate Analysis Of Variance (Repeated measures MANOVA). The assumptions of repeated measure MANOVA were tested before data was analyzed. Assumptions such as independent observations, outliers, multivariate normality, multicollinearity, and homogeneity of covariance were to be met.

Results

Forty-two participants were able to participate in the full program with 21 participants in the control group and 21 participants in the SystemCHANGE™-TIA group. In the SystemCHANGE™-TIA group, 17 participants were males and 4 participants were females. The mean age of the participants was 55.95 years. The majority of the participants had completed primary school

educations (47.60%). Some of them were laborers (42.86%). The majority of the participants were married (71.43%). Most of the participants were Buddhists and 38.10 percent of the participants had incomes between 5,000 to 10,000 baht per month. The majority of the participants did not smoke (71.43%), no alcohol intake (80.95%), and did not use alternative medications (80.95%). Most of the participants in the SystemCHANGE™-TIA group had TIA one time (95.24%). The majority of the TIA durations were 30–60 minutes (76.19%) and TIA one time (90.48%).

In the control group, 15 were males (71.40%). The participants' mean age was 56.86 years ($SD = 7.93$). Most had completed primary school educations (66.67%). Some of participants were laborer (45.24%). Twenty participants were married (95.24%). The major religion reported was Buddhism (71.43%). The majority of the participants had incomes under 5,000 baht per month. Sixteen participants did not smoke (76.19%) and seventeen

participants had no alcohol intake (80.95%). Most of the participants did not use alternative medications (85.71%). Fifteen participants had TIA durations of 30–60 minutes (71.43%). In both the control and the SystemCHANGE™-TIA groups, one hundred percent had hypertension and used hypertensive drugs. There were no differences in the pre-test demographic data for the SystemCHANGE™-TIA group and the control group ($p > .05$).

Post-TIA, the Thai adults who received the SystemCHANGE™-TIA program had higher mean scores on stroke risk behaviors and lower mean scores on systolic blood pressure, diastolic blood pressure, and LDL-cholesterol at weeks 6 and 12 than the control group (figure 2 – 5). In the SystemCHANGE™-TIA group, there were significant differences of mean scores across the three time periods of all outcomes ($p < .01$). There were significant interactions of group by time on all outcomes ($p < .01$).

