SURVIVAL OF END-STAGE RENAL DISEASE PATIENTS WHO UNDERGO CONTINUOUS AMBULATORY PERITONEAL DIALYSIS AS THE INITIAL TREATMENT STRATEGY UNDER THE UNIVERSAL COVERAGE OF THAILAND

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
(EPIDEMIOLOGY)
FACULTY OF GRADUATES STUDIES
MAHIDOL UNIVERSITY
2014

Thesis
entitled

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ACKNOWLEDGEMENTS

This thesis can be succeeded by the attentive supports from the members of thesis advisor committee, Assist. Prof. Kamol Udol, M.D., Surapol Ariyapitipan, M.D., Suchai Sritippayawan, M.D., Ph.D., and Assist. Prof. Chulaluk Komoltri, DrPH. I would like to thank the thesis advisor committee for their valuable guidance and encouragement throughout the course of my study, as well as the members of thesis examination committee, Prateep Dhanakijcharoen, M.D., (Vice Secretariat of the National Health Security Office: NHSO) and Piyatida Chuengsaman, M.D. for their kind suggestions and recommendations. I would like to express my deepest and sincere gratitude to all of them on this occasion.

My greatest appreciations are expressed to Winai Sawasdivorn, M.D., (Secretariat of the NHSO) for data support, Surapol Ariyapitipan, M.D. (Manager of the Renal Failure Fund), Public Health staffs, nurses responsible in the peritoneal dialysis units and the subjects of this study for their help and supports in data collection.

Finally, I would like to express my greatest and sincere gratitude to my parents and colleagues for their kind supports and cheerful encouragement throughout my study.

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ABSTRACT

This retrospective cohort study aimed to examine the prognosis and associated factors regarding survival of end-stage renal disease (ESRD) patients who participated in the Peritoneal Dialysis as the First Treatment Strategy (PD-First) Project of the National Health Security Office (NHSO) of Thailand. ESRD patients under the Universal Health Coverage Scheme (UC), funded by the NHSO, who required renal replacement therapy, have been obliged to have continuous ambulatory peritoneal dialysis (CAPD) as their initial treatment strategy since October 1, 2007. Patients were divided into 3 groups according to their subsequent mode of treatment: (1) those who continued CAPD; (2) those who switched to hemodialysis (HD), and (3) those who underwent kidney transplantation (KT). Data regarding survival status, mode of treatment, and associated factors were obtained from the Disease Management Information System (DMIS) managed by the Renal Failure Fund of the NHSO. Survival was estimated using Kaplan-Meier method and comparison between groups was performed using log-rank test. Factors associated with survival were analysed using Cox's proportional hazard model.

A total of 12,939 patients from 112 public health centers were included in the PD-First Project between October 1, 2007 and August 31, 2011. Additional follow-up data were obtained until January 10, 2012. A total of 11,355 patients (87.8%) continued CAPD; 1,527 (11.8%) switched to HD; and 57 (0.4%) underwent KT. Survival rates at 1, 2, 3 and 4 years were 72.2%, 58.7%, 48.8% and 40.4% respectively for patients who continued CAPD; 89.5%, 78.6%, 71.0% and 65.1% respectively for patients who switched to HD; and 100%, 98.2%, 96.1% and 87.4% respectively for patients who underwent KT. Compared to patients who continued CAPD, those who switched to HD and underwent KT had significant lower risk of mortality after adjustment for various baseline factors (HD vs. CAPD: HR 0.47, 95% confidence interval (CI) 0.39 to 0.56, $p < 0.001$; KT vs. CAPD: HR 0.21, 95% CI 0.51 to 0.83, $p = 0.026$). Other factors found to be significantly associated with mortality included age, history of diabetes mellitus, body surface area (BSA) and the type of public health center.

In conclusion, in ESRD patients receiving CAPD as the initial treatment strategy, subsequent treatment modality was significantly associated with prognosis. Specifically, survival rates of those who switched to HD or KT were significantly better than those who continued CAPD.

KEY WORDS: SURVIVAL RATE/END-STAGE RENAL DISEASE/CONTINUOUS AMBULATORY PERITONEAL DIALYSIS/UNIVERSAL COVERAGE

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การศึกษาอัตราการรอดชีวิตของผู้ป่วยไตวายเรื้อรังระยะสุดท้าย ที่เริ่มต้นการรักษาบำบัดทดแทนไตด้วยการล้างไตทางช่องท้องอย่างต่อเนื่อง ภายใต้สิทธิหลักประกันสุขภาพถ้วนหน้าในประเทศไทย

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บทคัดย่อ

การศึกษาแบบ Retrospective Cohort นี้มีวัตถุประสงค์เพื่อศึกษาอัตราการรอดชีวิตและปัจจัยที่มีความสัมพันธ์กับการรอดชีวิตของผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่เข้าร่วมโครงการล้างไตทางช่องท้องอย่างต่อเนื่อง (CAPD) เป็นทางเลือกแรกตามนโยบาย PD-first ของสำนักงานหลักประกันสุขภาพแห่งชาติ ซึ่งกำหนดให้ผู้ป่วยสิทธิหลักประกันสุขภาพถ้วนหน้าที่เข้ารับการบำบัดทดแทนไต เฉพาะผู้ป่วยที่ไม่สามารถหรือยังไม่ได้รับการปลูกถ่ายไต ต้องเริ่มต้นการรักษาด้วยการล้างไตทางช่องท้องอย่างต่อเนื่อง โดยเริ่มดำเนินการตั้งแต่วันที่ 1 ตุลาคม 2550 เป็นต้นมา จำแนกผู้ป่วยออกเป็น 3 กลุ่มตามวิธีการรักษาที่ได้รับครั้งล่าสุด ได้แก่ (1) ผู้ป่วยที่ยังคงรักษาด้วย CAPD, (2) ผู้ป่วยที่เปลี่ยนวิธีการรักษาเป็นการฟอกเลือดล้างไต (HD), และ (3) ผู้ป่วยที่ได้รับการปลูกถ่ายไต (KT) ข้อมูลเกี่ยวกับสถานะการรอดชีวิต, วิธีการรักษา และปัจจัยที่เกี่ยวข้องได้มาจากฐานข้อมูลผู้ป่วยโรคไตของกองทุนโรคไตวาย สำนักงานหลักประกันสุขภาพแห่งชาติ วิเคราะห์อัตราการรอดชีวิตโดยใช้ Kaplan-Meier method และเปรียบเทียบอัตราการรอดชีวิตระหว่างกลุ่มโดยใช้ log-rank test วิเคราะห์ความสัมพันธ์ระหว่างปัจจัยต่างๆ กับการรอดชีวิตโดยใช้ Cox's proportional hazard model

ผลการศึกษาพบว่ามีผู้ป่วยที่เริ่มต้นการรักษาบำบัดทดแทนไตด้วย CAPD ตามนโยบาย PD-first ระหว่างวันที่ 1 ตุลาคม 2550 ถึง 31 สิงหาคม 2554 จำนวน 12,939 ราย จากสถานบริการ 112 แห่ง เมื่อติดตามข้อมูลจนถึงวันที่ 10 มกราคม 2555 พบว่ามีผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่ยังคงรักษาด้วย CAPD 11,355 ราย (ร้อยละ 87.8), เปลี่ยนวิธีการรักษาเป็น HD 1,527 ราย (ร้อยละ 11.8), และได้รับการปลูกถ่ายไต 57 ราย (ร้อยละ 0.4) อัตราการรอดชีวิตในระยะเวลา 1, 2, 3 และ 4 ปี ของผู้ป่วยที่ยังคงรักษาด้วยวิธี CAPD เท่ากับร้อยละ 72.2, 58.7, 48.8 และ 40.4 ตามลำดับ อัตราดังกล่าวในผู้ป่วยที่เปลี่ยนวิธีการรักษาเป็น HD เท่ากับร้อยละ 89.5, 78.6, 71.0 และ 65.1 ตามลำดับ และในผู้ป่วยที่ได้รับการปลูกถ่ายไตเท่ากับร้อยละ 100, 98.2, 96.1 และ 87.4 ตามลำดับ เมื่อวิเคราะห์โดยควบคุมอิทธิพลของตัวแปรอื่นๆ พบว่ากลุ่มที่เปลี่ยนการรักษาเป็น HD หรือ KT มีความเสี่ยงต่อการเสียชีวิตน้อยกว่ากลุ่มที่ยังคงรักษาด้วย CAPD อย่างมีนัยสำคัญทางสถิติ (HD เปรียบเทียบกับ CAPD: HR 0.47, 95% CI 0.39-0.56, p <0.001; KT เปรียบเทียบกับ CAPD: HR 0.21, 95% CI 0.51-0.83, p = 0.026) ปัจจัยอื่นๆ ที่พบว่ามีความสัมพันธ์กับการเสียชีวิตได้แก่ อายุ, โรคเบาหวาน, พื้นที่ผิวของร่างกาย (BSA) และประเภทสถานบริการ

การศึกษาครั้งนี้ได้แสดงให้เห็นว่าในผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่เริ่มต้นการรักษาด้วย CAPD นั้น ผู้ป่วยที่เปลี่ยนวิธีการรักษาเป็น HD กับผู้ป่วยที่ได้รับการปลูกถ่ายไตมีอัตราการรอดชีวิตดีกว่าผู้ป่วยที่ยังคงรักษาด้วย CAPD อย่างมีนัยสำคัญทางสถิติ

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LIST OF ABBREVIATION

RRT	:Renal replacement therapy
ESRD	:End stage renal disease
CKD	:Chronic kidney disease
PD	:Peritoneal dialysis
CAPD	:Continuous ambulatory peritoneal dialysis
APD	:Automated peritoneal dialysis
IPD	:Intermittent peritoneal dialysis
CCPD	:Continuous cyclic peritoneal dialysis
HD	:Hemodialysis
KT	:Kidney transplantation
HHD	:Home hemodialysis
DMIS	:Registration program for patient treatment
DMIS_CAPD	:Registration program for kidney disease patient who underwent continuous ambulatory peritoneal dialysis
DMIS_HD	:Registration program for kidney disease patient who underwent hemodialysis
DMIS_KT	:Registration program for kidney disease patient who received kidney transplantation
BSA	:Body surface area
NHSO.	:National health security office
CI	:Confidence interval
NA	:Not available
NS	:Not significant
RR	:Relative risk
DM	:Diabetes mellitus
CVD	:Cardiovascular disease
HT	:Hypertension

LIST OF ABBREVIATION (cont.)

MI	:Myocardial infection
PVD	:Periperal vascular disease
CHF	:Congestive heart failure
GFR	:Glomerular filtration rate
BMI	:Body mass index
RRF	:Residual renal function
UF	:Ultrafiltration

CHAPTER I
INTRODUCTION

1.1 Background and Significance of the Problem

Chronic kidney disease (CKD**)** is a significant public health problem in many countries including Thailand [(1)]. Chronic kidney disease leads to uremic and cardiovascular complications and, the final stage of disease, end-stage renal disease (ESRD). Meanwhile, ESRD patients cannot be completely cured, they need medical treatments continuously and the cost of treatments is considerably high [(2)].

Most of early stage CKD patients did not receive the proper diagnosis or treatment because there are no guidelines for CKD diagnosis and classification. As a result, early stage CKD patients are not identified or treated and a number of ESRD patients increase rapidly [(3)]. From United States Renal Data System 2010 Annual Data Report [(4)], 5 countries that had the highest incidences of ESRD patients reported in 2007 are Morelos, Mexico (at 577 per million population), Jalisco, Mexico (at 400), Taiwan (at 384), United States (at 362) and Japan (at 288). The prevalence rate for 2007 was highest in Taiwan (at 2,311 per million population) following by Japan, United States, Belgium, French speaking parties and Belgium, Dutch speaking parties at 2126, 1752, 1153, and 1115 respectively. In Thailand, the incidences rate was at 100 per million populations and the prevalence rate was at 497.

The situation of chronic kidney disease in Thailand, presented in data of in-patient classification by cause of sickness (75 diseases) from public health centers under control of Ministry of Public Health from 2003-2009, showed a number of CKD patients at 77,899, 91,988, 103,440, 125,721, 143,410, 165,113 and 185,342 respectively [(5)]. CKD is a complicated disease and the organs may not work normally so the patients have a greater risk of complications or high death rate. Nephropathy is the 6th leading cause of death per 100,000 populations, divided by major causes of death. The death rate of patients with nephrotic syndrome and nephrosis increased to 19.2, 18.6, 20.2, 20.6, 21.5 and 22.5, respectively, per 100,000 populations [(6)].

ESRD is the complete or almost complete failure of the kidneys to work. The kidneys cannot remove waste and excess water from the body which causes oedema and congestion. If ESRD patients can receive renal replacement therapy (RRT) and do not have any complication, they can live longer for many years. On the other hand, if ESRD patients do not receive RRT, they would die in a short period of time.

In Thailand, there are 3 treatment services for ESRD patients; kidney transplantation (KT), chronic hemodialysis (CHD) and chronic peritoneal dialysis (CPD) [7, 8] and all of them are considerably expensive treatments [9]. This disease becomes a burden for patients and their families who suffer from illness, stress and high medical expenses. As a result, ESRD is sometimes considered as catastrophic illness or one of the most expensive diseases that bankrupt patients and their families. Most of ESRD patients cannot receive appropriate treatments so they die ahead of time. The surveys from 122 countries around the world found that 80.0% of ESRD patients who could access renal replacement therapy were in Europe, North America and Japan [10], whereas the rate in developing countries was very low.

