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Effects of a Community Health Nurse Telehealth Care Program on Self-Management and Quality of Life Among Persons With Peritoneal Dialysis

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Abstract

Background: Chronic Kidney Disease (CKD) is a major public health concern worldwide including in Thailand. Early intervention of CKD can prevent or slow kidney disease progression and improve health status and Quality of Life (QOL) of CKD patients with peritoneal dialysis (PD).

Method: This quasi-experimental study aimed to examine the effectiveness of the Community Health Nurse Telehealth Care (CHNTC) Program on self-management and QOL among persons with peritoneal dialysis. The samples consisted of 52 Chronic Kidney Disease patients with PD. They were assigned to experimental and comparison groups, with 26 persons in each group. The experimental group received the twelve-weeks CHNTC program and the comparison group received usual care. Data were obtained using three questionnaires including a demographic characteristics and health information questionnaire, the PD Self-Management Scale, and the Kidney Disease QOL Short Form. Descriptive statistics and t-tests were used to analyze data.

Results: The experimental group showed significant improvement in overall self-management and in all its subscales after receiving the CHNTC program. Results also showed significant improvement in several domains of QOL. After completing the CHNTC program, significantly greater improvements in self-management and QOL regarding effect of KD and burden of KD were noted among participants in the experimental group compared to those in the comparison group.

Conclusion: The findings suggested the effectiveness of the CHNTC program for improving self-management of PD patients, thus enhancing patients' QOL.

Keywords: Persons with peritoneal dialysis, QOL, Self-management, Telehealth care program, Thailand

1. Introduction

The growing prevalence of Chronic Kidney Disease (CKD) is a major public health concern worldwide including in Thailand. All stages of CKD are associated with increased risks of cardiovascular morbidity, premature mortality, and/or decreased Quality of Life (QOL) [1]. Its progression leads to end-stage renal disease (ESRD) and patients have to receive kidney replacement therapy. In Thailand, the number of patients in the last stage of CKD is steadily rising every year. Approximately 8 million (17%) Thai people aged 18 years and over have CKD and 39,411 people have CKD at its last

stage [2]. The prevalence of patients with peritoneal dialysis (PD) has increased from 392.5 to 463.8 patients per million population in 2018 and 2019. In 2019, 151,343 patients received kidney replacement therapy, of which 30,869 patients received peritoneal dialysis, 114,262 received hemodialysis and 6212 received kidney transplantation [3].

There is evidence to support that the QOL of ESRD patients undergoing dialysis is usually worse because of the high burden of comorbidity, complication of ESRD, and the intrusiveness of the treatment [2]. ESRD negatively impacts health-related QOL (QOL) of patients [4] and can also damage the body image and general QOL of patients [1]. In addition, infection or peritonitis is a

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major cause of death in patients with peritoneal dialysis [5] resulting in a reduced QOL for patients. Previous studies conducted in Thailand indicated that QOL of PD patients was at a moderate level for physical, psychological wellness and the ESRD-targeted QOL, and their QOL was worse than that of the general population [6,7].

QOL is a key outcome measure in the treatment of chronic illnesses, specifically CKD [1]. In Thailand, a government's "Peritoneal Dialysis First" project was established in 2008 to serve patients by providing PD under the national health security budget in cooperation with local governments [8]. Under-served care for patients may cause risks such as an increased rate of infections or peritonitis and complication of PD due to patients' lack of knowledge and skills to change the dialysis solution [9]. Self-management is therefore important in patients with PD. Furthermore, all activities and procedures take a long time and may mentally affect the patient causing discouragement, lack of motivation, and hopelessness [10]. Self-management is not only more than simple adherence to treatment guidelines but is also associated with the psychological, social, and behavioral management of living with a chronic illness [11]. It can thus be assumed that stimulating self-management may improve the health status and QOL of people with PD.