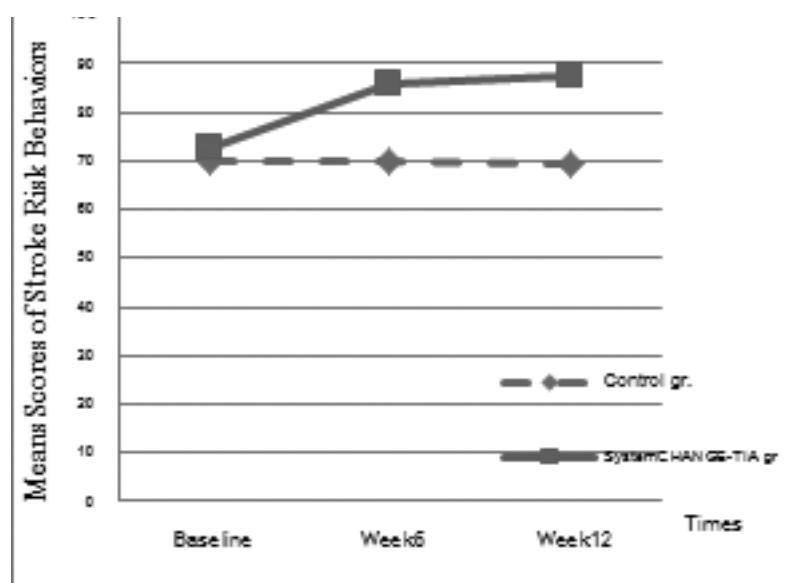


Figure 2 Change over time of mean scores of stroke risk behaviors

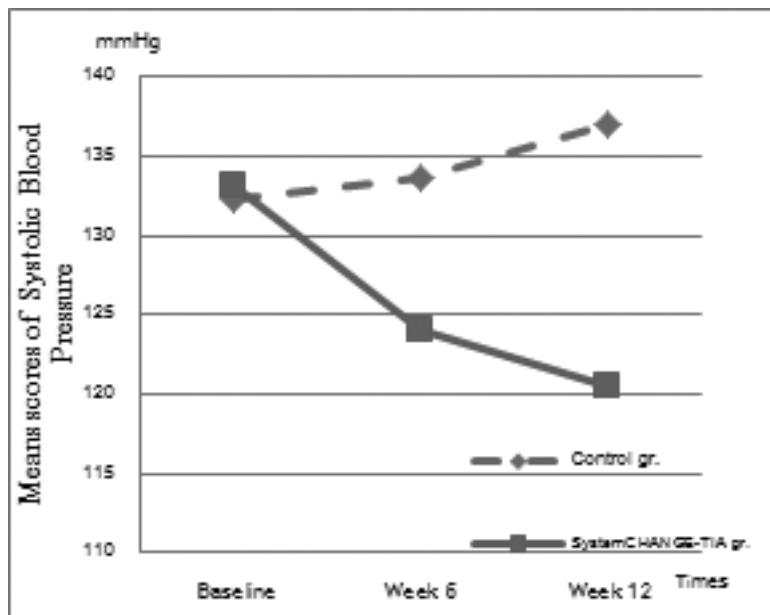


Figure 3 Change over time of mean scores of systolic blood pressure

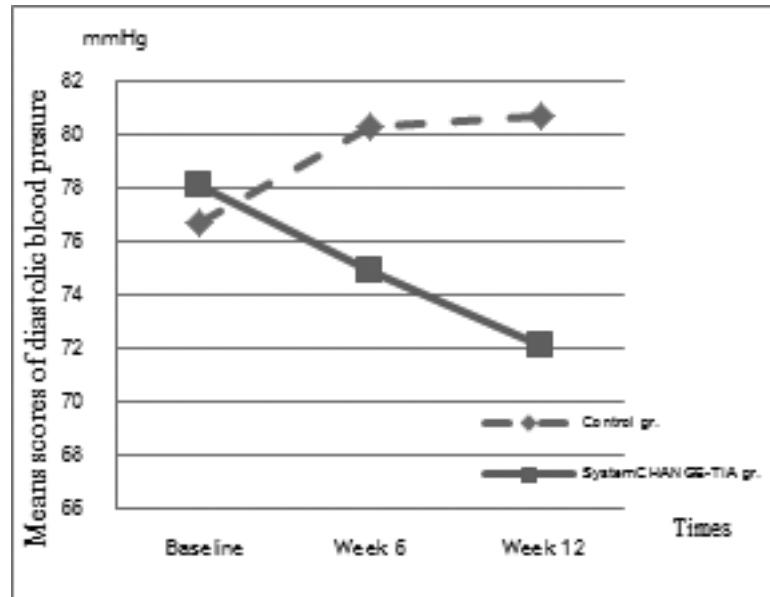


Figure 4 Change over time of mean scores of diastolic blood pressure

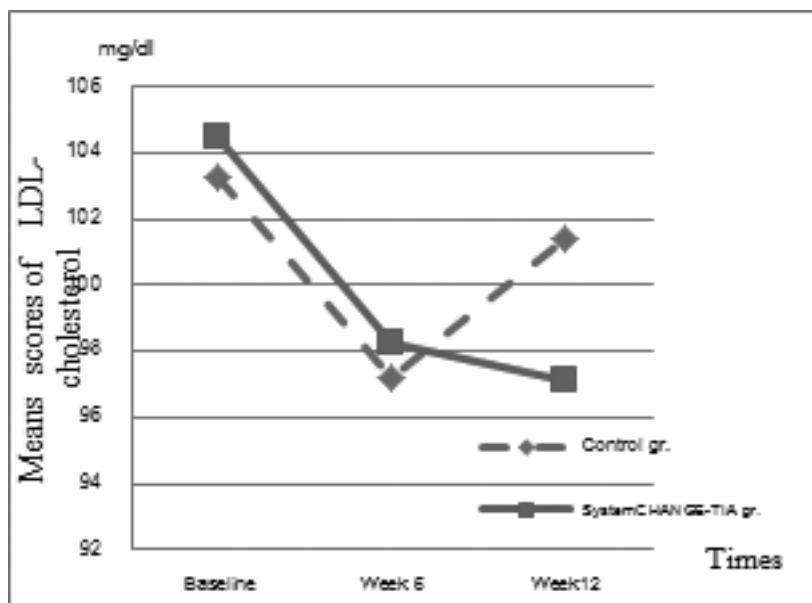


Figure 5 Change over time of mean scores of LDL- cholesterol

Discussions

These findings illustrated that the participants in the SystemCHANGETM-TIA group had improved behavior modification from moderate stroke risk behaviors level to low stroke risk behaviors level on a continual basis from baseline to weeks 6 and 12. Furthermore, all three aspects of stroke risk behaviors, namely, eating behavior, exercise behavior, and medication adherence behavior were improved. The participants in the control group had moderate stroke risk behaviors with no changes in the three stroke risk behaviors from baseline at weeks 6 and 12. The SystemCHANGETM-TIA group had more changes in stroke risk behaviors from the baseline to weeks 6, and 12 because they participated in the SystemCHANGETM-TIA group. It showed that the SystemCHANGETM-TIA program caused changes in stroke risk behaviors. Patients in the SystemCHANGETM-TIA program continually

reduced level of stroke risk behaviors because the SystemCHANGETM-TIA program encouraged individual modification in stroke risk behaviors. Therefore, the patients gained clear understanding about the problems at hand in modifying the stroke risk behaviors of each person. In particular, this program was designed for a patient to pair with an intimate person who understood their problems and knew how to encourage them to find a way to modify their behaviors. Moreover, the patients' team had to help monitor the patients' behavior modification in all phases. The participants and team developed systems thinking which would help them modify their overall environments which would lead to behavior modification without emphasizing on the motivation. Creating a positive environment might lead to success, even if a person is not fully motivated, because positive environments help people sustain good habits over time (Webel et al., 2013). The patients and team members joined together in understanding the

