Effects of Modified-Continuous Ambulatory Peritoneal Dialysis (CAPD) Patient's Handling Process on Nurse's Knowledge, Perceived Benefits and Performance in CAPD Care

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Abstract

Continuous Ambulatory Peritoneal Dialysis (CAPD) is one of kidney replacement therapy with advantage of home therapy and much cheaper than hemodialysis. Nevertheless, CAPD patients need integrated health care by primary care health facilities to maintain CAPD effectiveness of which has never been assessed and improved. Therefore, this study aims to assess the effect of modified CAPD patient's handling process among nurses at the primary care level. This quasi-experimental study, 47 nurses in sub-district health promoting hospitals (HPHs) of Nan general hospital renal node which completed the standard protocol were assigned to an experimental group, which received the modified-continuous ambulatory peritoneal dialysis (CAPD) patient's handling process intervention. The intervention covered both a case management (CM) and a CAPD web-based program. The comparative groups were 45 nurses in sub-district health promoting hospitals of Pua Crown Prince Hospital renal node. The main outcomes were improvement in knowledge, perceived benefits and CAPD patients care performances of which assessed by t-test, and ANCOVA. There were significant higher scores of knowledge, perceived benefits and performances of nurses in the experimental group applying the "Modified CAPD patient's handling process" than those of the comparative group. Therefore, this intervention should be implemented in other primary care facilities to improve qualities of care for CAPD patients.

Keywords: *Continuous Ambulatory Peritoneal Dialysis, CAPD, Nurses Case Management, web-based program.*

Introduction

End-stage renal disease (ESRD) is a chronic illness which is the most crisis and most expensive stage of chronic kidney disease (CKD). ESRD requires renal replacement therapies including hemodialysis (HD), peritoneal dialysis (PD) and kidney transplantation (KT) treatment modalities[1]. The renal replacement therapies (RRT) are expensive therapy, accounting for 1–2 percent of healthcare spending especially in high-income countries with the rising incidence and prevalence of end-stage renal disease (ESRD) modalities treatment[2]. Dialysis modality consisting of HD and PD is one of the most expensive available therapies for ESRD treatment. Hence, the cost of health care is borne by healthcare funder, individual patient and/or their family, making chronic illness a cause as well as a consequence of poverty by household's health expenditure[3] especially among patients with chronic conditions because the health care delivered in a hospital is the costliest aspect of this therapy. Hence, the argument for this approach extends beyond immediately financial benefits to the desire to promote patients' empowerment and autonomy. In most chronic diseases, a component of self-care is essential to use the cost-effectiveness of therapy and the best clinical outcomes[4]. At present with the advantage of home therapy for PD which is less costly than hemodialysis, many governments are encouraging the provision of PD treatment in the community and promoting home dialysis[5]. For frail, elderly patients, the cost of thrice-weekly transport to and from a dialysis facility can be

the most expensive component of their care. Also, the delivery of dialysis in the home environment can create a more favorable 'traveling time' versus 'treatment time' or patient's quality of life trade-off[6,7]. Several research method including a literature review on the CAPD patients on the societal perspective, life-long costs of PD and quality of life reveal that: on societal perspective, PD had a higher cost-effective and cost-utility than HD for all age groups of Thai ESRD patients and treatments provided to younger age groups of ESRD patients with better outcomes and higher cost-effective and cost-utility than those offered to the elderly patients. Therefore, PD is more cost-effective for the Thai government to invest in the economic point of view, societal perspectives such as human rights, equity in health, and humanity concern[8].

