JAPAN JOURNAL OF NURSING SCIENCE

Japan Journal of Nursing Science (2019) **16**, 25–36 doi:10.1111/jjns.12208

ORIGINAL ARTICLE

Cardiovascular self-management support program for preventing cardiovascular complication behaviors and clinical outcomes in the elderly with poorly controlled type 2 diabetes mellitus in Indonesia: A pilot study

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Abstract

Aim: The aim of the study was to determine the feasibility, and to evaluate the effect of, a cardiovascular self-management support program by applying the 5A's self-management support program on preventing cardiovascular complication behaviors and to assess the clinical outcomes in the elderly with poorly controlled type 2 diabetes mellitus (DM).

Methods: This pilot study used a quasi-experimental study design. Twelve elderly persons with poorly controlled type 2 DM were assigned into either a control or experimental group, with six participants in each group. The Preventing Cardiovascular Complication Behaviors (PCCB) was measured by the Preventing Cardiovascular Complication Behaviors Questionnaire, while the clinical outcomes were measured by clinical devices that were provided. These measurements were conducted and compared at baseline and 6 weeks after the completion of the program. The self-management support program was a 6 week program with several implementation methods, based on the 5A's self-management support program.

Results: The participants who received the cardiovascular self-management support program reported a significant improvement in their PCCB and clinical outcomes, compared to those receiving the usual care.

Conclusion: This study revealed that a cardiovascular self-management support program that applies the 5A's self-management support program is feasible for implementation.

Key words: cardiovascular self-management support program, elderly, poorly controlled type 2 diabetes mellitus, prevention of cardiovascular complication behaviors.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease that is characterized by hyperglycemia resulting from a defect in the production of insulin, the action of insulin, or both (ADA, 2013). The high prevalence of type 2 DM in the elderly has been associated with poor glycemic control, which is defined as a hemoglobin (Hb)A1c level of >7% (Otiniano *et al*., 2012).

It is common for the elderly with poorly controlled type 2 DM to develop cardiovascular (CDV) complications (ADA, 2015). In Cilegon City, Indonesia, 48% of the elderly population has developed CDV

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Received 5 April 2017; accepted 11 January 2018.

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complications (Ariadna, 2015). Every 1% rise in the HbA_1c was associated with a 30% increase in all-cause mortality and a 40% increase in CDV mortality (Kishore, Kim, & Crandall, 2012). Furthermore, Halter *et al.* (2014) reported that the association of diabetes and CDV complications in the elderly was influenced by endothelial dysfunction (i.e. mitochondrial dysfunction). In addition, it is more common for the elderly with diabetes to develop endothelial dysfunction, oxidative stress, and inflammation (De Tata, 2014).

Preventing CDV complications in the elderly with poorly controlled type 2 DM can be carried out by conducting the Preventing Cardiovascular Complication Behaviors (PCCB), which consists of a DM diet and heart-healthy diet by limiting the sugar and carbohydrate intake and following the Dietary Approach to Stop Hypertension (DASH), doing physical exercise by walking two-to-three times per week, taking medications regularly that consist of blood glucose-lowering drugs, antihypertensive drugs, lipid-lowering drugs, antiplatelet drugs, and smoking cessation (Meneilly, Knip, Tessier, & Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2013). Also, the PCCB focuses on reducing some clinical data values (i.e. blood glucose, lipid profile, and blood pressure) that could contribute to the development of CDV complications by lining the artery wall, which becomes enlarged and then ultimately the wall weakens and precipitates a rupture that would develop into a myocardial infarction (Anastasios Kalofoutis *et al.*, 2007).

The elderly with poorly controlled type 2 DM are different from others (Choi, Jang, & Nam, 2008). First, it is common to find functional changes in the elderly with poorly controlled type 2 DM that are caused by aging and psychological and social problems. These changes impact on the management of DM complications through the doctor's instructions or drugs alone (Sung, 2015). Second, this group has special needs in managing their behaviors to prevent CDV complications.Thirdly, they need diabetes self-management support to improve their ability to perform self-management for preventing CDV complications. Thus, the elderly with poorly controlled type 2 DM need diabetes self-management support to improve their health behaviors and to be physically active by involving healthcare professionals, family members, or friends (Suhl & Bonsignore, 2006). Self-management support also could improve the clinical outcomes, such as fasting blood glucose (FBG), lipid profiles, which consist of total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and blood pressure in patients with diabetes (Pamungkas, Chinnawong, & Kritpracha, 2015; Suwankruhasn, Pothiban, Panuthai, & Boonchuang, 2013).