The economist from World Health Organization reported that, in Thailand, the equity to access RRT is lower than other countries in Asia [11]. According to the nephrology society of Thailand, in 2007, there were 26,457 ESRD patients who could access RRT or 419.95 per million population. Most of patients who could access RRT were in government service system (41.3 percent) and social security system (17.4 percent) while most poor or middle class patients in universal coverage system rarely accessed RRT, only 4.8 percent [12], which indicated that of 47 million persons in universal coverage system, most of them could not access RRT [13].

To create equity and equality of ESRD medical treatment, eliminate limitations of medical personnel and expensive hemodialysis machine and preventing patients and their families bankrupt, in 2005-2007, the nephrology society of Thailand, The Kidney Foundation of Thailand and Thai Transplantation Society constrained the National Health Security Office (NHSO) to consider continuous ambulatory peritoneal dialysis (CAPD) as one of treatments for patients in universal coverage system [14]. NHSO agreed with the need of this proposal and approved RRT for ESRD patients in universal coverage package. The changed was approve by the cabinet on October 30,

2007 to extend the coverage of ESRD patients in universal coverage, focusing on kidney transplantation and providing CAPD as Peritoneal Dialysis First (PD-First) Policy for patients who are waiting for kidney transplantation or those who cannot have a transplantation. If patients cannot undergo CAPD, they can undergo chronic hemodialysis (CHD). This coverage has begun from January 1, 2008, therefore [15], ESRD patients have been accessed to all renal replacement therapies.

KT is the best treatment for ESRD patients because it gave them best quality of life but this treatment has many limitations and hard to perform, especially because of deficiency of donated organs. NHSO has chosen CAPD as the first treatment of RRT because it generally has least effect on patients and society. CAPD treatment needs less medical personnel than hemodialysis (HD) treatment and it helps patients to take care of themselves at home. Patients do not need to come to hospital 2-3 times a week so they can save time and travel expense. Also, it will not affect patients and their relatives' work. The study also showed that kidney condition of patients who underwent CAPD is better than those who underwent HD. Kidney deterioration of CAPD patients is slower than that of HD patients [16-18]. The survival of the patients in both treatments is also the same [19-38]. CAPD treatment is also economical service, comparing to HD treatment because of the most of its cost is peritoneal dialysis fluid which may be cheaper under effective management.

Before the change in universal health coverage policy, in 2006-2007, there were only 61 PD facilities throughout the country and there were a few ESRD patients accessing this treatment; old and new patients are only 5 percent of overall patients accessing to RRT. In Thailand, there were only 1,198 patients receiving PD treatment compared to 20,641 patients receiving HD treatment which meant HD patients are 17 times more than PD patients [11]. (327.47: 19.01) However, after the change in policy to extend RRT service of NHSO, the number of ESRD patients registered for PD treatment increased to 15,639 (December 30, 2011) and the number of PD facilities increased to 113 [39]. The number of patients and PD facilities rapidly increased might affect the capability of RRT service.

Nevertheless, the process of RRT service according to PD-First policy was the first time experience for many public health centers, they faced many problems while providing service. The work load of doctors and nurses increased which affected

efficiency and result of the treatment. As a result, it had to be a study of results of PD treatment to show overall image in the country. The crucial assessment of CAPD treatment was patient survival so the researcher would study the survival of ESRD patients, in universal coverage system, which started undergoing CAPD regarding PD-First policy by comparing patients who continued CAPD with those who changed their treatment to HD and those who had KT. The researcher aimed to use this result to create a guideline for medical personnel and to develop service system both in each facility and overall level for better quality of life of patients.

1.2 Research Question

Is the survival rate of ESRD patients, who were initial treatment of CAPD and had the right of universal health coverage as the PD-First policy, different when compared to those were the continued treatment of CAPD, the changed treatment of HD and the treatment of KT?

1.3 Research Objectives

1.3.1 Primary Objective

To investigate the survival rate of ESRD patients, who were the treatment of CAPD, comparing to those were the continued treatment of CAPD, the changed treatment of HD and the treatment of KT on the right of universal health coverage

1.3.2 Secondary Objectives

1. To investigate the survival rate of ESRD patients with co-mobid disease of DM, who were the treatment of CAPD comparing to those were the continued treatment of CAPD, the changed treatment of HD and the treatment of KT

2. To investigate the survival rate of ESRD patients classified by age group, who were the treatment of CAPD comparing to those of the continued treatment of CAPD, the changed treatment of HD and the treatment of KT

3. To identify factors associated with the mortality of ESRD patients who treated with RRT

1.4 Research Hypotheses

1.4.1 The survival rate of ESRD patients who had the right of universal health coverage with the initial treatment of CAPD as the PD-First policy is not different with the continued treatment of CAPD, the changed treatment of HD and the treatment of KT.

1.4.2 The survival rate of ESRD patients with co-mobid disease of DM who had the right of universal health coverage with the initial treatment of CAPD as the PD-First policy is not different with the continued treatment of CAPD, the changed treatment of HD and the treatment of KT.

1.4.3 The survival rate of ESRD patients classified by age group who had the right of universal health coverage with the initial treatment of CAPD as the PD-First policy is not different with the continued treatment of CAPD, the changed treatment of HD and the treatment of KT.

1.4.4 The mortality of ESRD patients who treated with RRT is associated with the factors of including treatment, age, gender, history of diabetes mellitus, BSA, type of public health center, number of patients in public health center, number of PD nurses and nephrologist.

1.5 Scope of the Research

This research was a retrospective cohort study investigating from medical records of the ESRD patients who had the right of universal health coverage and had the initial treatment of CAPD as PD-First policy. The records were stored into the registration program on individual disease (DMIS) of Renal Failure Fund, NHSO, were collected from 113 public health centers by the program during October 1, 2007 to August 31, 2011. The study ended on January 10, 2012.

1.6 Research Limitations

The researcher was not able to recheck the correction of patients' history in the medical records because data were used from the registration program (DMIS) of Renal Failure Fund, NHSO. Due to the CAPD case manager of each other public health centers has recorded data through the DMIS, then it was not regularly assigned to data entry for every variables. However, it was necessary to record only important data for the payment in the universal health coverage system. This is, therefore some recorded data are limited in the number of treatment follow-up for identifying the corrected value, so there might be some errors or incomplete data.

1.7 Definition of Terms

End-stage renal disease patient (ESRD) means an individual who has diagnosed by a physician whether he/she is the last stage (stage 5) of CKD.

The rights of universal health coverage means the rights of accessing to health care service in universal coverage scheme (UCS), which provides health care and its financial protection, combined the already existing medical welfare scheme and the voluntary health card scheme to all of Thai citizens, including for children aged 0-12 years (AA), secondary and high school students (AC), individuals with disabilities who registered as the act of rehabilitation for disabled persons (AD), veterans (AE), Buddhist persons of being monks, nuns, and novice (AF), elderly people (individuals aged 60 years and above) (AG), temporary card (AH), veterans with disabilities who registered as the act of rehabilitation for disabled persons (AI), community leaders (sub-district headman, village headman, assistant village headman, and sub-district medical practitioner) (AK). These are therefore the universal health insurance card or called "Gold Card".

ESRD patient with the universal health coverage /Patient who has the right for receiving the treatment of CAPD means an individual who has diagnosed by a physician whether he/she is the last stage of CKD and being people who have the right of universal health coverage enrolled to receive RRT in CAPD center through the DMIS_CAPD program.

Renal replacement therapy (RRT) means the treatment methods for renal failure which are continuous ambulatory peritoneal dialysis (CAPD), chronic hemodialysis (CHD) and kidney transplantation (KT).

Dialysis means peritoneal dialysis (PD) or hemodialysis (HD)

ESRD patient with the treatment of CAPD means the ESRD patient, who had the right of universal health coverage, started to receive the treatment of CAPD as PD-First policy.

ESRD patient with the continued treatment of CAPD means the ESRD patient, who had the right of universal health coverage, started to receive the treatment of CAPD as PD-First policy and remained to receive the treatment until patient died or the study finished.

ESRD patient with the changed treatment of HD means the ESRD patient, who had the right of universal health coverage, started to receive the treatment of CAPD as PD-First policy, then changed to be the treatment of HD and maintained to receive its changed treatment until patient died or the study finished.

ESRD patient with the treatment of KT means the ESRD patient, who had the right of universal health coverage, started to receive the treatment of CAPD as PD-First policy, then received the new treatment of KT and maintained to receive its treatment until patient died or the study finished.

Patient survival means the duration since the ESRD patient registered to receive the treatment of CAPD until patient died or the study finished.

Event of patient survival means the event of the ESRD patient has died during the study period (October 1, 2007-January 10, 2012).

Censoring of patient survival means the event of the ESRD patient is still to alive during the study period (October 1, 2007-January 10, 2012).

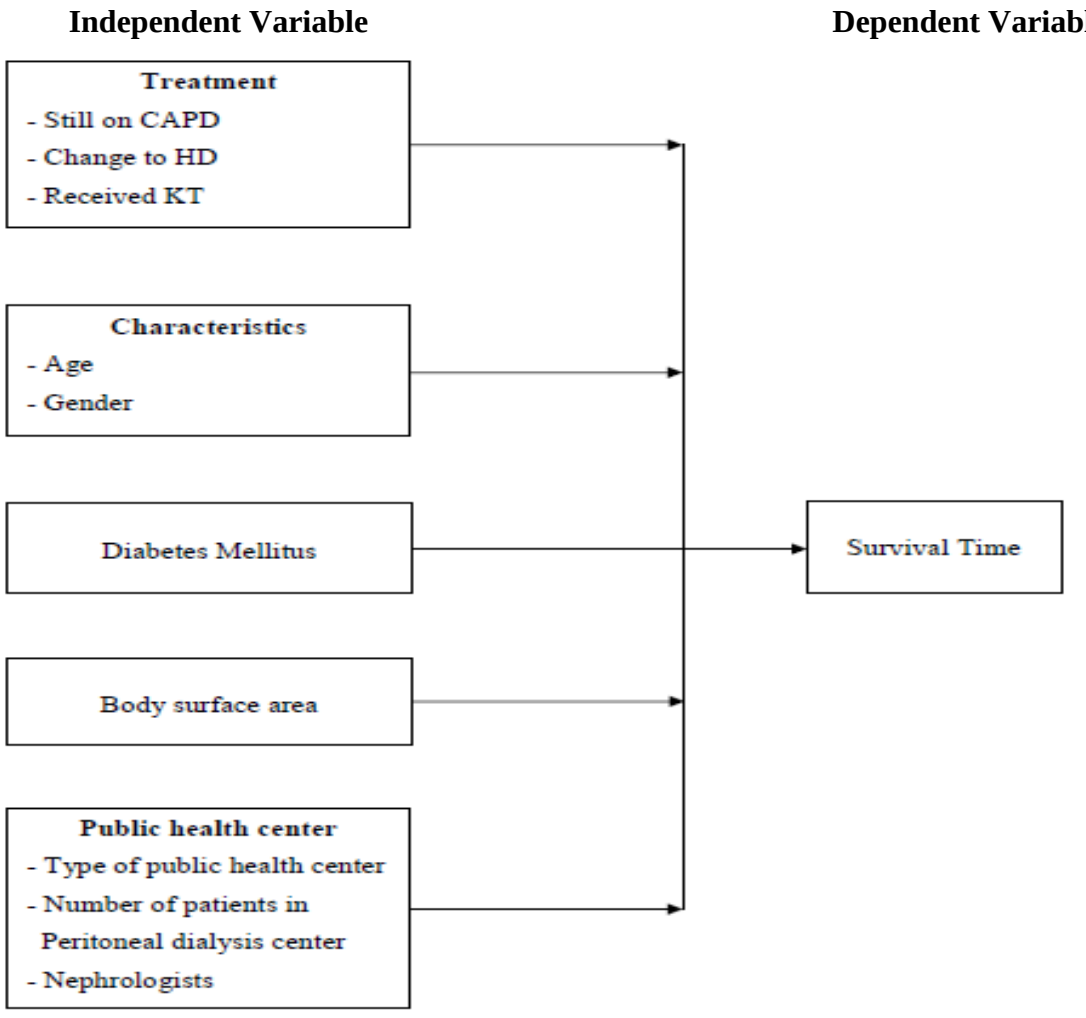
Registration program for patient treatment (DMIS) is the registration program of CKD patient, including the registration program for the patient with the treatment of CAPD (DMIS_CAPD), the registration program for the patient with the treatment of HD (DMIS_HD) and the registration program for the patient with the treatment of KT (DMIS_KT).

1.8 Practical Application

1. Knowing the survival rate of ESRD patients who were the continued treatment of CAPD, the changed treatment of HD and the treatment of KT on the right of universal health coverage in Thailand. This is, therefore, a crucial indicator of the treatments. It can be used to develop the treatment model for ESRD patients.

2. Knowing the factors associated with the mortality of ESRD patients who had treated by RRT in using as the guideline for physicians, nurses, caregivers, NHSO and others on monitoring and preventing the disease as well as resolving the direct problem further.

1.9 Conceptual Framework



CHAPTER II
LITERATURE REVIEW

2.1 End-Stage Renal Disease

The kidneys are bean-shaped organs located in the posterior abdominal wall. People normally have the paired kidneys, one on each side; it contains about a million nephrons (renal units). Each renal unit includes the renal corpuscles and the renal tubes. The kidneys filter about 180 liters of blood flowing through approximately 2 million of renal unit and actually excrete as urine about one liter per day[40].