The innovation of Telehealth intervention can help healthcare services be more effective and encourages a better QOL for PD patients [12]. The benefits for patients include the reduction of expense and inconvenience when compared with having to travel long distances to access a service [13]. It can additionally minimize the possible complications such as infection [14] and decrease anxiety and psychological problems [15]. A prior study indicated that home telehealth was cost-saving for the healthcare system [16]. Results from a previous study indicated "fewer episodes of health worsening" and "general improvement in clinical, functional, and QOL status" among patients receiving telehealth care [17]. However, there had been limited data of the existing telehealth program to support self-management for patients with peritoneal dialysis in Thailand. Most of the studies have been limited to self-management program without the use of telehealth technologies to support self-management [18,19]. A recent study conducted in Thailand indicated that the PD patients and caregivers reported overall needs for telehealth at a high level and required resources for knowledge and skills related to PD and self-care, communication channels in various forms, dialysis fluid follow-up,

and recording/monitoring health and dialysis related information [20].

Based on prior evidences and literature reviews, the researchers therefore developed a community health nurse telehealth care program for PD persons to promote self-management practices and QOL. Innovative Care for Chronic Conditions Model (ICCCM) [21] was applied to guide the study's theoretical framework. The ICCCM is an extension of the Chronic Care Model developed by Wagner et al. [22] to present a structure for organizing health care for people with chronic conditions. The ICCCM consists of three levels of care management including micro, meso, and macro level. For this study, three levels of ICCCM were applied to design the care management for PD patients. The **micro level** focused on PD patients, their family caregivers, and health care teams. PD Patients and their caregivers were informed about CKD and were prepared for self-management knowledge and skills and were motivated for self-management practice and self-management monitoring at home via phone and mobile application by the nurse researchers and PD nurse. The **meso level** focused on the use of information technology as a medium for promoting better treatment process in addition to regular treatment that helps PD patients at home. For this study, the telehealth mobile application (HomePDCare) was developed and used to support and promote self-management practice at home. The **macro level** focused on the delivery system by the healthcare team implementing individual or group visits and planning follow-up visits for PD patients. The purpose of this study was to examine the effectiveness of a community health nurse telehealth care program on self-management and QOL of persons with peritoneal dialysis.

2. Methods

2.1. Participants

This study was a quasi-experimental study with two groups, pre-test and post-test design. Initially, a sample of 62 CKD patients with PD who met the inclusion criteria were recruited from the CKD unit of a general hospital in Songkhla province. The sample size was determined using power analysis for comparisons of two groups at a single time point. The estimated effect size was based on a previous study [23]. According to Cohen [24] to achieve alpha (α) .05, power (ρ) .80 and effect size (d) .70, at least 26 subjects are required per group. An additional 20% were included to overcome attrition rate making the total number of subjects 62, or 31 per group. While

participating in the study, 10 PD patients dropped out due to the change of treatment to hemodialysis (experiment 3, comparison 2), death (experiment 2, comparison 2), and withdrawal from the study (comparison 1). A total of 52 PD patients completed 12 weeks of the study and were included in the analysis (experimental 26, comparison 26).

The names of potential participants were obtained from the list of PD patients who attended the CKD unit at a general hospital in Songkhla province. The researchers reviewed their medical records to determine if they met the inclusion criteria that included: 1) being diagnosed with stage 4 or 5 Chronic Kidney Disease by a physician 2) being adults 18 years old and above 3) no severe complications and cognitive impairment, and 4) being able to perform daily living activities independently. If potential participants met the inclusion criteria, they were approached via phone and informed about the study and invited to participate by the PD nurse. After consenting to participate, the eligible participants were assigned to either the experimental or the comparison group using simple random sampling. The researchers then made an appointment to meet the participants. **Exclusion Criteria:** During the study, the participants were excluded if they: 1) developed a severe complication that caused them to be unable to continue participating in the intervention or to be unable to perform self-management activities and 2) did not complete the full study.