Self-management support has been proven to be a basic foundation for empowering the performance of health behaviors and has benefits in improving the clinical outcomes in patients with DM. A study that was conducted by Glasgow, Davis, Funnell, and Beck (2003) stated that the 5A's self-management support could facilitate self-management and change the behaviors in patients with chronic illness, including DM. The 5A's self-management consists of assess, advise, agree, assist, and arrange (Glasgow *et al.*, 2002, 2003).

Some previous studies regarding self-management support have been conducted in Indonesia. A study that was conducted by Kurniwawan, Sae-Sia, Maneewat, and Petpichetchian (2011) focused on preventing diabetic foot ulcers, while Primanda, Kritpracha, and Thaniwattananon (2011) focused on the dietary behaviors of patients with type 2 DM. Another study focused on improving dietary and exercise behaviors, as well as the clinical outcomes, in the general DM population (Pamungkas, Chinnawong, & Kritpracha, 2015). However, there has been no published study on the use of a 5A's self-management support program that could improve the prevention of cardiovascular complication behaviors and improve the clinical outcomes in the elderly with poorly controlled type 2 DM in Indonesia. In addition, Indonesia is one of the countries that has had a high prevalence of DM in the elderly who are >60 years old (IDF, 2013) and who have developed CDV complications (Ariadna, 2015). The elderly with DM need social support to achieve their goals and family support is a basic social support for the elderly with type 2 DM to increase self-management behaviors (Miller & DiMatteo, 2013). Moreover, family support is a part of the "assist" process of the 5A's self- management support program to achieve behavioral change goals (Glasgow *et al.*, 2002, 2003).

Therefore, this study proposed to examine the effect of a cardiovascular self-management support program on preventing cardiovascular complication behaviors and improving the clinical outcomes in the elderly with poorly controlled type 2 DM by applying the 5A's self-management support program and by integrating family support in order to achieve the health behaviors and clinical goals, such as FBG, lipid profiles, and blood pressure.

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MATERIALS AND METHODS

2.1.Study aims

The aims of this study were to determine the feasibility, and to evaluate the effect of, a cardiovascular self-management support program by applying the 5A's self-management support program for preventing cardiovascular complication behaviors and improving clinical outcomes in the elderly with poorly controlled type 2 DM.

Conceptual framework of this study

Two concepts have been integrated in order to construct the conceptual framework of the study. The first was the 5A's self-management support program that was proposed by Glasgow *et al*. (2003). The second was preventing cardiovascular complication behaviors to prevent CDV complications in the elderly with poorly controlled type 2 DM, as proposed by ADA (2015). The detail of the conceptual framework of this study is available in Figure 1.

Design

A pilot study was undertaken in order to assess the feasibility of the cardiovascular self-management support program to enhance the quality of the real study. A two-group pretest–post-test quasi-experimental research design was used in order to examine the effect of the cardiovascular self-management support program on preventing cardiovascular complication behaviors and the clinical outcomes in the elderly with poorly controlled type 2 DM.

Setting

This study was conducted at the Elderly Health Care Unit from December, 2016 to February, 2017. This Elderly Health Care Unit serves as a top referral unit for diabetes, as well as a major research and education facility for doctors and nurses in Indonesia.

Participants

The participants were the elderly with poorly controlled type 2 DM who were recruited from the Elderly Health Care Unit by using the purposive sampling technique. The inclusion criteria were: (i) aged >60 years old; (ii) FBG of ≥154 mg/dL; (iii) duration of diabetes of at least 1 year; (iv) able to communicate in Indonesian; (v) has both verbal and written skills; (vi) can be contacted by a telephone and a home visit; (vii) has no hearing impairment; (viii) has a family member who stays with the elderly person with poorly controlled type 2 DM; and (ix) has no mental health problem.

As this study was a pilot study, according to Baker (1994), a pilot study often is used to try out the guideline or collecting data procedure in preparation for the real study. The calculation that is used to determine the sample size for the real study was based on the power analysis by using an effect size (d) from a previous study. The effect size from a previous study was 1.83 in order to achieve alpha = 0.5, power = 0.5, and effect size (d) = 1.83; therefore, at least 25 patients were required per group (experimental group [EG] and control group [CG]). To fill the two groups, 50 patients were enrolled. In addition, because the sample size was <200, the sample size was increased by 20% (five patients) for each group to prevent Type II error (Polit & Beck, 2012). Therefore, the sample size of the real study was 60 participants (Hisni, Chinnawong, & Thaniwattananon, 2017). The researcher calculated 10–20% from the real study. Thus, 12 participants were recruited in this pilot study. Then, they were randomly assigned to either the EG or the CG, which used a matching technique based on age and sex. The EG (n = 6) received the cardiovascular self-management support program from the researchers and usual care, whereas the CG (n = 6) received the usual care.