Functions of the kidneys are including, maintaining equilibrium of the internal environment of the body (homeostasis) such as the excretion of wastes, the absorption of nutrients, the proper balances of water and salts, acid-base, minerals, to control the blood pressure as well as to produce hormones[41-42]. Estimated 70.0%-80.0% of losses of renal function remain to excrete wastes and keeping those balances such as two-types of renal illness including the kidneys that are affected by process of loss of the disease function and the kidneys are not affected by the disease but it can be regularly processed. The normal process of renal units will be growing in a big size (hypertrophy) and having the increased function for maintaining balance in the body. The balance of function of between glomeruli and tubule still is in the process, which the kidneys have more of filtration then it will be more reabsorb similarly. However, the ability of the kidneys is limited on the adaptation resulting the end of the kidneys function is not sufficient in the process. So that signs and symptoms of chronic renal failure are occurred[43].

Progression of CKD may occur in both immunology and non immunology mechanism such as diabetes and hypertension. The destruction of the second group is caused by several mechanisms for including blood cholesterol disorders, high blood pressure of the ultimate body and intraglomerular pressure. In a clinical found that serum creatinine is higher than 1.5 to 2.0 milligrams per deciliter. CKD is mentioned of being CKD that is gradually destroyed in a long time. Until remained kidney units

are not able to compensate work for the lost function[44]. These cause the degeneration of structured organs and functions of the kidney such as filtration, absorption and hormones are steadily decreased. Even there have initially resolved the cause of kidney damage. However, the degeneration of the kidney is continued and eventually becomes ESRD.

Major causes of CKD are occurred by a large component disorder of four parts of the kidney as including glomerulus, renal tubule, other blood vessels, and interstitium, these are a leading cause of CKD[45-50] including DM (30-44.0%), an inflammation of the small blood vessel of the kidney (6.0-37.0%) and HT (10.0-27.0%). Other causes include kidney stones, chronic nephritis and gout (5.0-11.0%), etc.

Signs and symptoms as various systems of loss of renal function in the patient such as the excretion of wastes, the proper balances of water and salts, acid-base, minerals through the secretion of hormones and vitamin D synthesis that affect to deteriorated work of organ systems in the body and making various symptoms of uremia condition as well. The patient may be a mild symptom that causes a nuisance; somehow, the patient may be a severe symptom and even death.

Signs and symptoms of uremia condition affecting various systems in the body[51-54] are as follows: cardiovascular system such as HT, heart attack and failure, pericarditis and pericardial effusion; respiratory system symptoms such as pulmonary edema, lungs inflammation and uremic pneumonia; gastrointestinal system such as distortion in the sense of taste, hiccup, anorexia and nausea, gastritis, ulcers of stomach, intestine and colon, diarrhea and constipation; hematologic system such as anemia, malnutrition with a hemorrhage, and anemia of blood loss in gastrointestinal system; nervous system such as headache, dizziness and insomnia; musculoskeletal system such as joint pain and renalosteodystrophy, tickle, blurred eyes, ankylosis, and capillary fragility[55]; cutaneous system symptoms of including patients with ESRD are yellow pale skin due to anemia and a bottleneck of color substances that is urochrome pigments, bruise, bleeding or capillary fragility and itching skin[56]. These signs and symptoms may occur individually or simultaneously that can be found in all stages of CKD patients and these are a major cause leading to ESRD.

Therefore, however, ESRD means that kidney filtration rate is less than 15 milliliters per minute or receiving RRT. The ESRD patient is the thrombosis of wastes and symptoms of uremia condition. When the patient not receive RRT; consequently, the patient may be died. Therefore, the patient is needed to require RRT for a longer live. Currently, RRT is comprised into 3 methods including KT, kidney dialysis using machine and PD. However, RRT cannot treat the kidney as the normal condition but it is only the method for helping to postpone the degeneration of the kidneys and also prolong the patient life. So there have the planning of RRT which is a dialysis (HD or PD) for waiting KT. Thereafter, the kidneys function is not available then return to the dialysis for waiting KT further.

2.2 Renal Replacement Therapy Policy of National Health Security Office

The aim of universal coverage scheme (UCS) for health in Thailand is to reduce overall charges for health care in population of the whole country and to create opportunities for accessing to equity and dignity of the standard health service. The national health insurance fund is therefore established. The act is legislated regarding health insurance for all people on improving efficiency in the use of health budget of the government and reducing costs of health service. It has been announced for the performance since the year of 2002 to present[57-58].

The rights of health insurance accessing to health care service in Thailand include servant medical benefit scheme, social security scheme and universal health coverage scheme. Abilities of accessing health service of these rights may not have an equity especially people who used the universal health coverage scheme are more likely poor income. Approximately 47 million people then are not able to access to the equity of health service as the same as people who used servant medical benefit scheme. It may be cause of the disability and premature death due to people are lack of opportunity to receive health service. Particular the disease is a high medical cost like CKD so the patient needs the treatment of RRT for extending the patient life. This health care provision is a problem that has been raised for considering in public health

field in Thailand over ten years because of the inequity of accessing health service of the patient for receiving RRT.

Due to RRT is the treatment with the high costs beyond the ability of the patient's household to lade it. The ESRD patient who had the right of universal health coverage scheme is able to access the standard and quality of health service and to protect insolvency from the illness cost, the NHSO has undertaken to provide RRT project in the patient for benefits of health insurance. Committees of the NHSO have considered to extent the benefit scheme of RRT service in the ESRD patient on several times prior to submitting to the council of the ministers for approval. The council has approved the scheme on October 30, 2007 focused on the treatment of KT. The ESRD patient who did not receive the treatment of KT is promoted to receive the treatment of CAPD as first service (PD-First policy); however, except for the ESRD patient who has the interdiction in the treatment of CAPD then the patient received the treatment of HD. Therefore, the benefit scheme has been covered since January 1, 2008. Principles of RRT for the ESRD patient on the benefits of universal health coverage scheme are as follows[19, 59].

In the recent year of 2008, Thai government has supported the service of RRT by the treatment of KT to all of the ESRD patients with inclusion criteria of the treatment of KT and also kidney donation without a co-payment (Universal access to and full fund for the treatment of KT), subsidized RRT by PD for the ESRD patient (or full fund for PD) and the treatment of HD particularly the patient who is not able to treat by PD without a co-payment in a pilot area where ready to serve PD.

In the year of 2009, the government has extended to subsidize the service of RRT by the treatment of KT (Universal access to and full fund for the treatment of KT), PD for the ESRD patient in both of old and new cases, and the treatment of HD especially for the ESRD patient who is not able to treat by PD (Universal access to and full fund for PD) and without a co-payment. If the old case patient with the treatment of HD is not willing to participate in PD, the government also subsidizes the patient to pay the cost for one of third only and pay for the full cost by themselves in a new case.

Supportive management of CAPD service is an implementation of specific disease management. Public health center can be participated in this project with the NHSO for applying public health center and the patient registration and medical cost

compensation. Attending public health center can perform the registration through the DMIS_CAPD program for any support and receiving medical cost compensation from Renal Failure Fund of the NHSO with criteria and conditions as follows:

1. Selecting criteria for the patient receiving RRT, the ESRD patient who had the right for receiving RRT service as the health benefit scheme approval by the NHSO committee and the council, is being the patient with "the permanent loss of renal function up to approximately 95.0% and no adverse condition for receiving the service". Selection of the ESRD patient with a no condition to receive the treatment of CAPD[60] should be considered in the treatment at least one symptom as follows.

- Having a sign of uremia
- Having a fluid volume excess or hypervolemia that is not able to treat by water and salt restrictions or diuretic drugs
- Malnutrition condition that is to having an albumin level (serum albumin) lesser than 3.5 g/dL.

The patient should be suggested to receive the treatment of CAPD more than the treatment of HD by the machine that is the patient with vascular problems and unable to be done the vascular access for the patient with coronary artery disease or cardiomyopathy inconstantly reaction of blood flow and a pediatric patient.

The patient should be avoided the treatment of CAPD including patients with the following characteristics.

- Having a thing in the stomach before starts to PD such as artificial blood vessel tube implanted by a surgery or insert ventriculo-peritoneal shunt
- Having hernia that is not resolved or being abdominal wall hernia outside the abdomen
- Having body weight more than 90 kilograms, or BMI more than 35 kilograms per square meter
- Having a chronic inflammatory bowel disease
- Having an infection of abdominal wall and skin inserted the tube

- Having a recurrent diverticulitis

- Having abdominal tube connecting to outside such as gastrostomy, colostomy or ileostomy

- Having severe malnutrition

These are, therefore, the patient characteristics are prohibited to treat with the treatment of CAPD absolutely, such as the patient with a lesion of belly skin, who is not inserted abdominal tube, the patient with more abdominal adhesions, the patient with severe mental disorder and the patient without caregiver in PD if the patient is unavailable on the treatment by their own.

Although providing RRT by the treatment of CAPD is a major policy of RRT service of the NHSO but there have many patients who are unavailable to receive the treatment of CAPD since they started or during providing RRT with the treatments of CAPD and HD and the patient has treated before. However, the NHSO provides the kidney dialysis by machine for the one who had the right of universal health coverage with the following indications and contraindications of kidney dialysis by the machine.

- Indications of changing the treatment of CAPD to HD but not more than 3 months, and the patient is able to receive the treatment of CAPD without a co-payment thereafter as including:

1) Having an inflammation of abdominal by the treatment

2) Having an inflammation of abdominal by fungi

3) Having an inflammation of abdominal wound

4) Having an inflammation of connecting abdominal tube

5) Having an abdominal infection

6) Having undergoing abdominal surgery

- Indications of changing the treatment of CAPD to the treatment of HD and without a co-payment as including:

1) Dialysate leaking out of the stomach that is not able to treat with the treatment of CAPD

2) Adhesion of abdominal wall that is not able to treat with the treatment of CAPD

3) Severe depression that is not able to treat with the treatment of CAPD

- The relative prohibitions of the treatment of CAPD, the patient has the right for receiving the treatment of HD without a co-payment and the patient must be changed to treat by the treatment of CAPD when the relative prohibition is ended as including.

1) Having a thing in stomach before starting peritoneal dialysis such as artificial blood vessel tube before implantation

2) Having hernia that is not been resolved or being abdominal wall hernia outside the abdomen

3) Having overweight (BMI>35 kg/m^2)

4) Having a recurrent diverticulitis

5) Having stomach surgery or intestines outside the belly

6) Patients are unavailable on the treatment of CAPD by their own and the NHSO has approval under the guidance of the provincial board.

- Complete prohibitions of the treatment of CAPD, the patient has the right to treat with the treatment of HD and do not include a co-payment.

1) Having abdominal skin lesions

2) Having abdominal adhesions

3) Having a severe mental disorder

2. Step of receiving RRT, the patient who are the right of universal health coverage of the NHSO would be applied for RRT to the NHSO. The provincial service center must be documented evidence and the steps the commission has determined that the district and the central are considered RRT. In the case of changing the treatment of CAPD to the treatment of HD due to the patient has indicated. The patient is not treated with the treatment of CAPD that is considered by the committee level before. As the patient list that is considered to be the treatment of

HD and related documents to the NHSO for enrolling in the program, except the DMIS_HD patient with relative contraindications. If the patient is unavailable in the treatment of CAPD and required to submit the list form and supportive documentation to the NHSO for applying to consider enrolling in the program DMIS_HD further. The patients through the above steps are entitled without a co-payment. The NHSO is to support the artificial kidney dialysis using machine every 1,500 or 1,700 baht, including other involved costs and an unlimited number of times.

Therefore, the implementation of PD-first policy is to develop the service of CAPD and reduces public spending and burden of financing of health system of the country by implementing a pilot first, then gradually expand the service area for the providing. The expansion of the service increases the health provider accept a greater of the treatment of CAPD, leading to the results of the service which are quality of life of the patient, stop rate of the service and mortality rate of the patient into the gold standard.

2.3 Renal Replacement Therapy

2.3.1 Continuous Ambulatory Peritoneal Dialysis

The peritoneal dialysis is another method for helping to eliminate waste in the body and control minerals and pH balance of water in the body of the patient for returning to the normal. Principle of the PD is the treatment for the patient with CKD replacing the kidneys function by peritoneal membranes. It is the blood waste filter of being high amounts of waste are seeped out through capillaries of the abdominal wall with a peritoneal fluid into the abdominal. The method is the replacement of an intense dialysate (solute) as individual types of a dialysate for making differences between a dialysate and a fluid in the body. The movement of a fluid in the blood is through the small blood vessels of the peritoneum in the dialysis. The process is called “diffusion”, is the movement of waste by the blood in a dialysate and finished at overtime period. The patient is changed the new solution in every 4-6 hours for the purpose of the PD is removal of waste products of protein metabolism and eliminate excess water from the body.

The treatment of CAPD is, the PD, done by a fluid in the abdominal about 24 hours and having its exchange and removal of waste at all times. This may result to the change of waste in the body being the equilibrium at almost of the time; similarly, the kidney that will be changed a dialysate about 4 times per day and it must be done in every day.

The treatment of CAPD is the process of using a dialysate about two liters put into the abdominal through a special tube which is called “tenckhoff”, holding to exchange a fluid between the blood and a dialysate by diffusion and extracting a fluid from the body by osmosis then it releases from the body into a plastic bag, which is counted to performing the treatment of CAPD as one round. One cycle of the process consists into 3 phases: Phase 1 Inflow, this phase used approximately 10 minutes on a dialysate releasing as the gravitational force from a dialysate bag hanging on the above patient level; Phase 2 Dwell time, this phase is a fluid exchanges of between the blood and a dialysate. In this phase, a dialysate is remained in the abdominal about 4-6 hours at noon and 6-8 hours at night (or change a fluid bag for suitable the patient routine). The patient is available to perform an activity like the normal individual regularly; and Phase 3 Outflow, this phase allows a dialysate flowing outside the body into a plastic bag by approximately 20-30 minutes and start again.