Nan province located in the North of Thailand has the main challenges of chronic NCDs especially CKD which was the 4th cause of death of 38.09 per 100,000 population, which was higher than average cause of death with chronic renal disease of the North (average of 27.83 per 100,000 population). In addition, Nan has an increasing trend of ESRD with increased cases of HD and PD from 398 cases in 2010 to 1,488 cases in 2015. Peritoneal dialysis modality in Nan province after the first case in 2009 was increased to 653 cases in 2016 under two renal nodes of dialysis provision in Nan province including Nan general hospital renal node and Pua Crown Prince hospital renal node. The potential advantage of peritoneal dialysis is the home therapy which promotes patient autonomy with less traveling costs for patients than with in-center hemodialysis. However, patients with end-stage renal failure (ESRF) face lifelong physical, psychological and social problems related to their illnesses and treatments. This chronic and irreversible failure of kidney function poses a challenge to nurses and practitioners of related disciplines in the healthcare system at all levels. Dialysis is the major treatment modality to sustain the lives of patients waiting for kidney transplantation. Although the treatment can prolong life expectancy, it impacts the patient's physical, psychological, and social well-being and may impose a considerable burden on patients and families especially the continuous ambulatory peritoneal dialysis (CAPD) which required advance and holistic care by multi-disciplinary teams at all levels for integrated care with various approaches, including patient empowerment, education and counseling sessions, and involvement of family members. CAPD nodes in tertiary and secondary care hospitals have been suggested for improving treatment adherence and outcomes by manager of patient care in community. The previous study was not covered the case management of CAPD care by nurses in the primary care units. In addition, there were few studies that evaluated the effect of case management in CAPD care in renal node hospital only.

The purpose of this study was to examine the effects of modified-continuous ambulatory peritoneal dialysis (CAPD) patient's handling process implement in primary care level by community nurse case management and web-based program that was increased the knowledge, perceived benefits and performance on CAPD care of nurses in a primary care unit (sub-district health promoting hospital) and improved patient care in the long run.

Materials and Method

The quasi-experimental research aimed to implement and assess the effectiveness of the modified-continuous ambulatory peritoneal dialysis (CAPD) patient's handling process in the primary care unit (sub-district health promoting hospital). This CAPD patient's handling process program was based on case management (CM) and integrated with CAPD web-based program. There were two study renal nodes in Nan province including the Nan general hospital renal node and the Pua Crown Prince hospital renal node. They were allocated as an experimental and comparison groups. Additionally, all the sub-district health promoting hospitals were recruited as research setting with the inclusion criteria of 1) providing care for CAPD patients in the community, 2) access to internet. Consequently, nurses in those sub-district health promoting hospitals were recruited as the participants of this research. 47 nurses of 8 sub-district health promoting hospitals of Nan general hospital who met inclusion criteria were sequentially allocated to the experimental group, whereas 45 nurses in 7 sub-district health promoting hospitals of the Pua Crown Prince hospital renal node who met the inclusion criteria were allocated to the comparison group.

This study conducted for 18 months. There were three steps including: the first step was the model development based on context of the patients and health facilities, GAP analysis, and systems analysis on CAPD care in the primary care unit. This phase was aimed to develop a new program on CAPD patient's handling process based on case management (CM) with integrated web-based

program. The second step was the formulation and did pretest of both experimental and control groups. The implementation of the modified-continuous ambulatory peritoneal dialysis (CAPD) patient's handling process was applied among nurses in 8 sub-district health promoting hospital of Nan general hospital renal node. The third step was to assess the effectiveness of the implemented program of (CAPD) patient's handling process among nurses in the intervention group and compared with the control group which were nurses in 7 sub-district health promoting hospital in the Pua Crown Prince renal node. The research main outcomes were knowledge, perceived benefits and the performance on CAPD care of nurses at the primary care level.

Intervention: A comprehensive intervention protocol was developed by the researcher and reviewed by nephrologists and experienced renal nurses in Nan general hospital renal node, with further revisions according to their advice. These Modified-CAPD patient's handling process intervention protocol was design covering patient's assessment, nursing care planning, communication, advocacy and health education, health resource management, and service facilitation by the collaboration of multidisciplinary team by Care-map and Clinical Practice Guideline (CPG), and added-up with Web-based program for patient's information and monitoring of CAPD care among hospital renal node and sub-district health promoting hospitals.