Ethical considerations

This study was granted permission (Approval No. MOE 0521.1.05/3363, 800/221/16/TU, 800/224/TU) to access the elderly with poorly controlled type 2 DM. Informed consent was obtained from each participant and their family member with the standard informed consent procedure and the principles of respect for autonomy, anonymity, confidentiality, and privacy of the participants were practiced. The participants were treated with respect and were well informed of their right to freely decide whether to participate in the study, with the right to withdraw at anytime without penalty (Orb *et al*., 2001).

Data collection

The data collection was conducted sequentially. The head and staff nurses at the Elderly Health Care Unit, Jombang Public Health Center, were well informed of the study by the researcher; then, the elderly with poorly controlled type 2 DM were identified from the medical records at the Elderly Health Care Unit. Next, each participant was approached and asked for permission to introduce his or her family member to assist in

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Cardiovascular self-management support program	
Components of 5A's self-management support program	**Activities**
Assess	1. Assess the elderly on the current knowledge, skills, and their beliefs regarding: a. Blood sugar control b. DM complications, especially CDV complications c. Preventing cardiovascular complications behaviors 2. Assess the clinical data (FBG, total cholesterol, HDL cholesterol, LDL cholesterol, and blood pressure) as risk factors of CDV complications
Advise	1. Provide the specific information regarding the PB including DM diet and heart-healthy diet, physical exercise, taking medications regularly, and smoking cessation, as well as provide the results of the clinical data by: a. Performing discussion individually b. Preparing family member to be involved in this program c. Distributing a PCCB booklet
Agree	1. Elderly set the goals of the PCCB by collaborating with the researcher and family member 2. Elderly and their family member are able to change, modify, manage, continue, or discontinue the PCCB based on their interest and confidence to achieve the goals
Assist	1. Elderly develop the action plans that will be supported by the researcher and family member to meet the goals such as: a. List specific goals for DM diet and heart-healthy diet, physical exercise, taking medications regularly, smoking cessation, and target of the clinical data levels b. Identify the possible barriers while performing the PCCB c. Discuss and use problem-solving techniques to find the strategies to address the barriers d. Share the action plans with the researcher and family member of the elderly
Arrange	1. Set the time for follow-up session both via telephone, and face-to-face follow-up at the elderly healthcare unit or home visit 2. Evaluate and justify the goals of the PCCB as listed on action plans 3. Give reinforcement for elderly who successfully perform the PCCB 4. Give encouragement or moral support to the elderly who are trying to perform the PCCB

Preventing cardiovascular complications behaviors:
1. DM diet and heart-healthy diet
2. Physical exercise
3. Taking medications regularly
4. Smoking cessation

Clinical outcomes:
1. Fasting blood glucose
2. Lipid profiles
3. Blood pressure

Figure 1 Conceptual framework of the study. CDV, Cardiovascular; DM, diabetes mellitus; FBG, fasting blood glucose; HDL, high-density lipoprotein; LDL, low-density lipoprotein; PCCB, Preventing Cardiovascular Complication Behaviors.

this study. At the time of the appointment, the potential participants were assessed for their eligibility to participate in the study. Finally, the researchers started collecting the data by using individual education with each eligible participant in the EG, either face-to-face or via a telephone call.

The structured questionnaire that was used for the data collection consisted of three parts: (i) Preventing Cardiovascular Complications Behaviors Questionnaire (PCCBQ); (ii) demographic data questionnaire and health-related information (DDQHRI); and (iii) clinical outcome measurements, which consisted of the FBG, total cholesterol, HDL cholesterol, LDL cholesterol, and blood pressure. The original version of the PCCBQ was developed by Ahyana (2013). A high score on the PCCB indicated that the participants carried out the PCCB more frequently. The DDQHRI was developed by the researcher. The FBG was measured by using GlucoDr® (Ludhiana, Punjab, India), the total cholesterol, HDL cholesterol, and LDL cholesterol were measured by using LipidPro™ (South Korea), and the blood pressure was measured by using automatic blood pressure equipment (OMRON IA2; Singapore). In this study, the PCCBQ was modified and translated into an Indonesian version. Permission was received to use the PCCBQ. Its validity was approved by three experts from Prince of Songkla University, an endocrinologist from Cilegon City Hospital, and the University of Indonesia. The internal consistency of the PCCBQ was 0.88. According to Polit and Beck (2012), this result is reliably acceptable.