2.3.2 Hemodialysis

Artificial kidney dialysis is the circulation process of the blood bringing to a dialysis machine through the hemodialyzer which is a semipermeable membrane that having a dialysate flows through the blood on each side of the membrane. Waste and excess water in a filter of the exchanges, are more than in the blood such as alkali, is absorbed from a dialysis into the blood flowing through a filter and then flows back into the body of the patient. The filtered dialysate is rested about 4-5 hours[(12)]. This is the process of hemodialysis machine at one time. Individually times of this dialysis is required the blood through a filter about 200-300 cc per minute and also use heparin for preventing blood clotting while it through a dialysis machine.

The principle of a dialysis is the blood come out the body into the capillary tube filter. The filtered blood turns to a dialysis and returns to the body. Each time of a dialysis can reduce both of urea and creatinine levels approximately 60.0% and 50.0%,

respectively. This is, therefore, possible for 2-3 times a week of a dialysis at the level of waste reductions can control the balances of water and minerals and maintain its pressure to be a normal. The patient then is recovered by the symptoms causing from congestive waste in the body for reducing morbidity and mortality, which it results to the quality of life of the patient.

Artificial kidney dialysis can be done in a dialysis center by the physician but some patients can be performed a dialysis machine at home by their relatives who were trained for artificial kidney dialysis. The patient normally uses their life in daily during a dialysis, including reading, writing, sleeping, and watching TV, etc.

However, both of above artificial dialysis treatments (CAPD and HD) are only the replacement for lost kidney function. It cannot help the kidney turning back to the original condition. In normally, the kidney must act to eliminate waste occurring in the body in regularly. The treatments can help to postpone the patient kidney on renal function first. The patient is always needed for the enough elimination of waste. This is, therefore, the key of its accomplishment is longevity and a good quality of life of the patient.

2.3.3 Kidney Transplantation

Kidney transplantation is the implementation of kidney donor, the patient with brain necrosis and the kidney donation from their relatives. The enrolled patients are transplanted to the patient by placing kidney surgery in the pelvis on either side of the patient. Then, blood vessels of the new kidney are blood vessels of the patient and new ureter in the bladder of the patient. This new KT can have only one kidney when the kidney is well and without any complications. Therefore, however, the new kidney is also working well under the patient receives immunosuppressive life and the care of the physician forever. If the patient is without immunosuppressive, the body will resist the new kidney and it can be fatal.

In the current, KT is considered for the treatment of renal failure like the ESRD patient. It is the best treatment but it also has a risk more than the treatments of CAPD and HD. However, if the result is such a good treatment for the patient nearly the normal rather than other treatments, the result of the treatment is good if the patient without a systemic disease other than CKD, no infection, and younger, etc.

2.4 Survival Rates in ESRD Patients who Received RRT

Results of studies on the survival rates of the ESRD patients who received RRT in worldwide since 1979 to 2010 were found that the survival rates at 1, 2, 3, and 5 years between 62.0-95.0%, 49.0-91.0%, 30.0-84.0% and 39.0-74.0%, respectively on the patients with the treatment of CAPD[23-26, 31, 33-35, 45-47, 61-97, 104] and between 70.0-96.0%, 66.0-92.9%, 46.0-80.0% and 35.0-73.0%, respectively on the patients with the treatment of HD[23-26, 31, 33, 35, 46, 66, 69-70, 72, 76-77, 98-104] and the survival rates at 1, 2 and 5 years between 90.0-97.0%, 90.0-94.9% and 81.0-92.0%, respectively on the patients with the treatment of KT[50, 104-113].

However, most previous studies were a retrospective study. Some studies separately reported the specific groups such as age group, group of diseases, BMI, etc. Some studies are different on the survival rates due to differences of including sample size, duration of study, sample characteristics, place of the treatment, age and co-disease with CKD, etc. These differences may effect to results of the treatment. The findings were only specific groups even there are many sample size. The survival rates are shown in Table 2.1.

Table 2.1 Survival rates of ESRD patients who received RRT

Author	years	RRT	Number (n)	DM (%)	Mean Age (Year)	Patient Survival (%)				
						1 yr	2 yr	3 yr	4 yr	5 yr
Weber J. et al.[61]	1979-1989	CAPD	104	44	54	80	57			
Fried L. et al.[62]	1979-1995	CAPD	343	34	48.7	86.3	77.0	65.2	56.9	
Woodrow G. et al.[63]	1980-1993	CAPD	221	24.9	54.7	91		72		53
Serkes KD. et al.[24]	1981-1985	CAPD	325	37	NA			83		
		HD	332	30	NA			75		
Maiorca R. et al.[23]	1981-1986	CAPD	120	23	50.0	89	81	73	64	46
		HD	139	9	48.5	92	88	80	72	66
Maiorca R. et al.[25]	1981-1987	CAPD	480	20.2	56.2	91	79	68	60	48.7
		HD	373	7.2	50.0	92	84	79	67	62.4
Maiorca R. et al.[64]	1981-1993	CAPD	297	13	62					60
Han SH. et al.[45]	1981-2005	CAPD	1,656	27.8	48.9	93.4		81.5		69.8
Gloor HJ. et al.[65]	1982-1990	CAPD	50	20	53			80		60
Grant AC. et al.[66]	1982-1988	CAPD	139	0	39.4	94.5		86.2		
		HD	139	0	39.4	98.5		93.8		
Lo WK. et al.[67]	1983-1994	CAPD	507	NA	NA	93	71	57		
Lo WK. et al.[68]	1983-1994	CAPD	569	17.8	47.8	92		70		56
Gentil MA. et al.[69]	1984-1988	CAPD	272	28.7	NA	89	73	64		
		HD	842	2.3	NA	91	85	80		
Cueto-Manzano AM. et al.[71]	1985-1997	CAPD	627	37	45.2	85		68		50
Lupo A. et al.[70]	1985-1989	CAPD	660	13	59.7					45
		HD	962	8	53.6					54

Table 2.1 Survival rates of ESRD patients who received RRT (cont.)

Author	years	RRT	Number (n)	DM (%)	Mean Age (Year)	Patient Survival (%)				
						1 yr	2 yr	3 yr	4 yr	5 yr
Held PJ. et al.[72]	1986-1987	CAPD	681	36.4	53.7	91.8	78.0			
		HD	3,376	28.1	58.7	90.6	78.4			
Struijk DG. et al.[73]	1986-1989	CAPD	61	13.1	57		64			
Ohashi N. et al.[74]	1986-1997	CAPD	91	11	48					74
Jindal KK. and Hirsch DJ.[75]	1987-1990	CAPD	155	35	53			66		
Kim GC. et al.[46]	1987-1997	CAPD	82	30	49	91	80	67	57	57
		HD	55	50	47	96	92	79	67	55
Tanna MM. et al.[76]	1987-1997	CAPD	194	40	52	90	73			43
		HD	237	56	59	88	72			35
Ahlmen J. et al.[77]	1988-1992	CAPD	37	NA	52	92				
		HD	23	NA	59	70				
Churchill DN. et al.[78]	1990-1992	CAPD	100[a]	22	54.4		79.7			
			100[b]	25	53.4		63.2			
Jittinun A. et al.[79]	1990-1993	CAPD	59	28.8	48.7	87.8	78.6			
Davies SJ. et al.[80]	1990-1995	CAPD	210	NA	52.8					58
Utas C.[81]	1992-1999	CAPD	334	12.9	42.2	94.2	88.6	84.5		68.9
Fenton SSA. et al.[26]	1990-1994	PD	2,841	31.9	NA					35
		HD	7,792	23.1	NA					36
Lupo A et al.[82]	1994	CAPD	1,990	13	58.4				51	
Szeto CC. et al.[83]	1995-1997	CAPD	270	24	52.9		83			

Note: [a]Canada continuous ambulatory peritoneal dialysis patients,[b]U.S. continuous ambulatory peritoneal dialysis patients

Table 2.1 Survival rates of ESRD patients who received RRT (cont.)

Author	years	RRT	Number (n)	DM (%)	Mean Age (Year)	Patient Survival (%)				
						1 yr	2 yr	3 yr	4 yr	5 yr
Szeto CC. et al.[84]	1995-1998	CAPD	140	25.7	52.5		68.8			
Szeto CC. et al.[85]	1995-2000	CAPD	270	24.1	NA					41.5
Pongskul C. et al.[47]	1995-2005	CAPD	322	49.4	56.7	84.0		61.1		44.0
Lo WK. et al.[86]	1996-1999	CAPD	320	32.3	NA	94.8	84.9			
Lo WK. et al.[87]	1996-1999	CAPD	937	15.6	54.6	90.9	79.8			
Thom FS. et al.[88]	1997	CAPD	1,316	NA	NA	78.6				40.7
Yao Q. et al.[89]	1997-1999	CAPD	146	5.48	51.6		90			
Kririthichai O. et al.[33]	1998-2001	CAPD	1,485	NA	NA	91				62
Passadakis PS. et al.[90]	2000	CAPD	44	25	NA		90			70
Prasad N. et al.[91]	2000-2004	CAPD	373	52.8	56	90	72	60	49	39
Li PK. And Szeto CC.[92]	2000-2004	CAPD	328	46.34	57.6		91			
Fang W. et al.[93]	2000-2006	CAPD	240	NA	NA	90	79	71		64
Sanchez AR. et al.[94]	2003-2005	CAPD	139	77	62	62	49	42		
		APD	98	70	59	82	62	56		
Long HB. et al.[95]	2004-2009	CAPD	236	12.29	47	83.6	51.5	29.8		
Chung SH. et al.[96]	2005	CAPD	132[c]	59	53.9	91.1	86.4	72.6		
Kasemsup V. et al.[97]	2007-2008	CAPD	144	30	42.2	91.2				
Innes A. et al.[98]	1980	HD	282[e]	27	56	80	66	61		49
			452[f]	51	54	90	84	78		73
			106[d]	37	55.6	94.9	83.0	63.5		

Note: [c]Korea continuous ambulatory peritoneal dialysis patients., [d]Swedish continuous ambulatory peritoneal dialysis patients., [e]Nottingham hemodialysis patients., [f]Tassin hemodialysis patients

Table 2.1 Survival rates of ESRD patients who received RRT (cont.)

Author	years	RRT	Number (n)	DM (%)	Mean Age (Year)	Patient Survival (%)				
						1 yr	2 yr	3 yr	4 yr	5 yr
Chandran PKG. et al.[99]	1981-1991	HD	352	30	56.8	84		60		48
Choi SR. et al.[100]	1986-1995	PD	128	100	57	77.8				19.8
		HD	75	100	59.3	76.3				22.8
Deorco PB. et al.[101]	1994-1995	HD	1,000	36	58.2	92	83			
Locatelli F. et al.[31]	1994-1997	PD	1,292	16	63.6	87.2	74.7	58.2		
		HD	2,772	21.2	60.9	85.4	75.7	67.0		
Chauveau P. et al.[102]	1996-1998	HD	843	9.4	NA	86.4	79.0			
Combe C. et al.[103]	1996-1998	HD	1,610	11	59.6	89.7	78.4			
Termorshuizen F. et al.[35]	2003	PD	480	14.6	52.1		84			
		HD	742	15.0	62.3		73			
Ojo AO. et al.[50]	1988-1997	KT	86,502	NA	NA	97				91
Kramer A. et al.[104]	1997-2006	PD[g]	NA	NA	NA	88.4	75.9			43.1
		PD[h]	NA	NA	NA	89.7	79.4			
		HD[g]	NA	NA	NA	78.8	65.8			35.9
		HD[h]	NA	NA	NA	78.7	65.8			
		KT[g]	NA	NA	NA	95.8	94.0			87.8
		KT[h]	NA	NA	NA	96.1	94.5			
Pauly RP. et al.[107]	1994-2006	KT[i]	531	14	46.9	95.9	92.2			86.2
		KT[j]	531	14	43.9	97.7	94.9			91.3

Note: [g]patients underwent peritoneal dialysis in 1997-2001, [h]patients underwent peritoneal dialysis in 2002-2006, [i]Deceased Donor kidney transplantation case, [j]Living Donor kidney transplantation case

Table 2.1 Survival rates of ESRD patients who received RRT (cont.)

Author	years	RRT	Number (n)	DM (%)	Mean Age (Year)	Patient Survival (%)				
						1 yr	2 yr	3 yr	4 yr	5 yr
Van Dijk PCW. et al.[105]	1980-1999	KT	57,371	NA	NA		90			81
Couple S. et al.[106]	1985-1998	KT	1,937	NA	NA	97				92
Ansell D. et al.[108]	2006	KT	15,476	NA	NA	97.6				
Thai transplantation society[109]	2002-2009	KT	2,441	8	43	96		94		91
Teraoka S. et al.[110]	1964-1991	KT	8,384	NA	NA	90.4				82.7
				NA	NA	85.4				77.4
				NA	NA	92.2				84.4
Ingsathit A.[111]	1999-2008	KT	2,298	16.0	41.7	93				84
Hariharan S. et al.[112]	1988-1996	KT	93,934							
	1988	KT[i]	9,038	NA	NA	75.7				
		KT[j]				88.8				
	1996	KT[i]	11,766	NA	NA	87.7				
		KT[j]				93.9				
Stel VS. et al.[113]	1999-2003	KT[i]	NA	NA	NA	95.5	93.6			86.6
		KT[j]	NA	NA	NA	97.6	96.8			94.1
		Dialysis	NA	NA	NA	80.3	67.2			38.3
	2002-2006	KT[i]	NA	NA	NA	95.6	93.7			
		KT[j]	NA	NA	NA	97.9	97.1			
		Dialysis	NA	NA	NA	80.8	68.4			

Note: [i]Deceased Donor kidney transplantation case, [j]Living Donor kidney transplantation case

2.5 Factors Associated with Mortality of ESRD Patients who Received RRT

2.5.1 Renal Replacement Therapy

Continued Ambulatory Peritoneal Dialysis is the method of peritoneum use being the filter of waste in the blood. The high of wastes are absorbed through the capillary walls of the peritoneal and flowing out together with a dialysate that put in the abdominal. In this dialysis, the patient must be taken self-care at home and made the appointment by the physician only. Both of physician and nurse are very important role for the result of the treatment is going well and minimizing its complications. The problems of CAPD are ranged from mild to severe problems, for example taking out the tenckhoff then replaced the patient by KT or death, including abdominal infection and being wound at exit way of the plastic tube, leakage of a dialysate comes out the body, stomach pain by put it in-pull it out of a dialysate, release of a dialysate from the abdominal having a dialysate combined the blood, excess water condition, umbilical and groin hernias, abdominal bleeding, obstruction of the tube and protein deficiency, etc[114]. However, waste elimination of the peritoneal is many advantages which are the patient can be done the treatment by themselves and not often goes to hospital. The disadvantage is that, if the patient is not careful for cleanness especially the transition of dialysate bag, they will be got an infection.