2.2. Research instruments

Intervention Instrument: 1) *The Community Health Nurse Telehealth Care Program* was a telehealth program developed by the researchers based on the ICCCM of WHO [21] and reviewed literature. The program lasted for 12 weeks and consisted of three phases. The first phase (week 1) was a 90-minutes face-to-face educational and counselling session delivered by nurse researchers. The second phase (week 2–11) comprised self-management practices at home and follow-up with support and monitoring via phone once a week and mobile application once a month provided by the researchers and PD nurses. The third phase (week 12) was a 1-h face-to-face reflection and evaluation session. 2) **Telehealth Application** is an application created by the researchers as the medium of monitoring PD treatment, providing self-management support and communication with PD patients and their caregivers in order to increase knowledge, skills, and confidence in managing their health problems and self-management practices at home. The components of this telehealth application consist of 2

parts: 1) **Web application (on web browser)** for PD nurse and system administrators. Initially, PD nurse or related staff register all PD patients into the system and fill out their personal data e.g. gender, date of birth, marital status, education level, address, etc. PD nurses or related staff assign access rights to patients, caregivers and users and assign the username and password to each PD patient or caregiver to be able to access the system and record their daily vital health data by themselves when returning home. Through this web application, PD nurses or related staff are able to view the patient's daily record information. If the information indicates abnormality, the PD nurses are able to gain information from the system and contact PD patients through the chat menu to provide initial assistance and give advice to PD patients and their caregivers immediately. In addition, PD nurses are able to upload health information and health resources that are useful to PD patients and their caregivers through the health data management menu. 2) **Android application (on mobile) HomePDCare** for PD patients and their caregivers. This HomePDCare application was designed as a mobile health application that functions as one of the resources for PD self-management support. To access the system, PD patients have to sign in using their assigned username and password. Through this mobile application, PD patients had access to CKD health care resources provided by PD nurses. They are also able to record their daily vital health-related data such as weight, height, food consumption, PD self-management practices and complications in the assessment form. PD patients and their caregivers are able to have two-way communication with PD nurse and the researchers through a chat messages menu and they are able to send a picture to obtain help.

2.3. Data collection instruments

Personal and health information questionnaire includes demographic data such as age, gender, religion, marital status, education, occupation and health data such as CKD duration, peritoneal dialysis duration, peritonitis incidence, complications.

The PD Self-Management Scale (PDSMS) originally developed by Liu et al. [25] was back translated to Thai language and partly modified by Varitsakul [26]. It is a self-administered questionnaire used to determine the capability of PD self-management of the patient. It consisted of 24 items with five subscales including PD procedure, diet and fluid intake, medication, self-monitoring, and symptomatic management. It uses a 4-point Likert scale ranging

from poorly performing (1) to well performing (4). A higher score indicated a higher level of PD self-management capability. The content validity index (CVI) of PDSMS was assessed by five experts. All CVI values for items of the PDSMS were 1.00. The total scale for PDSMS was tested for its internal consistency among 30 PD patients yielding the Cronbach's alpha coefficient of .88.

The Kidney Disease QOL Short Form TM version 1.3 (KDQOL-SF TM) Thai Version [27]: The questionnaire was translated into Thai using forward and backward translation by two bilingual experts. It is a self-report measure developed for individuals with kidney disease and on dialysis focusing on particular health-related concerns of individuals [28]. It consisted of 24 specific questions with 79 items and composed of two parts: 1) ESRD-targeted areas and 2) general health survey (SF-36). The ESRD-targeted areas consisted of 11 domains with 43 items. The general health survey (SF-36) includes a 36-item health survey as a generic core consisting of eight multi-item measures of physical and mental health status. The total scale of KDQOL-SF TM questionnaire was tested for its internal consistency among 30 PD patients yielding the Cronbach's alpha coefficient of .96.

2.4. Data collection procedure

Ethical issue: Permission to conduct the study was approved by the Institutional Review Board on Research Involving Human Subjects of Prince of Songkla (PSU IRB 2017-Nst 032) and the Ethics Committee of the hospital in which data were collected (SHEC 2018-01-16- SH 259).