Cardiovascular self-management support program

The participants in the EG received the cardiovascular self-management support program, which consisted of assessing their current beliefs and behaviors in preventing cardiovascular complication behaviors, providing specific information regarding these behaviors by involving the family members of the participants, collaborating between the researchers, the participants,

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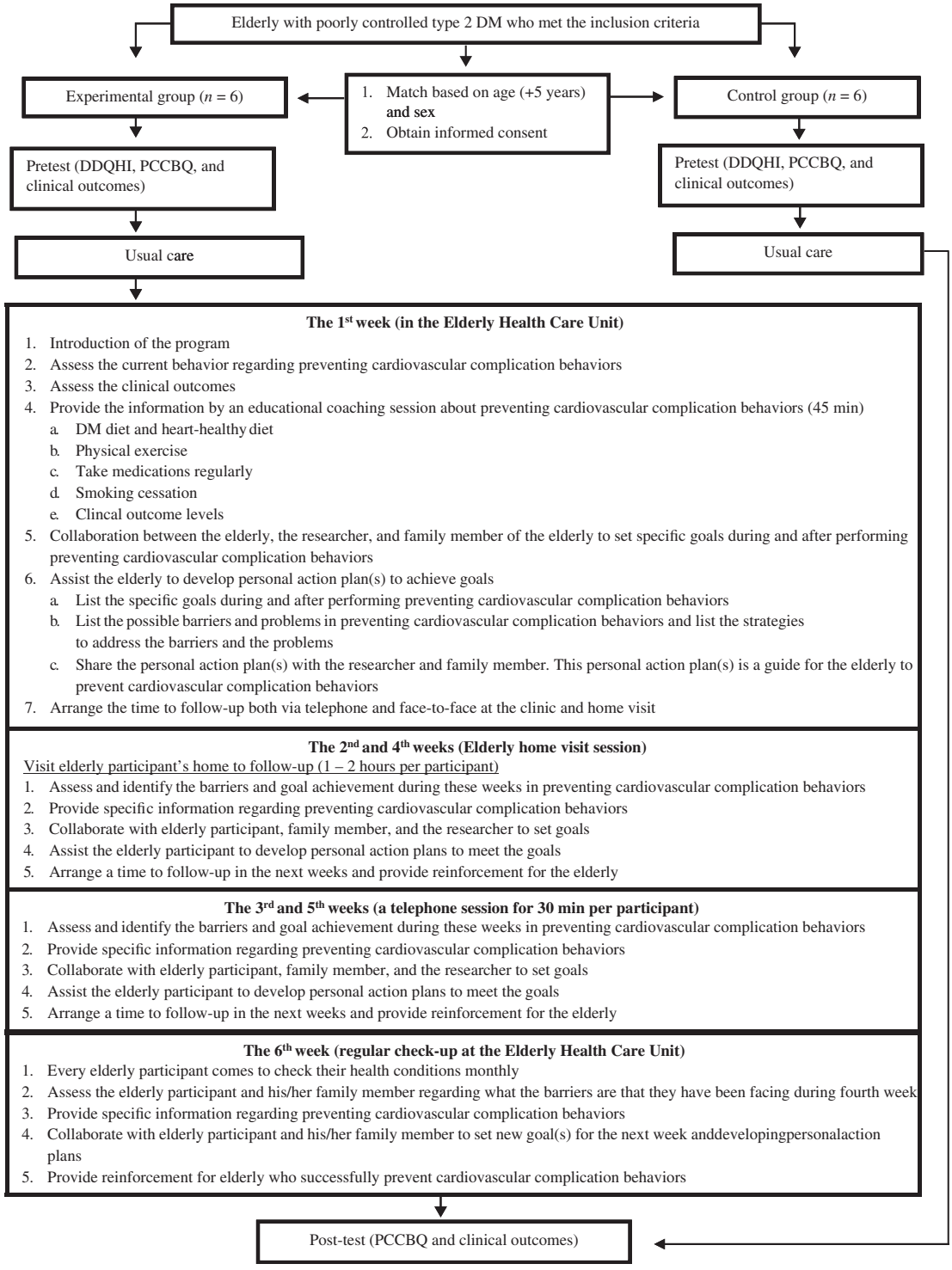

Figure 2 Cardiovascular self-management support program. DDQHRI, Demographic Data Questionnaire and Health-Related Information; DM, diabetes mellitus; PCCBQ, Preventing Cardiovascular Complication Behaviors Questionnaire.

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and the family members of the participants to set goals regarding the PCCB, assisting the participants and the family members to develop the action plans to meet their goals, and encouraging the participants and their family members to maintain their behaviors in achieving their goals, as well as arranging a time for follow-up planning, both face-to-face and by telephone. Meanwhile, the participants in the CG only received the usual care. The program was conducted over 6 weeks, both at the Elderly Health Care Unit, Public Health Center and the participant's home. The details of the program are available in Figure 2.