Artificial Kidney Dialysis is the process that involves the control of fluid volume of the mineral and pH filtering uremic toxin from the body[115]. Although the current technological is an advancement of artificial kidney for the preparation of pure water and filter (dialyzer) is more developed but its complications might be found. It is due to biochemical reactions, is resulted by human or mechanical error of the artificial kidney. Most of the complications are often occurred, including cardiovascular disease (CVD) such as hypotension, hypertension and arrhythmia during hemodialysis, brain and muscle such as muscle cramps, transient ischemic attack, dialysis disequilibrium syndrome and stroke; and hemodialysis such as filter and chemical allergic reactions, febrile, pyrogenic reactions, hypoxemia, air embolism, and hemolysis, etc. A higher cost of the dialysis treatment is resulted by these complications, which impacts to such as disability and may be a severity to the patient's death[116]. It can also cause the body

is loosed the blood by the testing for diagnosis and in the filter of hemodialysis, which is cause to anemia, losses of minerals and vitamins such as iron, folic acid, vitamin B and amino acids and then resulting to vitamin deficiency and malnutrition. However, advantages of the treatment are not to be done by the patient and use a small time. The disadvantages are the patient must often go to the hospital and the treatment is not to elimination of waste over the time period. The patient with diabetes also can be a CVD problem. This may affect to the treatment as unavailable for the patient.

Kidney Transplantation is the kidney surgery which is an achievement of both renal survival rate and quality of life of the patient thereafter the treatment due to having development on the preparation of the patient prior to KT, surgical technique, post care of KT and efficiently prevention and treatment of its complication. Although KT is highly successful in the treatment but still have problems and obstacles such as shortages of the organ, side effects of immunosuppressive drug, reaction of the kidney transplantation rejection, chronic diseases, and chronic graft dysfunction, which may eventually need a repeated kidney transplant[117].

As the correlation studies of between RRT and the mortality using Cox's Proportion Hazard Model found that patients who received the dialysis methods (HD, PD) had 4-5 times of mortality risk[104, 118] compared with those patients who received KT statistically significant. When compared to the treatments of between PD and HD, many studies in the United State, Europe and Asia even in Thailand concluded that no difference of the two treatments was found in mortality risk of the patients[119]. The details are shown in Table 2.2.

Table 2.2 Association of the methods of renal replacement therapy and mortality

Author	Relative Risk			p-value or 95%CI	COMMENT
	PD	HD	KT		
Maiorca R. et al.[23]	1.34	1.00	-	0.604	
Serker K. et al.[24]	0.90	1.00	-	NS	DM
	0.62	1.00	-	0.08	Non-DM
Maiorca R. et al.[25]	1.35	1.00	-	0.161	CAPD
Fenton SSA. et al.[26]	0.73	1.00	-	0.67-0.78	CAPD/CCPD
Van Biesen WV. et al.[28]	0.98	1.00	-	0.10	
Locatelli F. et al.[31]	0.91	1.00	-	0.215	
Krairithichai O. et al.[33]	1.47	1.00	-	1.25-1.74	
Lupo A. et al.[70]	1.00	1.57	-	NS	CAPD
Held PJ. et al.[72]	1.26[a]	1.00	-	0.03	DM
	0.84	1.00	-	0.25	Non DM
Fenton SSA. et al.[120]	0.88	1.00	-	0.83-0.93	CAPD/CCPD
Wolfe RA. et al.[121]	0.98	1.00	-	NS	CAPD/CCPD
Locatelli F. et al.[122]	1.42	1.00	-	1.31-1.53	CAPD/CCPD
Disney AP. et al.[123]	1.31	1.00	-	1.17-1.46	CAPD/CCPD
Gentil MA. et al.[69]	1.22	1.00	-	0.33	CAPD
Korevaar JC. et al.[124]	1.00[b]	3.6	-	0.09	
Kim GC. et al.[46]	1.00[c]	1.49[d]	-	NS	CAPD
Sriwajana P.[125]	2.71	1.00	-	<0.01	CAPD
Harris SA. et al.[34]	1.13	1.00	-	0.60-2.11	
Ganesh S. et al.[126]	1.11	1.00	-	1.07-1.16	
Liem YS. et al.[127]	0.43	1.00	-	<0.001	
Mircescu HJ. et al.[128]	0.81	1.00	-	0.63-1.05	
Nelson CB. et al.[129]	0.78	1.00	-	0.57-1.05	Non-DM
	1.13	1.00	-	0.56-2.15	DM
Sanabria M. et al.[130]	1.00	1.12	-	0.85-1.48	
Van Manen JG. et al.[118]	-	3.52	1.00	1.12-11.01	RRT
	3.64	-	1.00	1.16-11.45	

Note: [a] at age 58.7, [b] present results base on ITT analysis, [c] Remained on PD, [d] Transfer from PD to HD

2.5.2 Age

A study of survival rate of CAPD patients classified by age group from the study of Turkey[131] in the year 2005, studied in patients aged <20 years showed that the survival rates at 1, 2, 3, 4 and 5 years were 90.0%, 85.0%, 80.0%, 75.0% and 70.0%, respectively. The report of Honda et al[132] in the year 1996 in patients aged <16 years showed the survival rates better than in Turkey, which found survival rates at 1, 3 and 5 years classified by aged group <6 years, ≥6 years and <16 years (93.0%, 97.0%, and 95.0%), (80.0%, 91.0%, and 86.0%) and (73.0%, 87.0%, and 82.0%), respectively, and a previous study in the year 1999[133] in patients with the same age group showed the better survival rates in years 3 and 5 (91.0% and 86.0%). The study group of elderly patients of Mujais S & K Story[134] found that survival rates in years 1, 2, 3 and 4 of the patients aged 60-70 years were 83.2%, 68.6%, 57.1%, and 43.4%, patients aged 70-80 years were 76.5%, 58.5%, 44.6%, and 32.7%, respectively, and patients aged >80 years were 67.9%, 48.9%, 33.3%, and 23.4%, respectively. In the study of patients aged 65 years and above[38] found that patients with survival rates at 1, 3 and 5 years were 71.1%, 39.3%, and 25.2%, respectively. However, the previous studies of survival rates revealed a small number of survival rates in elderly patients. In comparing mortality rates showed that mortality rates among elderly patients were more than among younger patients statistically significant[135].

Elderly patients are the declined renal filtration due to blood circulation in the kidney is decreased, the filtration of glomeruli is small, the creatinine clearance is decreased and the excretion of the kidney is reduced. Therefore, wastes in the body of the patients still are retention more than younger patients. Particularly in the elderly patients, the renal disease is made to the prognosis worse. The risk of death increased from results of the Canadian study in the year 1995[120] that classified patients who received RRT by age groups of including 0-14, 15-44 (Ref), 45-64 and 65 years, found that the patients who received KT in aged 45-64 years (RR = 2.46, 95%CI = 2.12-2.86) and aged 65 years and above (RR = 5.27, 95%CI = 3.96-7.00) were statistically significant associated with the mortality, the patients who received PD had a different of risk and the age groups were statistically significant association with the mortality including aged 0-14 years (RR = 2.22, 95%CI = 1.73-2.86), aged 45-64 years (RR = 1.48, 95%CI = 1.35-1.63), and aged 65 years and above (RR = 2.17, 95%CI = 1.98-

2.39), which is consistent with the results of studies in the year 1997[26] whether the patients with dialysis in aged 45-64 years (RR = 2.14, 95%CI = 1.85-2.47) and aged 65 years and above (RR = 3.69, 95%CI = 3.21-4.25), but aged group 0-14 years has trended to improvement and there was not found the risk of death when compared to aged 15-44 years. In addition, other studies showed that the association between age and risk of death due to the factor of increasing age as shown in Table 2.3.

Table 2.3 Association of age and mortality of ESRD patients who received RRT

Author	Age (years)	Relative Risk	p-value or 95%CI	Comment
Song YS. et al.[136]	>55	3.75	2.09-6.72	RRT
Park HC. et al.[137]	>55	1.04	0.008	CAPD
Maiorca R. et al.[23]	≤53.2	1.14	<0.05	CAPD+HD
Maiorca R. et al.[25]	≤53.5	1.07	0.0001	CAPD+HD
Fenton SSA. et al.[26]	0-14	0.93	0.49-1.76	CAPD/CCPD
(age 15-44 yr as reference group)	45-64	2.14	1.85-2.47	+HD
	≥65	3.69	3.21-4.25	
Jittinon A. et al.[79]	>50	4.33	0.02	CAPD
Kritsaneepaiboon S.[138]	>50	1.0	0.4-2.5	CAPD
Gentil MA. et al.[69]	>60	4.10	<0.01	CAPD+HD
(age <60 yr as reference group)	>60	4.10	<0.01	ICHD
	>60	3.69	<0.01	CAPD
Sanabria M. et al.[130]	≥65	1.98	1.50-2.63	PD+HD
Keshaviah P. et al.[139]	45-60	1.57	0.13	HD
(age <45 yr as reference group)	>60	3.48	0.0001	
	45-60	1.50	0.32	CAPD
	>60	2.40	0.02	
Fenton SSA. et al.[120]	0-14	2.22	1.73-2.86	CAPD/CCPD
(age 15-44 yr as reference group)	45-64	1.48	1.35-1.63	/IPD+HD
	≥65	2.17	1.98-2.39	
	0-14	1.18	0.78-1.78	KT
	45-64	2.46	2.12-2.86	
	≥65	5.27	3.96-7.00	

Table 2.3 Association of age and mortality of ESRD patients who received RRT (cont.)

Author	Age (years)	Relative Risk	p-value or 95%CI	Comment
Ojo AO. et al.[50]	30-44	1.76	1.54-1.95	KT
(age 18-29 yr as reference group)	45-54	3.08	2.77-3.42	
	55-64	4.64	4.18-7.94	
	≥65	7.02	6.21-7.94	
Iseki K. et al.[140]	35-44	1.66	1.55-1.76	HD
(age 0-34 yr as reference group)	45-54	2.74	2.41-3.11	
	55-64	4.54	3.74-5.50	
	≥65	7.51	5.81-9.70	

2.5.3 Gender

A study of the United States of Mujais S & K Story[134] between the year 2000-2003 in more than 40000 patients who had PD with the treatments of CAPD and APD found that survival rates at 1, 2, 3, 4 and 5 years of between males and females were not different including 86.0%, 85.8%; 74.6%, 74.5%; 63.1%, 65.2%; and 53.2%, 58.3%, respectively, but the study in Southeast Asian elderly of Hung et al[38] during the year 1985 to 2004 found that patients aged ≥65 years had survival rates in males more than females in especially for 1-3 years of the survival rates at 1, 3 and 5 years of between males and females were 81.2%, 60.0%; 49.6%, 27.1%; and 25.5%, 24.3%, respectively. The association of between gender and mortality found that females had 1.68 times of mortality risk when compared to males statistically significant (95%CI = 1.05-2.67) while in the multivariate analysis found no association between gender and mortality. Additionally, there are many studies showed the association between gender and mortality as shown in Table 2.4.