The experimental group: The researchers and research assistant met the participants and their caregivers in a private room at the CKD unit of the study setting hospital during the first week on the appointed date. The PD nurse research assistant then asked PD patients to complete the questionnaires (pre-test) including the personal and health information questionnaire, the self-management scale, and the Kidney Disease QOL Short Form. After completing questionnaires, the CHNTC program was carried out as follows:

At Week 1, the researchers and research assistant conducted a 90 min face-to-face educational and counselling session. The session included the following activities 1) PD patients and their caregivers received a 30 min face-to-face orientation about the HomePDCare mobile application and a set of instruction manuals for using the mobile application. Then, the PD patients were invited to download the HomePDCare application. The PD patients and their caregivers were taught about the function of the

HomePDCare Application features 2) an educational session was also included 3) during the session, PD patients were also motivated to reflect on their self-management experiences, discuss emotions and feelings, identify problems, create a goal and action plan for their PD self-management 4) PD patients were encouraged to reinforce themselves positively by setting rewards for themselves if their goals were achieved, and 5) caregivers received instructions on how to observe the PD patients' self-management practices at home and to examine the recording of activities in the mobile application.

Week 2 until Week 11 involved the following activities: 1) PD patients performed their PD self-management practices at home and recorded their daily self-management practices via their mobile application 2) The caregivers facilitated and observed the PD patient's self-management practice, examined the recording, and helped record data of self-management for the PD patients each week and assisted PD patients when needed 3) the researchers and PD nurse conducted telephone follow-up every week to assess whether patients had problems using the personal mobile application, to monitor patients' self-management practices, identify the problems, and give feedback and encouragement to comply with their goals and action plan 4) the researchers conducted face to face follow up once a month in week 4 and 8 via mobile application for evaluating goals achievement, checking self-management practice record, assessing problems, and providing information and support according to patient's problems and needs.

In week 12 at the CKD Unit, the researchers conducted a one-hour face-to-face reflection and evaluation session involving the following activities: 1) PD patients were urged to evaluate their self-management practices in the previous 11 weeks and to reflect on the problems, barriers, solutions, and conclusion of their practices 2) caregivers summarized their observations of the PD patient's self-management and provided comments on the problems, barriers, and solutions 3) the researchers concluded the overall participation in the CHNTC program 4) the research assistant asked participants to complete questionnaires a second time (post-test) 4), the researchers informed all participants and their caregivers about the end of the study and verbally thanked them for participating.

The comparison group: The researchers and PD nurse research assistant met the participants and their caregivers in a private room at the CKD unit of the study setting hospital at the first week on the appointed date. Then, the research assistant asked participants to complete the questionnaires including Personal and health information form, the

PD Self–Management Scale, and the Kidney Disease QOL Short Form (pre-test). After completing the questionnaires, the researchers made a second appointment with the participant at week twelve on a date that coincided with their medical appointment. From week 1–11, participants received usual care provided by PD nurse. The standard care provided was face-to-face health education about PD care and complication prevention. The PD nurse and PD patients communicated through a Line app group chat. At week 12, questionnaires were administered, a second time (post-test). All participants were verbally thanked for participating in the study and were invited to join the CHNTC program.

2.5. Data analysis

Descriptive statistics were used to analyze demographic data and health information. For comparison of differences between the two groups

regarding demographic data and health information, Chi-square and Independent t-test was used. For comparison of differences of Post-test mean scores of self-managements and QOL, between the comparison and experimental group, Independent t-test was carried out. For within group comparison, paired t-test was carried out. Before the analysis was carried out, the normality assumption of t-test (using skewness/SE and kurtosis/SE ± 1.96) was examined. The results showed that normality assumption was met for almost all dependent variables except SM regarding medication and symptom management (Post-test experimental gr), QOL regarding role physical (pre-test experimental and comparison grs), staff satisfaction (pre and Post-test comparison gr), patient satisfaction (pre-test experimental gr), and pain (Post-test comparison gr). Therefore, nonparametric statistics including Mann Whitney U test and Wilcoxon signed-rank test were used to analyze those non-normal data.