Data analysis

The data were obtained and were entered, recoded, cross-checked, and analyzed by using IBM SPSS for Windows (v. 20.0, IBM Corporation, Armonk, NY, USA). Data statistics were used to analyze the DDQHRI.

The chi-squared test and independent *t*-test were used to examine the difference of characteristics between the EG and CG at the baseline. The assumption of normality and homogeneity of variance of the variables were conducted before to determine the appropriate statistical analysis. The researcher used the independent *t*-test for testing the differences of the mean score of the PCCB and the clinical outcomes between the EG and CG, while the paired *t*-test was used to test the differences of the mean score of the PCCB and clinical outcomes in both the EG and the CG before and after receiving the cardiovascular self-management support program (CSSP).

RESULTS

Demographic data and health-related information

The mean age of the participants in the EG was 63.67 (SD [standard deviation] = 3.14) years and in the CG it was 62.67 (SD = 4.08) years. There was no significant difference in terms of sex between the EG and CG. Most of the participants had graduated from elementary school (33.3%) and senior high school (33.3%) in the EG, while in the CG, it was senior high school (66.7%). In both the EG and CG, there were housewives (50%). Regarding the duration of the DM, most of the participants had experienced DM for >5 years in the EG (66.7%) (Table 1).

Effect of the cardiovascular self-management support program on preventing cardiovascular complication behaviors in the elderly with poorly controlled type 2 diabetes mellitus

The mean score of the PCCB between the EG and the CG before receiving the program showed no significance difference ($t = 0.53$, $P > 0.05$) (Table 2). However, after receiving the program, the mean score of the PCCB

Table 1 Demographic Questionnaire and Health-Related Iinformation data ($n = 12$)

	Experimental group		Control group		
Variable	$n_{1\,=}$ 6	%	$n_{2\,=}$ 6	%	*P*-value
Age (range = 60–70 years)	Mean = 63.67	SD = 3.14	Mean = 62.67	SD = 4.08	0.64†
Sex					1.00
Male	3	50.0	3	50.0	
Female	3	50.0	3	50.0	
Educational level					0.57‡
Elementary school	2	33.3	1	16.7	
Junior high school	1	16.7	1	16.7	
Senior high school	2	33.3	4	66.7	
Diploma degree	1	16.7			
Occupation					1.00‡
Housewife	3	50.0	3	50.0	
Retired government employee	2	33.3	2	33.3	
Retired private employee	1	16.7	1	16.7	
Diabetes mellitus duration (years)					0.55‡
3–5	2	33.3	3	50.0	
>5	4	66.7	3	50.0	
Last fasting blood glucose level (mg/dL)	Mean = 177.33	SD = 36.69	Mean = 189.83	SD = 112.78	0.80†

† Independent t-test. ‡ Chi-squared test. SD, standard deviation.

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Table 2 Pretest and post-test mean scores of the Preventing Cardiovascular Complication Behaviors Questionnaire (PCCBQ)

Variable	Experimental group $n_1 = 6$		Control group $n_2 = 6$			
	Mean score	SD	Mean score	SD	*t*-value	*P*-value
PCCBQ						
Pretest	61.33	2.22	59.00	6.38	0.53	0.60
Post-test	92.83	13.17	58.17	6.08	12.25	0.00

SD, standard deviation.

Table 3 Comparison of the pretest and post-test mean scores of the Preventing Cardiovascular Complication Behaviors Questionnaire (PCCBQ)

Group	Pretest		Post-test			
	Mean score	SD	Mean score	SD	*t*-value	*P*-value
Experimental group	61.33	2.22	92.83	13.17	5.67	0.00
Control group	59.00	6.38	58.17	6.08	0.26	0.80

SD, standard deviation.

showed a significance difference between the EG and the CG ($t = 5.67$, $P \leq 0.05$) (Tables 2 and 3).

Effect of the cardiovascular self-management support program on the clinical outcomes in the elderly with poorly controlled type 2 diabetes mellitus

The mean scores of the clinical outcomes before receiving the program demonstrated no significant difference between the EG and the CG ($P > 0.05$), except for the diastolic blood pressure ($P < 0.05$). However, after receiving the program, the clinical outcomes showed a significant difference between the EG and the CG ($P < 0.05$) (Table 4).