Table 2.4 Association of gender and mortality of ESRD patients who received RRT

Author	Gender	Relative Risk	p-value or 95%CI	Comment
Maiorca R. et al.[23]	Female	0.65	NS	CAPD+HD
Wolfe. et al.[121]	Male	1.09	NS	CAPD+HD
Maiorca R. et al.[25]	Female	1.13	0.44	CAPD+HD
Yao Q. et al.[89]	Female	2.02	0.094	CAPD+HD
Stack AG. et al.[141]	Male	0.99	0.97-1.02	CAPD+HD
Kritsaneepaiboon S.[138]	Male	1.5	0.8-3.0	CAPD
Kim GC. et al.[46]	Male	1.26	0.59-2.69	CAPD
Van Manen JG. et al.[118]	Female	0.85	0.74-0.97	RRT
Ganesh SK. et al.[126]	Male	0.99	0.97-1.02	PD+HD
Liem YS. et al.[127]	Female	0.87	<0.001	PD+HD
Lee HY. et al.[143]	Female	1.27	0.96-1.68	CAPD
Han SH. et al.[45]	Female	0.74	0.43-1.26	CAPD
Prasad N. et al.[91]	Male	0.66	0.42-1.03	CAPD
Kririthichai O. et al.[33]	Male	1.12	0.99-1.27	PD+HD
Mircescu HJ. et al.[128]	Male	0.88	0.72-1.08	CAPD
Wang AY. et al.[142]	Male	3.18	1.57-6.44	CAPD
Szeto CC. et al.[85]	Male	1.95	1.20-3.17	CAPD
Locatelli F. et al.[31]	Male	1.02	0.89-1.18	PD+HD
Lupo A. et al.[70]	Male	1.28	NS	CAPD+HD
Ojo AO. et al.[50]	Male	1.16	1.11-1.22	KT

2.5.4 Diabetes Mellitus

Diabete mellitus (DM) is a chronic public health disease of the country. It is a major cause of different complications including macrovascular and microvascular complications, glomerulosclerosis, coronary heart disease and myocardial infarction (MI). These factors affect to low survival rate in patients with DM than those without DM. Several studies of survival rates in DM patients who received PD revealed that survival rates of ESRD patients with DM were lesser than those without diabetes[36, 38, 47, 66, 68, 70, 72, 91, 137, 148-151]. The ESRD patients with and without DM, who received the treatment of CAPD, the survival rates at 1, 3 and 5 years were between 79.0-87.0%, 88.0-96.0%; 37.0-50.0%, 71.0-86.0%; and 20.0-40.0%, 42.0-81.0%, respectively, The

ESRD patients who received the treatment of HD, the survival rates at 1, 3 and 5 years were between 76.0-85.0%, 90.0-98.0%; 33.0-65.0%, 72.0-93.0%; 12.0-22.0%, 57.0%, respectively, which is consistent with the study in Hong Kong[152] in the year 1995-2000 that studied survival rates of the patients who received RRT in 4,479 cases classified as 1,026 cases of patients with DM and 3,453 cases of without DM, divided by the treatments including 827 (1,702) cases of CAPD, 92 (500) cases of HD and the 107 (1,251) cases of KT, showed that the patients with and without DM at 1-year of survival rate were 89.0%, 95.0%; 73.0%, 91.0%; and 94.0%, 97.0%, respectively, and the patients at 5 year of survival rate were 32.0%, 60.0%; 26.0%, 71.0%; and 87.0%, 92.0%, respectively.

As the survival rates in the patients with DM were less than in the patients without DM that depend on many factors. The main cause is the complication of being DM since the beginning of receiving RRT such as peripheral vascular disease (PVD), HT and retinopatthy. In addition, there also have a complication that is different in the patients who received the treatments of CAPD and HD whether diabetic retinopatthy condition in the patients who received the treatment of CAPD was better than those who received the treatment of HD, but some studies have found no difference in either patients who received the treatments of CAPD and HD.

As the study of association between ESRD patients with DM and mortality in the patients who received RRT found that the mortality risk was ranged 1.10-4.78 in the patients who received the treatment of CAPD and ranged 1.26-1.58 in the patients who received the treatment of HD as shown in Table 2.5.

Table 2.5 Association of DM and mortality of ESRD patients who received RRT

Author	Relative Risk	p-value or 95%CI	Comment
Kritsaneepaiboon S. [138]	4.5	2.2-9.3	CAPD
Jittinon A. et al.[79]	4.78	0.009	CAPD
Davies SJ. et al.[144]	0.35	0.08-1.49	CAPD
Woodrow G. et al.[63]	1.32	1.04-1.67	CAPD
Ohashi N. et al.[74]	3.37	1.04-12.08	CAPD
Park HC. et al.[137]	3.91	<0.001	CAPD
Cueto-Manzano AM. et al.[71]	2.56	<0.0001	CAPD
Chung SH. et al.[145]	1.20	0.92-1.56	CAPD
Keshaviah P. et al.[139]	1.10	0.60	CAPD
	1.26	0.11	HD
Wang AY. et al.[142]	2.48	1.22-5.05	PD
Szeto CC. et al.[85]	2.44	1.59-3.76	CAPD
Chung SH. et al.[96]	1.55	1.10-2.23	CAPD
Pongskul C. et al.[47]	1.44	0.96-2.17	CAPD
Lee HY. et al.[143]	1.56	1.16-2.11	CAPD
Han SH. et al.[45]	2.78	1.60-4.85	CAPD
Prasad N. et al.[91]	1.95	1.23-3.07	CAPD
Hung CC. et al.[38]	2.21	1.38-3.56	CAPD
Fenton SSA. et al.[26]	1.69	1.49-1.91	CAPD/CCPD+HD
Ganesh SK. et al.[126]	1.08	1.05-1.11	PD+HD
Liem YS. et al.[127]	5.65	<0.001	PD+HD
Combe C. et al.[103]	1.58	1.21-2.08	HD
Kim GC. et al.[46]	1.18	0.59-2.33	CAPD
Van Manen JG. et al.[118]	1.51	1.29-1.77	RRT
Nelson CB. et al.[129]	3.15	1.74-5.70	CAPD
	2.17	1.73-2.73	HD
Chauveau P. et al.[102]	1.71	1.05-2.81	HD
Sanabria M. et al.[130]	1.76	1.30-2.40	PD+HD
Fried LF. et al.[146]	2.23	<0.001	PD
Lee HY. et al.[147]	1.69	1.37-2.07	CAPD
Fenton SSA. et al.[120]	3.41	2.81-4.12	KT
	1.97	1.81-2.16	PD+HD
Ojo AO. et al.[50]	1.93	1.82-2.05	KT

2.5.5 Body Surface Area

Body surface area (BSA) is a measurement or calculation of the size of the surface area of physical features, is a square meter (M^2). In RRT is used to calculate the glomerular filtration rate (GFR). In assessing adequacy of PD were calculated for eliminating waste smaller that is the weekly Kt/V_{urea} and weekly creatinine clearance (CCr) equal to the surface area that the body such as the measurement is often reliable repeatability and correlated with the results of the treatment.

The calculation of BSA has been used for many formulas. The formula use is depended on a suitable of individual countries. In Thailand employs the formula of Mosteller as the practicial guideline for CKD of the Nephrology Society of Thailand[2], the calculation only uses for weight (kg) and height (cm), where the BSA can be divided[153] into a small size (BSA $\leq$ 1.7 M^2), a medium size (BSA = 1.71-2.0 M^2) and a larger size (BSA $\geq$ 2.0 M^2).

As the study in the United States of Fried et al[54] for survival rate of the patients who received the treatment of PD classified by BSA $\leq$2.0 M^2 and >2.0 M^2 showed that survival rate of the patients with BSA >2.0 M^2 was better than those with BSA $\leq$ 2.0 M^2 and having a survival rate and its persistence at 2 years were 82.8% and 84.8%, respectively. The association between BSA and mortality found that BSA did not associate with mortality[154]. Although the analysis of association of BSA as the quartile then the association was not found [quartile 1 (BSA = 1.21-1.66, OR = 1.09, P = 0.74), quartile 2 (BSA = 1.67-1.84, OR = 1.19, P = 0.49), and quartile 3 (BSA = 1.85-2.00, OR = 1.23, P = 0.41)]. This is similar to the study in Europe[153], in patients who received the treatment of automated peritoneal dialysis (APD) (baseline BSA, RR = 0.83, P=0.88).

2.5.6 Types of Public Health Center

Hospital or public health center is the health services place of emphasizing to health promotion and prevention, treatment, and rehabilitation of both physical and mental illness or disease. Most hospitals in regions of Thailand are affiliated with the government. These belong to Ministry of Public Health including provincial hospital (general hospital) and district hospital (community hospital), which are various levels of their capability. Moreover, governmental hospitals include other hospitals that are

affiliated in other ministry such as Medical Department, Department of Mental health, Red Cross Council, Ministry of Defense, Ministry of Education, Local Administrative Organization, and Bangkok. All of the government hospitals provide to the public by keeping in the right of universal coverage of health insurance with a no payment. The different hospitals are divided into capacity and type as follows:

1. Teaching Hospital, this type is a hospital of being medical school and university, a faculty of medicine, and a college. This hospital belong to the Ministry of Education as medical facilities, tertiary advanced (super tertiary care) with the ability of service and ready to advanced treatment because there used for the teaching and produce the graduates of medical staff and researcher.

2. Regional Hospital is a public hospital of Ministry of Public health. This type is provincial hospital with the ability of tertiary care where the number of bed is more than 500 beds.

3. General Hospital is a public hospital of Ministry of Public health. This type is a provincial hospital and a district hospital with the secondary capacity where the number of bed is between 120-500 beds.

4. Crown Prince Hospital is a community hospital of Ministry of Public health (except Sa Kaeo Crown Prince Hospital is the general hospital of the province) with the ability of primary or secondary care in some of the existing number of beds operated by 30-200 beds.

5. District Hospital is a public hospital of Ministry of Public health. This type is a district hospital with the ability of primary care or secondary care in some of its number of beds operated by 10-120 beds.

6. Sub-District Health Promoting Hospital is a public health center located in community of Ministry of Public health with the ability of primary care. This type of hospital will not accept for an admitted patient and no physician work on regularly but there have a public health staff working together with a physician comes outside from community hospital during days.

7. Private Hospital is established by a private organization. This type of hospital is both limited company and public limited company. Some private hospitals are specific treatment such as ophthalmology hospital, dentistry hospital, etc.

However, on performing under the National Health Security System makes several hospitals empower to care for the patient with complexity disease. Particularly care to the patient with CKD that is treated by RRT. In addition, a team of physician and nurse is expertise specific branch disease. Health unit in Thailand that can provide RRT is a public health center in a middle size and above level including community hospital, general hospital, regional hospital, teaching hospital, specialty hospital and public organization, etc. The ability to provide the service in each public health center is a limitation such as tertiary care of including teaching hospital, large private hospital that provides medical service to patient with complexity of illness uses the advanced technology in medical treatment. It contribute to operating units are intimate response to complexity illness integrated with the use of advanced treatment in order to achieve the extreme result of treatment[155]. A study have reported comparison of the service in each level and risk of death in the patient who received dialysis[33] found that public institutes, private institutes and charity organization were 1.27, 1.77, 1.88 times at risk of death when compared to teaching hospital statistically significant (p-value = 0.021, 0.000, 0.000, respectively) and survival rates of the patient in private institutes were better than those who admitted in hospital or dialysis center of the government. This may be due to the different quality of the service between public institutes better than private institutes, such as ratio of between number of the patient on the nursing care found that in public institutes were better than private institutes. The institutes for RRT mostly had taken care by a physician or nurse with the specialized training or artificial kidney. In the most cases, ratio of between number of the patient and nurse in hospital providing RRT was to be two per one, which is better than the rule of Medical Council is required that institute must have supervise by a physician or nurse with the expertise or training in dialysis for the patient, the ratio is not more than four physician per one patient. Therefore, the quality and quantity of providing health personnel in RRT is a good level.

2.5.7 Nephrology

Factors that affected morbidity and mortality of the patient with CKD are many factors especially the patient with old age, malnutrition, co-morbid disease and a physician delayed consultation. Some studies have found that a physician consultation

of renal disease was associated with the rates of morbidity and mortality[156-158], for example the study in the U.S. has collected in AD patients. 1995-1998 of 81dialysis centers found that survival rate of the patient being fast consultation was 96.0% and in the group of delayed consultation was 81.0%, so early physician consultation for renal disease has a positive impact on the patient care rather than and then only at the time of dialysis (mainly to get feedback on the diagnosis and treatment) in the patients with CKD. There gives the opportunity to decide how to perform RRT, the preparation of dialysis access in advance, you can choose the right time to start dialysis reduced the costs and minimized its complications (frequency of doctor received abdominal cavity dialysis than the patient who received a dialysis. Complications of its diagnosis and treatment of RRT and renal failure delayed[159] as well as reduced the time of having to admit in hospital and reduced mortality, etc[8].

To providing the holistic care, health care providers should be scheduled a consultation to prepare for the patient before start a dialysis in both the treatments of HD and CAPD. A physician might to assess the condition of blood vessels to vascular access or condition of the abdominal to perform the treatment of CAPD, occupation of patient/caregiver, journey of the patient between home and hospital, dialysis center or hospital especially in hygiene and cleanliness of the environment at home. These are important to consideration in appropriate for dialysis.

The treatment of CAPD requires the medical team to provide guidance and instruction to the patient is how to treat the patient correctly and checking accuracy as a consultant to the patient and treatment complications. This makes the total number of persons less than HD[10] Moreover, the effective teaching technique requires expertise and allows the patient or caregiver who learns better. If the patient or caregiver lack of the meticulous details that can be causes of infection in the abdominal. In the opposite, on performing a great of the treatment of HD, the patient or caregiver does not need to learn and experience. Therefore, however, the correct treatment is to reduce a severity of complicated conditions. Both physician and nurse are to be understood as well. A condition may occur as a complication of the treatment. They must be able to guide the patient to understanding whether the condition may occur and how to prevent the complication, as well as giving the patient be aware of their practice on the symptom

of complicated conditions[160]. Additionally, the expertise on patient care is another factor making the survival rate is also improved[7].

2.5.8 Peritoneal Dialysis Nurse

In health services, the tertiary care especially a teaching hospital including a large private hospital where provides medical care to the public with a severity and complexity of illness and use an advanced technology in medical treatment for patient in the specific needs such as patient with heart disease, patient with kidney disease and patient with cancer, etc. Nurse who practices in this group of health service must have deeper knowledge about seriously complicated illness with using advanced treatment technology for working with healthcare team in order to achieve maximum results of medical treatment.