problems encountered in modifying stroke risk behaviors. Clear goals of behavior modification were set and teams worked together to find the best methods for modifying stroke risk behaviors by using the things around them to help with the modification in the real-life situations of the patients (Matteson, & Russel, 2013). This program encouraged the patients and their team members to work together to monitor and evaluate the results of the behavior modification by using the Plan-Do-Study-Act (PDSA) cycle. The PDSA Cycle was Plan: identifying and analyzing the problem for changing behaviors. Do: Developing and testing a potential solution. Study: Measuring how effective the test solution was, and analyzing whether it could be improved in any way and Act: Implementing the improved solution fully. Then, the patients continually employed this PDSA cycle to improve low stroke risk behaviors. Finally, patients told story of changing behaviors using story board. A story board is a communication vehicle to display the person's project to the public. Whether the person succeeds or fails in improvement efforts, it is important to post the person's results to the storyboard and to celebrate the fact that the person is still at it (Webel et al., 2013). When the participants continually engaged in all aspects of good behavior namely eating behavior, exercise behavior, and medication adherence behavior, their blood pressure and LDL-cholesterol would be reduced.

This finding concurred with previous studies and resulted from the SystemCHANGE™-HIV (Webel et al., 2013) which revealed that the integration of even a small modification (improving systems thinking, self-monitoring, goal-setting,

systems improvement strategies and social support, improving knowledge, creating self-experiments, and preventing relapse with continual improvement) at a level of individual, inter-individual, and environmental into daily routines could lead to success. The findings revealed that 70% of the participants in the SystemCHANGE™-HIV group increased physical activity compared to 65% of the participants in the control group. The success of behavior modification required real practice of self-designed experiments which properly modified for each individual in the sample group. Furthermore, the experiments required constant monitoring in order to lead to sustainable good behaviors.

Implementation

Nursing Practice

The public health nurses could apply the SystemCHANGE™-TIA program directly because they had good relationships with people in community. The adults undergoing TIA could consult with nurses to enhance systems thinking easily when relapse stroke risk behaviors occurred.