The comparison of the clinical outcome mean scores within the EG and CG showed that the participants in the EG demonstrated significant differences in the FBG, total cholesterol, HDL cholesterol, systolic blood pressure, and diastolic blood pressure before and after receiving the program ($P < 0.05$), except for the LDL cholesterol ($P > 0.05$), in contrast to the participants in the CG, who showed no significant difference in the clinical outcomes before and after receiving the program ($P > 0.05$) (Table 5).

Table 4 Pretest and post-test mean scores of the clinical outcomes for the elderly

Variable	Experimental group $n_1 = 6$		Control group $n_2 = 6$			
	Mean score	SD	Mean score	SD	*t*-value	*P*-value
Pretest clinical outcomes (mg/dL)						
FBG	223.00	77.43	192.50	68.39	0.72	0.48
Total cholesterol	190.00	41.62	193.50	31.95	–0.16	0.87
HDL cholesterol	41.50	3.39	49.17	10.18	–1.74	0.11
LDL cholesterol	93.00	35.91	81.33	22.58	0.67	0.51
Systolic blood pressure	148.00	18.34	156.67	18.61	–0.78	0.45
Diastolic blood pressure	88.33	4.08	85.00	5.47	1.19	0.26
Post-test clinical outcomes (mg/dL)						
FBG	132.00	28.86	190.67	48.65	–2.54	0.02
Total cholesterol	145.67	32.84	194.67	6.97	–3.57	0.00
HDL cholesterol	52.17	7.19	41.50	6.15	2.75	0.02
LDL cholesterol	56.83	7.88	94.17	18.77	–4.49	0.00
Systolic blood pressure	131.67	13.29	148.33	11.69	–2.30	0.04
Diastolic blood pressure	72.67	3.32	84.33	9.75	–2.77	0.02

FBG, fasting blood glucose; HDL, high-density lipoprotein; LDL, low-density lipoprotein; SD, standard deviation.

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Table 5 Comparison of the pretest and post-test mean score of the clinical outcomes within the experimental group (EG) and control group (CG)

Variable	Pretest		Post-test		*t*-value	*P*-value
	Mean score	SD	Mean score	SD		
Clinical outcomes in the EG						
FBG	223.00	77.43	132.00	28.86	4.21	0.00
Total cholesterol	190.00	41.62	145.67	32.84	2.37	0.00
HDL cholesterol	41.50	3.39	52.17	7.19	–4.95	0.00
LDL cholesterol	93.00	35.91	56.83	7.88	2.23	0.07
Systolic blood pressure	148.00	18.34	131.67	13.29	2.98	0.03
Diastolic blood pressure	88.33	4.08	72.67	3.32	9.28	0.00
Clinical outcomes in the CG						
FBG	192.50	68.39	190.67	48.65	0.19	0.85
Total cholesterol	193.50	31.95	194.67	6.97	–0.09	0.92
HDL cholesterol	49.17	10.18	41.50	6.15	1.42	0.21
LDL cholesterol	81.33	22.58	94.17	18.77	–2.54	0.05
Systolic blood pressure	156.67	18.61	148.33	11.69	1.74	0.14
Diastolic blood pressure	85.00	5.47	84.33	9.75	0.15	0.88

CG, control group; EG, experimental group; FBG, fasting blood glucose; HDL, high-density lipoprotein; LDL, low-density lipoprotein; SD, standard deviation.

DISCUSSION

Demographic data and health-related information

The findings of this study showed that the average age of the participants was 63 years in the EG and 62 years in the CG. A study that was conducted by Gunasekaran and Gannon (2011) found that the prevalence of type 2 DM was more than twice that in the elderly than that of middle-aged adults and this peaked at 60–74 years old. Most of the participants who came to the Elderly Health Care Unit were housewives with a duration of DM of >5 years.

An increasing type 2 DM duration was associated with disease progression. Progressive loss of the pancreatic beta cell function has been shown to cause poor glycemic control, regardless of the treatment regimen (Sazlina *et al.*, 2014).

Effect of the cardiovascular self-management support program on preventing cardiovascular complication behaviors in the elderly with poorly controlled type 2 diabetes mellitus

The improvement in the PCCB in the EG in this study was related to the application of the 5A's self-management support model. It was to facilitate self-management and behavioral change. Suwankruhasn *et al.* (2013) reported that the 5A's self-management, using behavioral change strategies, stimulated the individual's conduct of health behaviors, achieved the target behavior actions, as well as improved the clinical characteristics, such as the FBG, lipid profiles, and blood pressure.