Table 1. Comparisons of pre-test mean scores of self-managements and QOL between the experimental group and the comparison group (N = 52)

Variables	Experimental group (n = 26)		Comparison group (n = 26)		t/Z	p-value
	M	SD	M	SD		
Self-management						
Overall PDSM	66.50	7.04	66.35	8.55	.07	.994
Subscale						
PD procedures	27.42	3.05	27.31	4.45	.11	.914
Diet and fluid	9.61	2.09	9.50	2.32	.19	.852
Medications	9.27	1.71	9.27	1.71	.00	1.000
Self-monitoring	12.15	2.07	12.27	2.13	.19	.844
Symptom management	8.04	1.73	8.00	1.77	.08	.937
QOL						
ESRD-targeted area						
Symptom/problem list	52.96	6.38	50.32	6.42	1.49	.143
Effects of kidney disease	40.98	8.49	37.86	8.90	1.29	.202
Burden of kidney disease	44.71	10.71	41.97	8.86	1.01	.319
Work status	30.77	31.86	30.77	31.86	.00	1.000
Cognitive function	63.59	7.83	61.28	12.37	.80	.425
Quality social interaction	52.31	10.78	49.23	8.45	1.14	.257
Sexual function ^a	62.50	13.87	55.77	10.96	1.05	.303
Sleep	35.58	6.83	35.48	7.84	.047	.963
Social support	49.35	16.65	49.35	15.97	.00	1.000
Dialysis staff encouragement	86.06	13.38	90.86	13.02	1.56 ^b	.118
Patient satisfaction	76.28	13.48	80.78	13.90	1.43 ^b	.152
Overall Health	57.31	8.27	57.69	8.15	1.69	.867
General Health (SF-36)						
Physical functioning	44.04	14.63	40.96	17.61	.68	.496
Role-physical	28.85	35.84	28.85	35.84	.00 ^b	1.000
Pain	44.13	9.35	42.40	12.91	.09	.993
General Health	42.50	6.96	44.81	9.11	1.03	.310
Emotional well-being	41.31	6.57	39.08	6.63	1.22	.229
Role-emotional	28.20	29.35	28.20	29.35	.00	1.000
Social function	47.60	8.67	43.56	9.00	1.65	.106
Energy/fatigue	52.88	6.03	49.23	8.21	1.83	.073

^a Sexual function (experimental gr n = 18; comparison gr n = 15).

^b Mann–Whitney U Test.

Table 2. Comparison between pre and Post-test mean scores of self-managements and QOL in the experimental group (n = 26) and the comparison group (n = 26)

Variables	Pre-test		Post-test		t/Z	p-value
	M	SD	M	SD		
Self-management						
Overall PDSM						
Experimental	66.50	7.04	79.73	3.21	9.99	<.001
Comparison	66.35	8.55	65.96	8.51	2.30	.030
PD Procedure						
Experimental	27.42	3.05	34.08	1.72	8.84	<.001
Comparison	27.31	4.45	27.27	4.49	0.57	.574
Diet and fluid						
Experimental	9.61	2.09	11.15	1.49	3.91	.004
Comparison	9.50	2.32	9.50	2.32	0.00	1.000
Medications						
Experimental	9.27	1.71	10.81	1.26	3.77 ^b	<.001
Comparison	9.27	1.71	9.27	1.71	0.00	1.000
Self-monitoring						
Experimental	12.15	2.07	13.96	1.64	4.75	<.001
Comparison	12.27	2.13	11.96	1.99	2.13	.043
Symptom management						
Experimental	8.04	1.73	9.73	0.78	3.76 ^b	<.001
Comparison	8.00	1.77	7.96	1.78	1.00	.327
QOL						
ESRD-targeted area						
Symptom/problem list						
Experimental	52.96	6.38	74.28	3.72	17.80	<.001
Comparison	50.32	6.42	75.72	4.86	14.65	<.001
Effects of kidney disease						
Experimental	40.98	8.49	56.85	7.23	8.36	<.001
Comparison	37.86	8.90	50.48	7.16	8.73	<.001
Burden of kidney disease						
Experimental	44.71	10.71	58.89	7.53	5.49	<.001
Comparison	41.97	8.86	47.35	8.69	2.01	.056
Work status						
Experimental	30.77	31.86	38.46	32.58	0.89	.381
Comparison	30.77	31.86	23.08	29.09	0.94	.356
Cognitive function						
Experimental	63.59	7.83	64.87	13.67	0.39	.698
Comparison	61.28	12.37	67.69	8.78	2.44	.022
Quality of social interaction						
Experimental	52.31	10.78	63.59	11.81	3.55	.002
Comparison	49.23	8.45	65.38	13.60	4.79	<.001
Sexual function ^a						
Experimental	62.50	13.87	74.11	15.86	2.01	.066
Comparison	55.77	10.96	63.46	20.07	1.38	.193
Sleep						
Experimental	35.58	6.83	52.21	14.84	5.68	<.001
Comparison	35.48	7.84	44.81	12.88	2.94	.007
Social support						
Experimental	49.35	16.65	62.82	15.85	3.25	.003
Comparison gr	49.35	15.97	58.32	20.69	1.61	.120
Dialysis staff encouragement						
Experimental	86.06	13.38	88.94	8.89	0.84	.407
Comparison	90.86	13.02	91.83	11.15	0.29 ^b	.772
Patient satisfaction						
Experimental	76.28	13.48	86.54	16.34	2.19 ^b	.029
Comparison	80.78	13.90	84.61	16.28	1.03	.314
Overall Health						
Experimental	57.31	8.27	69.61	11.82	4.92	<.001
Comparison	57.69	8.15	63.85	11.34	2.61	.015
General Health (SF-36)						
Physical functioning						