The patients in the experimental group received the CAPD standard care and our comprehensive CAPD cares. The clinical practice guideline of CAPD care was the research protocol for nurses in primary care unit as well as a comprehensive assessment of the patient's physical, social, cognitive and emotional needs based on the clinical practice guideline. An individualized education program was conducted by the case manager nurse covering exercise regimen, medication, fluid and diet adherence behaviors, technical procedures for home peritoneal dialysis and prevention of infection. The case manager nurses received a 12-hour training program which included a theoretical input, case training, and web-based program. The nurse set scheduled for home visits and used their professional judgment to define the frequency, intensity, and focus of contacts to meet patient's and caregiver's needs and did follow up the patients for care and assess the patient's progress. If a CAPD patient was at risk of unstable conditions, a referral to the main renal node will be done for proper assessment, investigation, and medical treatment. If needed lastly, referral to the emergency department for urgent treatment was the next step.

The web-based program which links information of CAPD patient was introduced for patient's care plan among main hospital renal node, community hospital, and primary care unit for CAPD care. This web-based program provided a physical assessment of medical information which linked between main renal node and primary care unit procedure treatment, effective care and monitoring. Both comparison and experimental groups, patients received the same routine care during hospitalization. This modified-continuous ambulatory peritoneal dialysis (CAPD) patient's handling process in the primary care unit intervention were an advanced health care technology program combined with diminishing resources for an increased demand for qualified nurse case managers in primary care level who can manage complex cases for the best interests of the CAPD patients that could save time, money, improved quality of life and treatment outcomes of the patients.

Data collection and measurement tools: Measurement tools of CAPD care among nurses were questionnaires to assess knowledge, perceived benefits of CAPD care. The questionnaire consisted of two parts. The first part was the participant demographic and socioeconomic information including age, gender, and education level. The second part was knowledge and perceived benefits of CAPD. The performance of CAPD care was assessed by a check list questionnaire which assess the medical record and health service program in each sub-district health promoting hospital.

All of assessment tools were developed by the researcher. The analysis of Item-objective congruence index (IOC) was conducted for content validity of the questionnaire and was revised based on the expert's recommendation. The reliability was tested among 30 participants who had similar characteristics with the study population at the primary care level. The Cronbach alpha coefficient of the questionnaire was 0.86 scores.

Data Analysis: The Chi-square test was used to compare the differences in demographic data (Category variable) between experimental and comparison groups. The t-test was utilized to compare the difference of the sum of knowledge score, perception, and performance of CAPD care. In addition, the ANCOVA was used to assess the effectiveness of the CAPD handling process program covering baseline and post-intervention

period while the statistically significant ($p < .05$) were considered significant.

Ethical Consideration: This research was approved by the Chulalongkorn University's Ethics Review Board. The certificate of approval number was COA. No.096.1/59 Additionally, office of Nan Provincial Public Health also has permission for this study in Nan province and also all study participants were signed informed consent forms before data collection and implementation of the intervention. The information in these studies were analyzed, synthesized and presented for academics only.

Results

A total of 92 nurses were included in the analysis, 47 among the experiment and 45 among the comparison group. Among these participants, 94.57% were female. Their ages ranged from 25 to 56 years, with a mean of 43.34 years (S.D. 7.03) in experimental group whereas it was 40.71 years (S.D. 7.08) in the comparison group. Almost all of them finished bachelor's degree in nursing (95.74% among experimental and 95.56% among comparison groups. Only 4.26% in experiment and 4.44% in comparison groups graduated a master's degree in nursing. The personal characteristics of experimental and comparison groups including sex, age, marital status, education, official status, received community nursing training, and experience of work in community were comparable ($p>0.05$).