Performing under the policy of PD-first project is the condition of reality of the current CKD patient who received RRT with the treatment of PD mainly. There is the responsibility of nurse with the experience on the patient with dialysis. Most of nurse practitioners in PD are lack of preparedness in terms of knowledge, skills and expertise of PD. Because of having new technologies are used in the treatment and the developing innovation and techniques use to optimize care of the patient better[161] but nurse who provides care are received an alternating rotation throughout nursing duties on PD[162], in which nurse acts PD without the necessary qualifications to perform these tasks could result to morbidity of the patient from infections, loss of high costs, antibiotics use, severe abdominal pain. The patient is to be unable to receive PD for longer as possible[163-164]. Additionally, the CKD patient in RRT by PD may cause depression, stress, and anxiety due to need to perform it is to rely on their relatives, sometimes free of charge and may be adversely affected by self-care for providers[165]. Nurses may feel whether they have no experience resulting to no confidence in the treatment, which shows that the process of knowledge management and development about PD may not respond adequately to the needs of nurses[166]. So the care must be practiced specializing in the patient care with CKD and PD in holistic[167].

The PD Nurse constitutes specialized nurse to provide nursing care for the patient, which requires PD knowledge, skills and expertise. Dr. Thawee Siriwong[162] described that the treatment of CAPD of the CKD patient and the needs for refinement

of the patient care on nursing staff's duty should have an understanding of the disease complications and treatment methods as well, including the need to develop the ability to add up over time. So nurse who provides care must therefore be able to assess the performance of the peritoneum (PET) to the information modifying the treatment plan and provide nursing care to suitable for each patient[168]. Additionally, the registered nurse who provides patient care dialysis also requires knowledge, skills and ability to evaluate wound out of line (exit site) to change a dialysate bag with various reagents. The application of technology and innovation used in the better treatment are required an application of basic knowledge about nursing process on patient care in both patient and their family holistically. Therefore, the patient is better quality of life and having an ability to correct the complication to the patient owing to self-care at home[169]. In addition, to providing patient care is to be effective, council of nursing has determined the criteria staffing on minimum nursing patient care safely in secondary and tertiary therapy only (dialysis, radiotherapy, and chemotherapy). Proportion of the registered nurse per patient is ratio of 1:2 but in a general ratio of personnel per patient to cover amply hospital is one nurse per 15 patients. However, for PD units as a whole in Asia is one nurse per 25-50 patients but some services in some places may require a lower level of nurse regularly under the supervision of an experienced nurse[170].

Because of the nursing is an important to maintain public health center at all levels well as research results clearly indicated that the rate is not enough to have a direct relationship to the security of the patient life[171-173], which increase the going rate nursing care to the patient sufficient to reduce complications unpleasant and has the effect of increasing the satisfaction of the patient to the hospital as well as results in better care for the patient[174]. In addition, to safe and adequate staffing yet as a result, the patient receives the quality care and more reduce health costs to individual families and communities as well as additional revenue to the government in tax when the patient can return to work as usual.

2.5.9 Patients

From the USRDS predicted that PD center with large patients of at least 20 or more is reduced the chance of technique failure on average 23.0% of the patients with a small number of PD patients experience was inadequate. The result of treatment

was inclined toward the conclusion whether the treatment of PD was worse than the treatment of HD[175]. In addition, a study of Australian Iberia and New Zealand[176] has divided the size of the treatments of PD and HD into 4 levels of including a small size (<340 cases), a small-medium size (340-610 cases), a medium-large size (611-740 cases), and a large size (>740 cases) and found that dialysis centers serving with the 0-399 cases of the patients was 1.18 times at risk of death when compared to the center ≥400 cases of the patients statistically significant (95%CI = 1:10-1:28)[120].

2.6 Changing the methods of CAPD to HD

The ESRD Patient who received RRT with CAPD when treating a given period of time, some patients may not be able to continue treatment possible. This may be due to the patient relatives, medical/nursing techniques, procedures, and treatments, etc. However, it has developed a method of treatment to the patient satisfaction and benefit of maintaining. There is to have a good quality of life and longevity of the results of the studies on the persistence of the treatment with CAPD around the world since the year of 1996-2009, the rates of persistence of the treatment period of 1, 3, and 5 years were 62.0-98.0%, 40.0-91.0% and 10.0-86.0%, respectively[33, 45-47, 62-97]. The rate of high treatment indicated that the patients are accepted the treatment and without any serious complications.

Changing the method in the ESRD patients who received RRT from the treatments of CAPD to HD affects about 4.0-48.0%[63, 68, 79, 81, 83, 84, 86, 96, 137, 144-145]. The main causes were 52.0-93.0% of infectious peritonitis (Peritonitis)[45-47, 63, 68, 75, 80, 94, 96], 13.0-54.0% of ultrafiltration (UF)[45, 47, 80, 96], and during the first of 3 months of the treatment causes changing to the treatment of HD was an infectious complication and a psychosocial reason[63, 148, 177-179]. For peritoneum infection rates found 13-18 months at a time[63, 75, 79, 94] or approximately 0.38 to 1.5 times per year[45, 79].

At the present, even the prevalent of an infection is significantly reduced from continuously device and new knowledge developments but an infection in the lining of abdominal remains a problem and a significant barrier to RRT in all kinds of PD, which can be a major cause of technique failure as a reason to change the method treatment also affects mortality as well[48, 152, 180]. Based on the result of the study to

identify factors that is associated with the treatment change, Cueto-Manzano et al[71] found that peritonitis is statistically associated with a change in the treatment method (RR = 1.13, p = 0.004).

2.7 Cause of death

The ESRD Patients who received the treatment of PD, had the incidence of death from CVD almost 20 times at risk higher than the normal, which are risk factors of being atherosclerosis (HT, DM, hypercholesterolemia, anemia, phosphate retention and inactivity) and increased the excess water is a major cause of ESRD patients die from CVD rapidly[9].

From results of several studies showed the major cause of death in ESRD patients who received RRT that was CVD approximately 28.0-64.0% in patients with treatment of CAPD[23, 25, 36, 45, 47-49, 66, 105, 110, 152, 154, 181-184], 36.0-73.0% in patients with treatment of HD[23, 25, 36, 37, 66, 105, 110, 152], and 12.0-30.0% in patients with treatment of KT[4, 105, 110, 152]. The study of Johnson et al[185] in the year 2009 in the ESRD patients of 24,587 cases found that the patients died from CVD approximately 21.0%. The patients with treatments of PD and HD had the mortality rates from CVD about 9.99 and 7.96 cases per 100 patients per year, respectively, which the major of death from CVD was MI.

Beyond CVD is the leading cause of death of ESRD patients who received RRT, many studies also showed the significant causes of death from infections (11.0-31.0%)[23, 25, 37, 48, 68, 81, 83-84, 105, 110, 146, 152, 182], cancer (malignancy 2.0-10.0%)[23, 25, 37, 48, 105, 110, 152, 180, 182], and other risk factors that may be found including cachexia, liver disease, dementia, miscellaneous and suicide, etc (15.0-31.0%)[23, 25, 66, 37, 105, 110, 152].

CHAPTER III
METHODOLOGY

3.1 Research Design

This research was a retrospective cohort study investigating the medical records of ESRD patients who had the right of universal health coverage and started to register for the treatment of CAPD according to the PD-First policy. The records came from the registration program for the treatments (DMIS) of Renal Failure Fund of NHSO. The researcher used records from the DMIS registration program to study the survival rates of ESRD patients who received the continued treatment of CAPD and compared to those who received the changed treatment of HD and those who received the treatment of KT.

3.2 Population and Samples

3.2.1 Target population

Population of this study was ESRD patients, who had the right of universal health coverage, who started to register for the treatment of CAPD according to the PD-First policy of Renal Failure Fund of NHSO.

3.2.2 Samples

Samples of this study were ESRD patients who registered the program for enrolling to receive the treatment of CAPD (DMIS_CAPD) during October 1, 2007 to August 31, 2011 from 113 public health centers participating in the program till the ended of January 10, 2012.

3.2.3 Inclusion criteria

1. The ESRD patients who registered the program for enrolling to receive the treatment of CAPD (DMIS_CAPD) during October 1, 2007 to August 31, 2011

2. The ESRD patients aged 15 years and above

3.2.4 Exclusion criteria

1. The ESRD patients who registered the program for enrolling to receive the treatment of HD or received KT before

2. The ESRD patients whose incomplete data such as no date of birth or gender

3.2.5 Power calculation

In this study, the researcher compared the survival rate of 3 groups of the patients by investigating all patients from October 1, 2007 to August 31, 2011 and performed the power analysis from the number of patients in the study as follows:

G = Number of group = 3 Groups (CAPD, HD, KT)

α = Significance level = 0.05

n = Number of samples

Out of 12,939[39] ESRD patients who registered for the treatment of CAPD according to the PD-First policy from Renal Failure Fund of NHSO through the registration program of DMIS_CAPD from October 1, 2007 to August 31, 2011 and who were followed until January 10, 2012, 11,355 patients continued CAPD, 1,527 patients changed the mode of treatment to HD, and 57 patients underwent KT.

r_i = Sample proportion = n_i/n_1

p_i = Survival proportion of ESRD patients who received RRT from the study report in Thailand as follows,

p_1 = Survival proportion at 1 year of ESRD patients who received the treatment of KT is 0.96 (Thai Transplant Society[109] from 2002-2010, 2,441 inpatients from 21 public health centers)

p_2, p_3 = Survival proportion at 1 year of ESRD patients who received the treatments of HD and CAPD is 0.93 and 0.91, respectively (Thai Transplant Society[33]

from 1998-2001, 7,323 HD inpatients from 301 public health centers and 1,485 CAPD inpatients from 56 public health centers)

Treatment	p_i	n_i	$r_i=n_i/n_1$
KT (1)	0.96 (p_1)	57 (n_1)	1
HD (2)	0.93 (p_2)	1,527 (n_2)	27
CAPD (3)	0.91 (p_3)	11,355 (n_3)	199
Total		**12,939**	**227**

$\sum r_i$= n as multiple of n_1 = $\sum n_i/n_1$

$$\sum r_i = \frac{1,355+1,527+57)}{57} = 227$$

p_0 = Average proportion = $\sum r_i p_i/\sum r_i$

$$p_0 = \frac{(1x0.96)+(27x0.93)+(199x0.91)}{227} = 0.913$$

V = Variance of proportion = $\sum r_i(p_i-p_0)^2/\sum r_i$

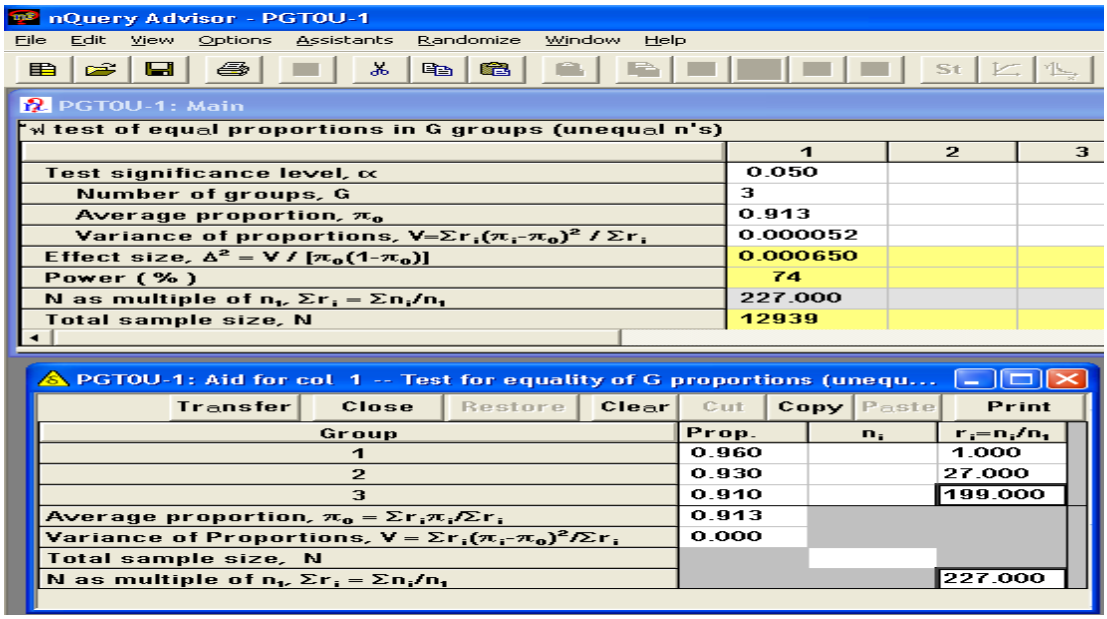
$$V = \frac{1(0.96-0.913)^2+27(0.93-0.913)^2+199(0.91-0.913)^2}{227}$$

$$= 0.000052$$

Δ^2 = Effect size = $V/[p_0(1-p_0)]$

$$\Delta^2 = \frac{0.000052}{0.913\ (1-0.913)} = 0.000650$$

The calculation used the nQuery Advisor Software and the power of test ;1-ß is supposed to 74.0 percent.



3.3 Data Collection

1. Contacted to Renal Failure Fund of NHSO and ask for permission to use data of CAPD patients into this study.

2. Contacted and coordinated with the Manager of Renal Failure Fund of NHSO and made an appointment to propose the details of this study for permission to use data of CAPD patients.

3. Together with the advisor of this study, Assist. Prof. Kamol Udol amd Suchai Sreethiphayawan, the researcher met with the Manager of Renal Failure Fund of NHSO to explain the process of this study and question about the data which would be used in this study.

4. Sent a document to NHSO secretary general to explain objectives of this study and ask for permission to use CAPD patients data from the registration program for the patient treatment (DMIS) of Renal Failure Fund of NHSO.