(continued on next page)

Table 2. (continued)

Variables	Pre-test		Post-test		t/Z	p-value
	M	SD	M	SD		
Experimental	44.04	14.63	51.35	8.67	2.51	.019
Comparison	40.96	17.61	49.42	12.67	2.01	.055
Role-physical						
Experimental	28.85	35.84	38.46	34.08	1.28 ^b	.200
Comparison	28.85	35.84	34.61	34.70	0.66 ^b	.508
Pain						
Experimental	44.13	9.35	57.98	11.70	4.81	<.001
Comparison	42.40	12.91	56.73	11.93	3.53 ^b	<.001
General Health						
Experimental	42.50	6.96	47.11	7.09	2.78	.010
Comparison	44.81	9.11	45.77	6.27	0.45	.653
Emotional well-being						
Experimental	41.31	6.57	58.00	3.96	9.99	<.001
Comparison	39.08	6.63	59.69	4.51	11.93	<.001
Role-emotional						
Experimental	28.20	29.35	50.00	30.18	3.05	.005
Comparison	28.20	29.35	43.59	29.47	1.95	.063
Social function						
Experimental	47.60	8.67	54.33	11.70	2.16	.041
Comparison	43.56	9.00	52.88	7.34	4.23	<.001
Energy/fatigue						
Experimental	52.88	6.03	57.50	7.78	2.40	.024
Comparison	49.23	8.21	57.50	8.03	3.29	.003

^a Sexual function (experimental gr n = 14, comparison gr n = 13).

^b Wilcoxon Signed Rank Test.

3. Results

3.1. Demographic characteristics and health data of the participants

The total number of participants in this study was 52 and were assigned to the experimental (n = 26) and comparison group (n = 26). For the experimental group, the mean age was 48.00 years old (SD = 10.37). Half of the participants were males (50.0%). Most of the participants were single (38.5%). Most of the participants were socially supported by a son/daughter (42.3%). The average duration of CKD and PD was 35.5, and 23.5 months. For the comparison group, the average age was 47.12 years old (SD = 12.73). More than half were females (57.7%). The largest group were single (42.3%). Half the participants were socially supported by son/daughter (50.0%). The average duration of CKD and PD was 36 and 26.5 months. Most of the participants reported that PD was performed by themselves (42.3%), experiencing complication of peritonitis and fatigue (30.8% and 19.2%), and hospitalization (57.7%). The demographic characteristics and health

data of the two groups were not statistically significantly different.

3.2. Comparison of pre-test mean scores of self-managements and QOL between the experimental group and the comparison group

The comparison of pre-test means scores of self-managements between the experimental group and the comparison group revealed that the pre-test means scores of self-managements and QOL of the two group were not significantly different, [Table 1](#).