In this study, the process of the 5A's self-management support program was conducted sequentially every week during the 6 week period. The first process was assessment. The result of this process in this study could assist the researcher to obtain more understanding about the self-management issues and beliefs of the elderly with poorly controlled type 2 DM. The second process was to advise; thus, the researcher provided specific information individually regarding the PCCB to ensure the information from the researcher was understood well by the participants and their family members. This was similar to a previous study that was conducted by Zareban, Karimy, Niknami, Haidarnia, and Rakhshani (2014), who reported that giving specific education could improve diabetes self-management behaviors. Another study that was conducted by Bodenheimer and Handley (2009) reported that giving education individually enabled the patients to feel free to either gain more knowledge or share their experience, based on achieving goals and problem-solving when they were facing some barriers.

Besides providing specific information, the researcher also distributed a PCCB booklet. Although a

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quantitative measurement was not taken, the participants who received a booklet during the program reported that it was useful to them in regards to their daily life, as well as improved their knowledge. It has been found that written guidelines, such as a booklet, could effectively improve a patient's knowledge (Melchior, Carter, Helsley, Ernest, and Friesner, 2010). The next process of 5A's self-management support was agreement; thus, while conducting the study, the participants and their family members collaborated with the researcher to set specific goals regarding the PCCB and the clinical outcomes every week. Bodenheimer and Handley (2009) and Handley *et al*. (2006) reported that the practice of goal-setting and incorporating collaborative goal-setting into routine primary care practice was a useful strategy to promote behavior change.

The next process of the 5A's self-management support was assistance. The participants developed the action plans. They also contributed to improving the PCCB. During the study, some of the participants found barriers related to the DM diet and heart-healthy diet. They reported that Indonesian society has a habit in terms of preparing a variety of food during celebrations, such as Islamic festivals called *Eid Al-Fitr* and *Eid Al-adha*, as well as a weekly recitation called *pengajian*. Each family prepared a lot of food in which they did not consider the amount of fat, sugar, carbohydrates, vitamins, and protein. During festivals, the families invited their neighbors to come, celebrate, pray, and eat together. Eventually, some of the participants had difficulty in managing the challenges to carry out the DM diet and heart-healthy diet. However, the strategy to solve these barriers came from the role of the family member of the participants. It was necessary for the family member to remind the participants to avoid certain food during the festivals. This finding was similar to a previous study by Kelly (2011) that stated that individuals with a high level of commitment were able to consistently carry out a wide range of healthful behaviors and maintain a stage of dietary change.

In this study, family support had an influence on improving the PCCB in the elderly with poorly controlled type 2 DM. This finding was similar to the previous study that was conducted by Miller and DiMatteo (2013), which revealed that the elderly with DM needed family support to achieve behavioral change. The role of the family member in this study was to take care of the participants every day, in terms of carrying out the PCCB, such as reminding the participants to eat based on the DM diet and heart-healthy diet, preparing food for them, accompanying them to perform physical exercise, as recommended by the researcher, reminding them to take their medications as scheduled, and assisting them in recording the medications that were consumed in the medication logbook. Furthermore, achieving behavioral change goals should involve healthcare professionals, family members, friends, or other caregivers (Suhl & Bonsignore, 2006). In addition, a lack of family support was associated with a failure to change health behaviors (Suwankruhasn, Pothiban, Panuthai, and Boonchuang, 2013).

The last reason for the improvement in the PCCB in the EG in this study was related to the participants receiving weekly follow-ups, both by telephone and face-to-face. In this study, there were two telephone follow-ups and four face-to-face follow-ups at the participants' home and at the Elderly Health Care Unit. Each week, the participants and their family member received follow-up regarding their performance of the PCCB. This finding was similar to previous studies of interventions using phone calls and face-to-face follow-ups, which were effective in improving self-management behaviors, such as dietary and physical exercise (Eakin *et al*., 2007; Fan & Sidani, 2009). However, the result of this study was in contrast with a previous study that revealed that follow-ups using phone calls did not improve the behavioral outcomes of patients with DM (Polisena *et al*., 2009).

Effect of the cardiovascular self-management support program on the clinical outcomes for the elderly

The mean scores of the FBG, total cholesterol, HDL cholesterol, LDL cholesterol, systolic blood pressure, and diastolic blood pressure were significantly better in the EG than for those in the CG. Furthermore, there was a significant difference in the mean scores between the EG and CG. There were factors that contributed to the clinical outcomes of the EG that showed a significant reduction afterwards.

The first reason for the improvement in the clinical outcomes in this study was related to the participants and their family members in the EG performing well, in terms of the DM diet and heart-healthy diet by limiting their sugar and carbohydrate intake and carrying out the Dietary Approach to Stop Hypertension, which consists of eating protein, reducing the total fat intake, whole grains, low fat dairy products, a diet rich in fruits and vegetables, and limited sodium intake to no more than one teaspoon per day. This finding was consistent with another study that was conducted by Azadbakht

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et al. (2011), which revealed that the DASH diet significantly reduced the FBG level, HbA1c level, lipid profiles, and body weight of the participants. The mechanism of DASH to improve the FBG and lipid profiles has been stated by Barclay *et al.* (2008), who explained that fiber from whole grains, legumes, and nuts reduce glucose absorption, as well as improve insulin demand and β-cell function.