Table 1 Socio-demographic characteristics of nurses in the experimental and the comparison groups at baseline

Characteristics	Experimental Group 47 participants		Comparison Group 45 participants		t-test/χ^2	p value
	Number	(%)	Number	(%)		
Sex					4.868 [a]	0.181
Male	2	4.26	3	6.67		
Female	45	95.74	42	93.33		
Age						
30 and below	3	6.38	1	2.22		
31 – 40	13	27.66	22	48.89		
41 – 50	24	51.06	16	35.56		
51 - 60	7	14.89	6	13.33		
Mean (S.D.)	43.34 (7.03)		40.71 (7.08)		1.79[b]	0.077
Median (Min, Max)	40 (30, 56)		44 (25, 56)			
Marital Status					1.352[a]	0.857
Single	10	21.28	12	26.67		
Married	34	72.34	31	68.89		
Widowed	2	4.26	2	4.44		
Divorced	1	2.13	0	0.00		
Separate	0	0.00	0	0.00		
Education					0.002 [a]	0.965
Bachelor	45	95.74	43	95.56		
Master	2	4.26	2	4.44		
Ph.D.	0	0.00	0	0.00		
Official Status						
Government official	47	100.00	45	100.00		
Certificated nursing training						
Certificated trained	47	100.00	45	100.00		

Characteristics	Experimental Group 47 participants		Comparison Group 45 participants		t-test/χ^2	p value
	Number	(%)	Number	(%)		
Experience of work						
Less than 10 years	4	8.51	6	13.33		
11 – 20 years	17	36.17	23	51.11		
21 – 30 years	23	48.94	12	26.67		
More than 30 years	3	6.38	4	8.89		
Mean (S.D.)	21.34 (7.08)		18.71 (7.03)		1.787[b]	0.077
Median (Min, Max)	22 (3, 34)		18 (8, 34)			
Experience of work in HPH						
Less than 5 years	1	2.13	0	.00		
6 – 10 years	5	10.64	9	20.00		
11 – 15 years	23	48.94	23	51.11		
16 – 20 years	16	34.04	6	13.33		
21 – 25 years	2	4.26	6	13.33		
26 – 30 years	0	.00	1	2.22		
More than 30 years	0	0.00	0	0.00		
Mean (S.D.)	14.49 (3.95)		14.56 (4.95)		0.071[b]	0.943
Median (Min, Max)	15 (3, 23)		24 (8, 27)			

(a) = Chi square, (b) = independent t-test

Knowledge of CAPD care Assessment: The knowledge assessment covered PD exchange, steps for PD exchange, activity of CAPD patient, drugs use and health education for self-care of CAPD patient, home visit care and knowledge on drug use such as erythropoietin injection for anemia treatment from iron deficiency in chronic renal disease patients. The level of knowledge on CAPD care of the experimental and comparison groups at baseline, the highest proportion of both groups was at average level (34.04% among experiment and 35.56% among comparison groups). However, after intervention, the level of on knowledge CAPD care in the experimental group were much more improved than the comparison group. All of the nurses in the experimental group had high level of knowledge whereas only 46.67 % of the comparison group had high level of knowledge, followed by 40.00 % with average level and 13.33 % had low level of knowledge (Table 2).

Table 2 Level of knowledge on CAPD of experimental and comparison groups at baseline and after intervention

Level of knowledge assessment on CAPD care	Baseline				After intervention			
	Experimental Group 47 participants		Comparison Group 45 participants		Experimental Group 47 participants		Comparison Group 45 participants	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Low (<60 scores)	10	21.25	5	11.11	0	0.00	6	13.33
Average (60-79 scores)	21	44.68	24	53.33	0	0.00	18	40.00
High (≥ 80 scores)	16	34.04	16	35.56	47	100.00	21	46.67

Perceived Benefits of CAPD care: Baseline information of perceived benefits of CAPD care illustrated no significant difference between nurses in experimental and comparison groups. The highest proportion of perceived benefits of CAPD care at baseline was at fair level (40.43 % among experiment and 33.33% among comparison groups) followed by good perception on benefits (29.79 % and 28.89 among experimental and comparison groups) and similar proportion had poor perceived benefits (29.79% in experiment and 37.78% in Control groups). However, after intervention, the perceived benefits of CAPD care in the experimental group was much higher, of which all the nurses in this group had good level of perceived benefits when compared with 55.56% of good level, and 44.44% of fair level in the control group respectively (Table 3).