3.3. Comparison of pre and post-test mean scores of self-managements and QOL in the experimental group

The post-test mean scores of the experimental group were significantly better than pre-test mean scores regarding overall self-management and its subscale ($p < .05$). For the comparison group, post-test mean scores regarding overall self-management and its subscale of self-monitoring were significantly lower than those of the pre-test ($p < .05$), [Table 2](#).

3.4. Comparison of post-test mean scores of self-managements and QOL between the experimental group and the comparison group

The comparison of Post-test means scores of self-managements between the experimental group and the comparison group revealed that the Post-test means scores of overall self-managements and of its subscale of the experimental group were significantly higher than those of the comparison group ($p < .05$). For the QOL, only the Post-test means scores of effects of KD and burden of KD of the experimental group were significantly higher than those of the comparison group ($p = < .01$), [Table 3](#).

4. Discussion

The findings of this study suggest the effectiveness of the CHNTC program on self-management and QOL of PD patients. The following reasons can explain the effectiveness of the CHNTC program.

The CHNTC program applied concept of self-management support system derived from ICCM model [22]. The researchers and healthcare team provided information and support to enable PD patients and their family caregivers to care better for their illness. During the program, PD patients and caregivers were informed about CKD and were prepared for self-management knowledge and skills during a face to face educational workshop. In addition, they were motivated for self-management practice and self-management monitoring at home via phone and mobile application by the nurse researchers and PD nurse. Caregivers also received the instructions on how to observe the patients' self-management practices and to examine the recording of self-management activities. Through the self-management support system, PD patients, therefore, become capable of controlling their health problems and improving their self-management practice, thus enhancing their QOL. Self-

Table 3. Comparisons of Post-test mean scores of self-managements and QOL between the experimental group and the comparison group (N = 52)

Variable	Experimental group (n = 26)		Comparison group (n = 26)		t/Z	p-value
	M	SD	M	SD		
Self-management						
Overall PDSM	79.73	3.21	65.96	8.51	7.72	<.001
Subscale						
PD procedures	34.08	1.72	27.27	4.49	7.21	<.001
Diet and fluid	11.15	1.49	9.50	2.32	3.06	.004
Medications	10.81	1.26	9.27	1.71	3.48 ^b	.001
Self-monitoring	13.96	1.64	11.96	1.99	3.96	<.001
Symptom management	9.73	0.78	7.96	1.78	3.99 ^b	<.001
QOL						
ESRD-targeted area						
Symptom/problem list	74.28	3.72	75.72	4.86	1.20	.253
Effects of kidney disease	56.85	7.23	50.48	7.16	3.19	.002
Burden of kidney disease	58.89	7.53	47.35	8.69	5.11	<.001
Work status	38.46	32.58	23.08	29.09	1.80	.079
Cognitive function	64.87	13.67	67.69	8.78	.88	.381
Quality social interaction	63.59	11.81	65.38	13.60	.51	.614
Sexual function ^a	74.38	14.32	64.20	18.21	1.99	.053
Sleep	52.21	14.84	44.81	12.88	1.92	.060
Social support	62.82	15.85	58.32	20.69	.879	.384
Dialysis staff encouragement	88.94	8.89	91.83	11.15	1.59 ^b	.111
Patient satisfaction	86.54	16.34	84.61	16.82	.42	.673
Overall Health	69.61	11.82	63.85	11.34	1.79	.079
General Health (SF-36)						
Physical functioning	51.35	8.67	49.42	12.67	.64	.526
Role-physical	38.46	34.08	34.61	34.70	.40	.688
Pain	57.98	11.70	56.73	11.93	.01 ^b	.993
General Health	47.11	7.09	45.77	6.27	.72	.472
Emotional well-being	58.00	3.96	59.69	4.51	1.44	.157
Role-emotional	50.00	30.18	43.59	29.47	.78	.442
Social function	54.33	11.70	52.88	7.34	.53	.597
Energy/fatigue	57.50	7.78	57.50	8.03	.000	1.00

^a Sexual function (experimental gr n = 20; control gr n = 22).

^b Mann–Whitney U Test.

management support is central to improving care and health outcomes [11].