Besides the DM diet and heart-healthy diet, physical exercise could improve the clinical outcomes. This finding was similar to the study from the ADA (2015), which stated that regular exercise for at least a 6 week duration could improve blood glucose control, reduce cardiovascular risk factors, contribute to weight loss, and improve well-being. In this study, the participants were accompanied by their family member in order to perform physical exercise (i.e. walking) for at least 30 min per day for 3–5 days per week, and before they walked, they had to perform warming-up and cooling-down techniques. Walking is the exercise that improves oxygen consumption and increases the functioning of the cardiovascular and respiratory systems and also improves the physiological parameters, including glycemic control, the FBG level, and lipid profiles. Moreover, it could restore the endothelial function and reduce the arterial stiffness, which is the positive denominator for developing cardiovascular complications in patients with type 2 DM (Thent, Das, & Henry, 2013).

Taking medications regularly also contributed to improving the clinical outcomes. In this study, the participants received medications from the doctor, such as metformin, simvastatin, and amlodipine. Soe *et al.* (2011) reported that metformin, amlodipine, and simvastatin have a role in reducing the FBG level, total cholesterol, LDL cholesterol, blood pressure, and in increasing the HDL cholesterol. Metformin has a benefit by reducing the FBG by 50–70 mg/dL. Using metformin also is linked with a lower cardiovascular risk in the elderly with diabetes (Solini *et al.*, 2013). Furthermore, Devabhaktuni and Bangalore (2009) reported that amlodipine effectively lowered the blood pressure and reduced the cardiovascular risk, while simvastatin is a medicine that is used to prevent CDV risk factors (Boden *et al.*, 2011).

LIMITATIONS OF THE STUDY

The study was conducted within 6 weeks, which might not be enough time to evaluate a long-term behavior change in the elderly with poorly controlled type 2 DM. The follow-up by using telephone calls was conducted to ensure the effectiveness and improvement of the PCCB. However, some elderly were not able to use a phone and the researcher had to wait to talk with their family member to ensure that the elderly had carried out the PCCB well. Also, the researcher did not use the frail elderly scale to categorize the fraility levels of the elderly.

IMPLICATIONS OF THE STUDY

This study provides evidence that a cardiovascular self-management support program by using the 5A's self-management support program can be used as a nursing intervention to improve the prevention of cardiovascular complication behaviors and clinical outcomes in the elderly with poorly controlled type 2 DM. The program consists of clear intervention guidelines and a method to be applied by nurses to assist both the elderly with poorly controlled type 2 DM and their family member in providing effective care for their loved one with poorly controlled type 2 DM. The nurses can use this program either in hospital or in a community setting by applying the 5A's self-management support program. The health policy-makers should consider this program to be one of the necessary programs in the Elderly Health Care Unit, Public Health Center, Indonesia. Therefore, using the cardiovascular self- management support program by applying the 5A's self-management support program to fulfill the visions of Indonesia to prevent DM complications; in particular, CDV complications, can be achieved. The results also suggest that the cardiovascular self-management support program should be used further with a larger sample size and longer follow-up in order to evaluate the sustainability of this program and to enhance the health behaviors of the elderly with poorly controlled type 2 DM and their family member.

CONCLUSION

In conclusion, this pilot study supports the feasibility and acceptability of implementing a cardiovascular self-management support program. Based on the results, the pilot study showed that a cardiovascular self-management support program that applies the 5A's self-management support program could improve the prevention of cardiovascular complication behaviors and clinical outcomes in the elderly with poorly

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controlled type 2 DM after the 6 week program. Moreover, future studies need to test the reliability of the PCCBQ in order to achieve better reliability for a large sample.

ACKNOWLEDGMENTS

We would like to express our gratitude to the expert from the Faculty of Nursing, Prince of Songkla University, Thailand, who validated the research instruments of this study: Charuwan Kritpracha. Also, all of the nurses at the Jombang Public Health Centre and the participants who participated in this study.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

D. H., T. C., and P. T. contributed to the conception and design of this study; D. H., S. S., and R. R. conducted the statistical analysis, drafted the manuscript, and revised it critically for important intellectual content; and D. H. and T. C. critically reviewed the manuscript and supervised the whole study process. All the authors read and approved the final manuscript.

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