Table 3 Level of perceived benefits of CAPD care between experimental and comparison groups at baseline and after intervention

Level of Perceived benefits of CAPD care	Baseline				After intervention			
	Experimental Group 47 participants		Comparison Group 45 participants		Experimental Group 47 participants		Comparison Group 45 participants	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Poor (<60 scores)	14	29.79	17	37.78	0	0	0	0
Fair (60-79 scores)	19	40.43	15	33.33	0	0	20	44.44
Good (≥80 scores)	14	29.79	13	28.89	47	100.00	25	55.56

Effect of the program on knowledge, perceived benefits of CAPD care and performance on CAPD care: At baseline the level of knowledge on CAPD among comparison group was not significantly higher than that of the experimental group, whereas the perceived benefit score and performance of CAPD care among the experimental was non significantly higher that the comparison's group. The model using ANCOVA with controlling for covariate variables including age of nurses, training in nursing and duration of working experience in sub-district health promoting hospital between the experimental and comparison groups at baseline and post intervention (4 months after applied intervention program). There was a statistically significant difference between the intervention and control groups (p-value<.05). Both knowledge and perceived benefits of CAPD care were significantly higher in the experimental than that of the control groups at similar magnitudes with the mean difference of 4.41 (3.73-5.09 scores) on knowledge and 3.77 (3.21-4.44 scores) on perceived benefits of CAPD care. There was more improvement on CAPD care performance among the experimental group when compared with the controls with the mean difference of 17.12 (14.51-19.73 scores) (Table 4).

Table 4 Mean difference adjusted for baseline measurements, sex age, educational status, training in nursing, duration of working experience as a nurse and duration of working experience in sub-district health promoting hospital for experimental and comparison groups using the analysis of covariance (ANCOVA) on Knowledge, Perceived benefits and Performance of CAPD care.

Variable	Duration	Experimental Group		Comparison Group		Mean difference	Adj. Mean difference	95% CI	P-value
		Mean	S.D.	Mean	S.D.				
Knowledge of CAPD care	Baseline	14.06	2.83	14.44	2.55	-0.38	NA	NA	NA
	After	19.10	1.04	14.91	2.73	4.19	4.41	3.73 - 5.09	<0.001
Perception of CAPD care	Baseline	25.31	2.68	25.04	1.97	0.27	NA	NA	NA
	After	34.02	1.07	30.13	1.54	3.88	3.77	3.21 - 4.33	<0.001
Performance of CAPD care	Baseline	80.10	16.87	78.28	17.69	1.81	NA	NA	NA
	After	111.17	2.79	94.31	7.88	16.85	17.12	14.51-19.73	<0.001

Despite increasing the knowledge of CAPD care in all intervention and the control group but strongly increasing in the intervention group. Nevertheless, the performance of CAPD care was increasing in the intervention group only (Figure 1).