Nursing education

The knowledge gained from this study could be applied for nursing education by training advanced nurse practitioners. The curriculum should encompass the process improvement theory which would promote systems thinking and behavioral change.

Future study

It was necessary to monitor the response to stroke risk behaviors over 12 weeks, 6 months, and

1 year in order to sustain consequences of the SystemCHANGE™-TIA program in Thai adults undergoing TIA. Recording of self-reports on behavior modification should be performed in order to obtain data with better coverage of the aforementioned behaviors.

Conclusion

The SystemCHANGE™-TIA program was a nursing intervention to help TIA adults to stay focus on changing their daily lives systems which affected stroke risk behaviors such as exercise behavior, eating behavior, and medication adherence behavior which would lead to an improvement of their physiological outcomes, blood pressure, and LDL-cholesterol.

References

Alemi, F., Nuuhauser, D., Benson, L., Dill, R., Fallon, W. F., Headrick, L., Ismail, Moore, S. M., Norman, L., Pawloski, L., & Tinsley, N. (2005). A thinking person's weight loss and exercise program. Victoria, BC: Trafford.

Bureau of policy and strategy. (2011). The Thailand healthy lifestyle strategic plan B. E. 2554-2563. Retrieved from <http://www.bps.moph.go.th/.../thailand-healthy-lifestyle-strategic-plan-be-2554-256>.

Chanrungvanich, W. (2005). RCT: Self-regulated exercise program on transient ischemic attack and minor stroke patients. *Thai Journal Nursing Research, 10*(3), 165-179.

Ellis, G., Rodger, J., McAlpine, C., & Laghorne, P. (2005). The impact of stroke nurse specialist input on risk factor modification: A randomized controlled trial. *Age Ageing, 34*(4), 389-392.

Gillham, S., & Endacott, R. (2009). Impact of enhanced secondary prevention on health behaviour in patients following minor stroke and transient ischemic attack: A randomized controlled trial. *Clinical Rehabilitation, 24*(9), 822-830.

Green, T., Haley, E., Eliasziw, M., & Hoyte, K. (2007). Education in stroke prevention: Efficacy of an educational counseling intervention to increase knowledge in stroke survivors. *Canadian Journal of Neuroscience Nursing, 29*(2), 13-20.

Kanyamee, P. (2010). The effect of education and social support program on risk behaviors to stroke among older people with hypertension, *Journal of Nursing Science Chulalongkorn University, 26*(2), 14-25.

Matteson, M. L., & Russel, C. L. (2013). Systematic review of continuous self-improvement interventions. *Clinical Nursing Studies, 1*(1), 10-25.

McManus, J. A., Craig, A., McAlpine, C., Langhorne, P., & Ellis, G. Does behaviour modification affect post- stroke risk factor control? Three-year follow-up of a randomized controlled trial. (2009). *Clinical Rehabilitation*, 23(2), 99-105.

Moore, S. M., Charvat, J., Alemi, F., Gordon, N. H., Ribisl, P., & Rocco, M. (2011). Improving lifestyle exercise in cardiac patients: Results of the SystemCHANGE™ Trial. *Circulation*, 124(4), A13341.

Plow, M., Moore, S. M., Kirwan, J. P., Frost, F., Katzan, I., Jaeger, S., & Alberts, J. (2013). Randomized controlled pilot study of a SystemCHANGE™ weight management intervention in stroke survivors: Rationale and protocol. *Trials Journal*, 14: 1-7.

Webel, A. R., Moore, S. M., Hanson, J. E., Patel, S. R., Schmotzer, B., & Salata, R. (2013). Improving sleep hygiene behavior in adults living with HIV/AIDS: A randomized control pilot study of SystemCHANGE™-HIV intervention. *Applied Nursing Research*, 26(2), 85-91.

Webel, A. R., Moore, S. M., Hanson, J. E., & Salata, R. A. (2013). The rationale, design, and initial efficacy of SystemCHANGE™-HIV: A Systems- based intervention to improve physical activity in people living with HIV. *Journal AIDS & Clinical Research*, 4(3), 2-16.