The researchers used a combination of strategies in the process of self-management support including self-management reflection, goal setting, action plan, and face to face follow up with support via phone and mobile application. The researchers asked the participants to reflect on their self-management experience and encouraged to identify their own health problems, set their goals, established their self-management action plan, and recorded the data in the form within their mobile application. While participating in the program, PD patients received a phone call once a week and face to face follow up from PD nurse via mobile application every 4 weeks. Previous studies indicated that effective self-management support (SMS) intervention must be tailored to patient needs and included a combination of strategies to improve chronic illness outcomes which involved patients and family as partners [11,29]. In addition, follow-up should include tailored immediate feedback, monitoring of progress with regard to patient set healthcare goals, or problem-solving and decision-making skills [29]. Through the process of SMS, the researchers provided education related to PD knowledge and skills, counselling, monitoring, appreciation and reinforcement to PD patients and their family caregivers with declarations. The strategies used in the process of SMS influenced the patient's confidence and prospects to maintain the good self-management practice at home. Previous studies indicated positive outcomes for effective SMS including improvements in clinical indicators, health-related QOL, confidence to self-manage, and disease knowledge [30].

In this study the use of technology is addressed as part of health care delivery, a concept also known as “mobile application”. The HomePDCare application was designed as a mobile health application that functions as one of the resources for PD self-management support. Information technologies, mobile health in particular, can enhance collaborative care interventions, and thus improve the health of individuals when deployed in integrated delivery systems [30]. QOL is regarded as one of the evaluation indicators for successful self-management telehealth intervention in CKD [31]. The motivation of patients can be increased significantly using the telehealth system by immediate feedback, which may provide improved adherence of programs that seek to increase the QOL of the patients [32,33]. All forms of media can be used as a powerful forum for educating public and providing them with the needed skills for improving their health status [30]. The CHNTC program was found to be effective as in

previous studies in which home telehealth could enhance self-management and QOL among patients with chronic conditions [32,34,35].

Only two domains of QOL of the experimental group were significantly better than those of the comparison group and about 75% of the QOL domains were significantly improved. This may be due to the fact that the study was conducted within twelve weeks and the QOL was evaluated at the same time which is may not be sufficient to evaluate all the domains of the QOL change. Findings of this study were consistent with previous studies in which a few domains in the QOL of the study group was significantly better than that of the control group and the study group demonstrated significant improvement in several domains of QOL during the 12-weeks follow-up period [23,36].

Notably, PD patients in the comparison group had significant improvement in about half of the domains in QOL. This may be due to the fact that PD patients in the comparison group received the usual care which included health education and communication with the PD nurse via line application. The PD patients may have better subjective perception of QOL as a result of emotional and information support from PD nurse. The other possible reason was due to testing effects [37]. As PD patients in the comparison group were completing the pre-test questionnaires, some of them may have begun to self-evaluate and raise their awareness about the importance of self-management practices and the QOL. Another possible reason may be due to Hawthorn effects [38] in which PD patients modified their behaviors in response to their awareness of being observed.

The limitations in this study was that of recruitment of the participants from only one study setting of Thailand, which may not represent the other regions that have different cultural features. Future study needs to use multiple data gathering settings that can be representative of PD persons. This study is also limited by the small numbers of subjects due to the withdrawal from the study. The small and decreasing number of subjects, however, can affect the power and validity of the study, and the statistical analysis. The number of subjects in future studies should be increased in order to have more statistical power and produce more accurate results.

5. Conclusions and Recommendations

The CHNTC program is useful to provide long distance home dialysis therapies and PD self-management support for CKD patients treated and help them maintain a good level of independence while ensuring good outcomes.

The findings of this study indicated that the CHNTC program was effective in enhancing self-management practices and thus improving the QOL among CKD patients with PD. PD patients in the experimental group demonstrated significantly greater improvements in self-management and QOL compared to those in the comparison group. Most of the domains in the QOL were significantly improved in the experimental group. The CHNTC program therefore should be integrated into the regular nursing system as a part of PD care service for PD patients in particular in community settings. Future study should use RCT with a double-blinded design to eliminate the potential sources of bias.

Conflict of Interest

The authors state that there is no conflict of interest.

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