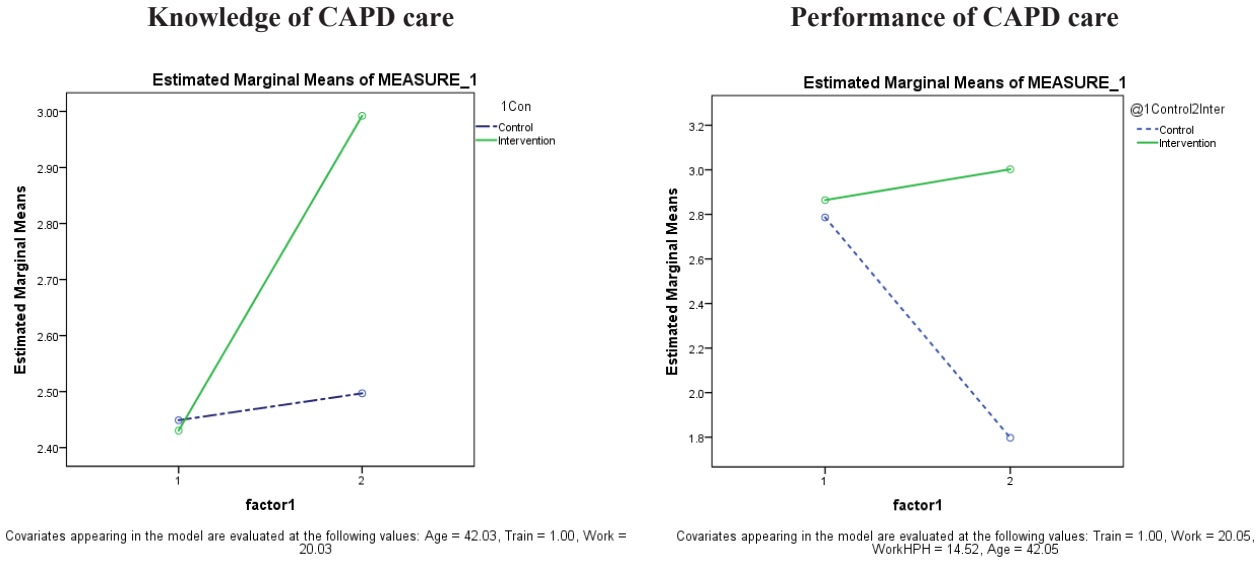

Figure 1 Change over times on Knowledge and Performance of CAPD care scores between the intervention and control group

Discussion

This study developed and implemented as well as determined the effectiveness of the CAPD handling process program on knowledge, perceived benefits and performances of CAPD care among nurses in order to strengthen the performance of CAPD care in primary care level. The research results indicated statistically significantly increase in knowledge of nurse in sub-district health promoting hospital. Considering the baseline knowledge on CAPD care of community nurses, the intervention and the control groups were not significant difference. It may be because all nurses acquired knowledge on CAPD care on annual training from hospital renal node. The experimental group had a little lower knowledge level more than the comparison group at baseline. However, after intervention, all of nurses in the experimental group had hid high level knowledge on CAPD care whereas less than half of those in the control group had high level. It may be because the intervention group received additional trainings as well as applied eHealth by web-based application[9] for nurses in primary care level which linked information from nephrologist and CAPD nurses in hospital renal node. This finding is similar with the study of web-based learning in practice settings among nurses in United Kingdom[10] that increased their knowledge of patient care. In addition, the nurses also reported an increase in their ability to transfer their knowledge to practice through improved emotional and psychological support of patients and their relatives. The participants in the experimental group also worked in an integrated health care procedure with specialist in hospital renal node by setting the CAPD care systems in sub-district health promoting hospitals.

The assessment on perceived benefits of CAPD care among nurses in sub-district health promoting hospitals illustrated a significant increase in perceived benefits of CAPD care in the intervention group. This might help improving their performance on CAPD care. In 2017, the Ministry of Public Health launched the policy on service plan to increase quality of care in critical diseases especially the service plan for CKD of which improvement of standard of CKD care among excellence center well as primary care level are essential. Most importantly, the performance of CAPD care was much improved in the experimental group after intervention which was similar with a study among case manager nurses conducted by Tao X, Chow SK, Wong FK[11] reported the improvement of care performance for hemodialysis patients in community as well as the

practice guideline for community nurse with increased competency for patient care in community as well[12].

Conclusion

The "Modified CAPD patient's handling process" intervention which included both the program of case manager nurse and web-based program of eHealth was effective in improving the nurse's knowledge and perceived benefits of CAPD care as well nurse's CAPD care performances among nurses who worked in primary care level. However, it is recommended to implement the Modified CAPD patient's handling process in other setting with the aim of improvement to be fit with wider context. This study developed a CAPD patient's handling process as an additional existing standard CAPD care with case management of community nurse for CAPD care as well as a CAPD web-based program which is the online operation. This technology might be restricted to primary care unit with poor resource internet.

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