5. Data from DMIS of Renal Failure Fund of NHSO in Microsoft Access format of including file names: SERVICE_ALL, REG_PATIENT, REGKIDNEYHD, REGKIDNEY, REG_PATIENT_CHANGE, FUKIDNEY, COMORBIDITY, GENDER and ADDRESS, was selected for specific data as in Figure 3.1

Details of each file

SERVICE_ALL	Renal replacement therapy data
FUKIDNEY	Treatments and follow-up of CAPD patients
REG_PATIENT_CHANGE	Change of treatment
REG_PATIENT	Registration data for renal replacement therapy
REGKIDNEY	Registration data of CAPD patients
REGKIDNEYHD	Registration data of HD patients
COMORBIDITY	Other incurrent diseases
ADDRESS	Domicile
GENDER	Gender

- PID	Patient code
- Birth date	Date of Birth
- Register Criteria	Registered treatment
- Register Date	Date of registration
- Register Hospital	Registered public health center
- Death Date	Date of Death
- Cause of death	Cause of death
- Shift from criteria	Change treatment from
- Shift to criteria	Change treatment to
- Shift to hospital	Change public health center to
- Shift date	Date of treatment change
- Treatment date	Date of treatment / follow up
- High	Height
- Weigh	Weight
- Change_date	Date of treatment change
- Hmain_from	Public health center before treatment change
- Criteria_from	RRT treatment before change
- Criteria_to	New treatment
- Hmain_to	New public health center
- Hmain_First	First public health center
- Criteria_First	First RRT treatment

- Register_Date_First	First date of RRT registration
- Criteria_Current	Current RRT treatment
- Register_Date_Current	Date of current treatment registration
- Hcode_Current	Current public health center
- Hmain	Public health center
- Doctor_Visit	Doctor in charge
- ICD10	Disease code
- District	District
- Province	Province

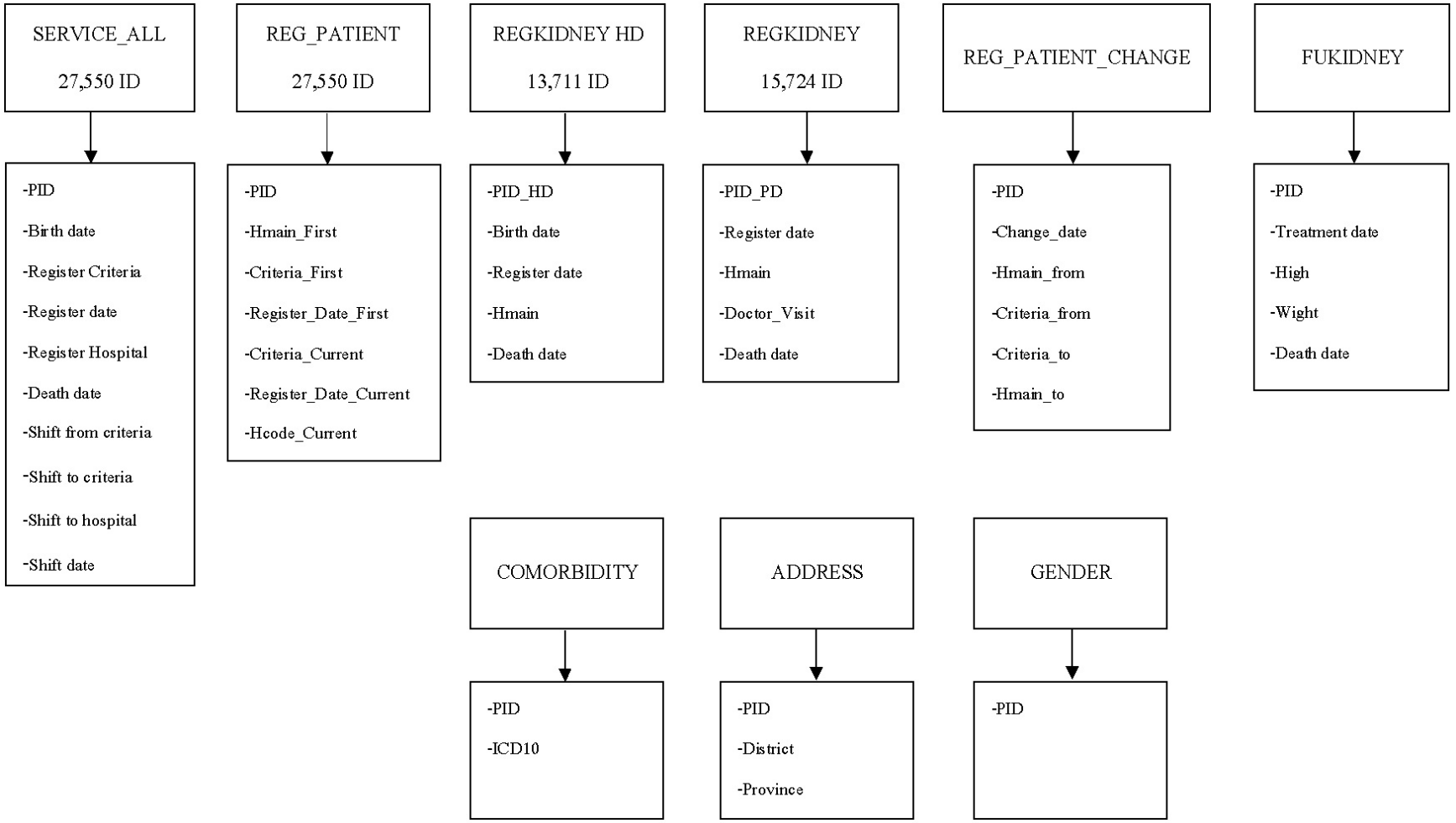


Figure 3.1 Details of data studied in this research: Data files from DMIS, Renal Failure Fund, NHSO

6. Changed database from Microsoft Office Access to Microsoft Office Excel.

7. Selected data from Microsoft Office Excel database.

7.1 General data including patient code, date of registration, date of birth, gender, DM, birthplace, type of public health center, nephrologist, responsible area of NHSO, number of PD nurse and number of patients in PD center.

7.2 Medical records/Follow up records including

- Medical records which are date of first treatment, weight, date of recording weight and height.

- Follow up outcome data which are date of death, cause of death, date of treatment change, last status of RRT treatment and public health center.

Procedure of data selection displayed in Figure 3.2

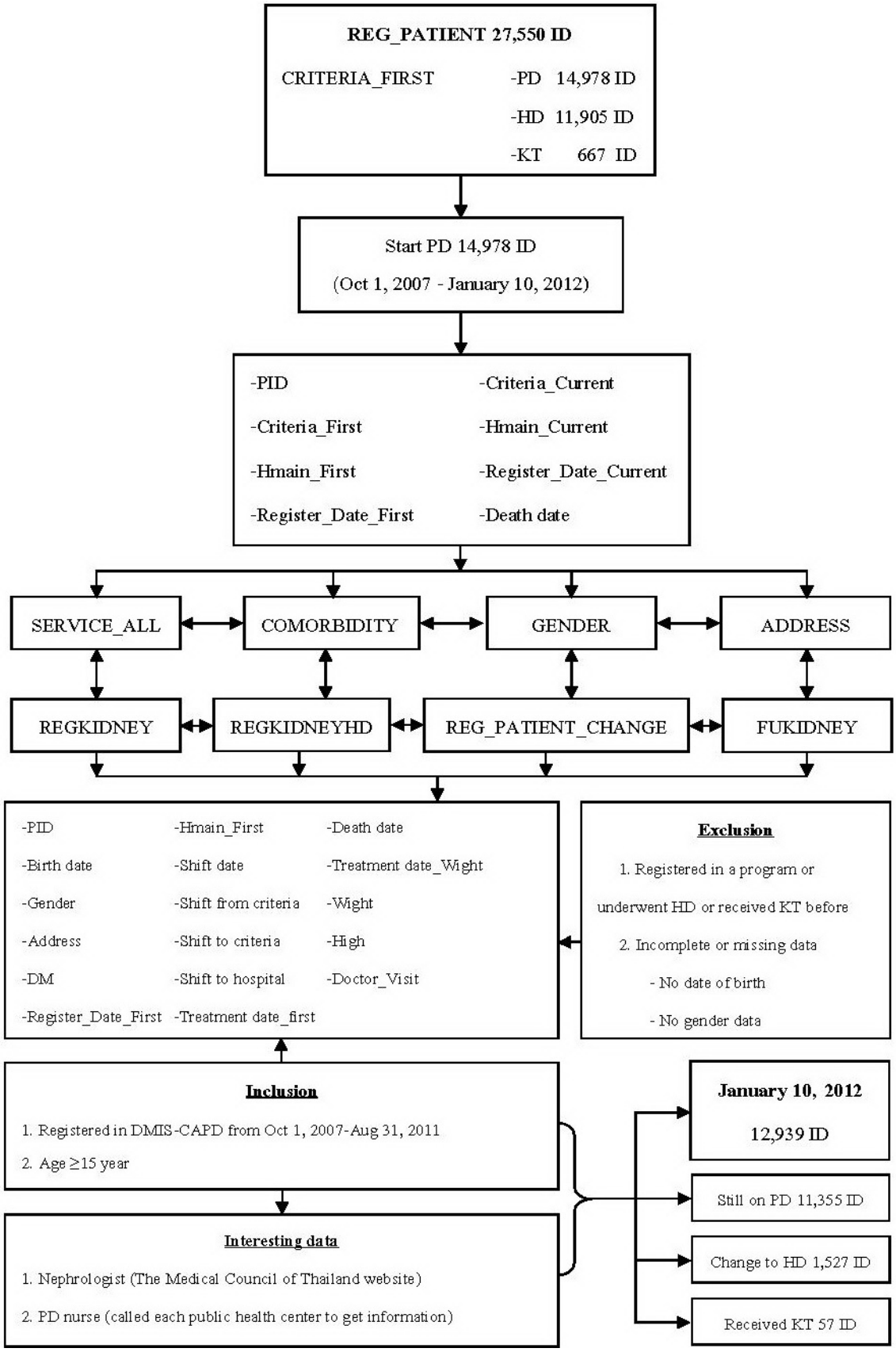


Figure 3.2 Data selection from DMIS, National Health Security Office

8. Interesting data from gathered data which is type of public health center, nephrologist and number of PD nurses

8.1 Type of public health center, first public health center data (Hmain_First) classified by using Ministry of Public Health of Thailand guideline[186] including regional hospital, general hospital, community hospital, teaching hospital (university or medical school) and Public Organization.

8.2 Nephrologist, the researcher used data from physician in charge (Doctor_Visit) to search patients' name from The Medical Council of Thailand[187] website.

8.3 Number of PD nurses, the researcher called each public health center to get information.

9. Variables Selection

9.1 Treatment, including patients who received the treatment of CAPD, those who received the changed treatment of HD and those who received the treatment of KT according to RRT treatment status until the patients died or the study finished.

9.2 DM, selecting from the medical data bases of including ICD10, Disease codes E10-E14 and other disease through DMIS_CAPD program.

9.3 BSA, the researcher calculated BSA by weight (kilogram) and height (centimeter) from the first month record when patients started to CAPD by using Mosteller formula according to medical guideline for CKD before receiving RRT in 2009 of The Nephrology Society of Thailand as follows:

$$BSA(m^2) = \sqrt{\frac{weight\ (\mathrm{kg}) \times height\ (\mathrm{cm})}{3600}}$$

9.4 Date of Death, Renal Failure Fund of NHSO checked data correction from Civil Registration Office, Ministry of Interior every day through online system.

9.5 Checking the completion and correction of all data and recording all variables for this study in Microsoft Office Excel program.

3.4 Data Preparation and Analysis

3.4.1 Data Preparation

1. Preparing data from Renal Failure Fund, NHSO by examine the correction of selected data depending on individual variables and encoded them by manual, recorded and kept all data in computer program before data quality auditing, and analyzed all data with statistics program of SPSS for Windows.

2. Studied Variable

2.1 Independent Variable

- Treatment
- Age
- Gender
- Diabetes Mellitus
- Body surface area
- Type of public health center
- Number of patients in PD center
- Nephrologist

2.2 Dependent Variable

2.2.1 Last status of ERSD patients

- Failure: Death during the time of study and Censored: Still alive during the time of study

2.2.2 Survival time from the date of the beginning of CAPD registration to the date of death or the last day of living

3.4.2 Statistics Used for Data Analysis

1. Descriptive statistics consisted of frequency percentage, mean and standard deviation were use to describe responsible area of NHSO, public health center, RRT treatment, year of registration, birthplace, age, gender, diabetes mellitus, body surface area, type of public health center, number of patients in PD center, nephrologists, number of PD nurse and proportion of PD Nurse and ESRD Patients.

2. Analytical Statistics

- Creating survival curve by using Kaplan-Meier method and compare survival curve of different groups by using Log-rank test

- Investigating any relationship between mortality of the patients and other variables by using Cox's proportional hazard model

CHAPTER IV
RESULTS

This study was to investigate survival rates of ESRD patients who initially treated with the treatment of CAPD compared those who were the changed treatment of HD and those who were the treatment of KT. This study also determined its associations with the risk factors affecting to patients' death including treatment, age, gender, history of DM, BSA, type of public health center, number of the patients in PD center and nephrologist under the right of universal health coverage in Thailand. The results are showed as the following topics:

4.1 Demographic and characteristic data

4.2 Comparison of ESRD patients' survival rate using Kaplan-Meier method and Log-rank test

4.3 Univariate analysis of associated factors using Cox's proportional hazard model

4.4 Multivariate analysis of associated factors using Cox's proportional hazard model

4.1 Demographic and Characteristic Data

Samples of the study were ESRD patients who had the right of universal health coverage. A total of 12,939 patients were received the treatment of CAPD in the beginning, according to the policy of PD-first project from participated 112 of public health centers, classified by treatments including 11,355 of patients in the treatment of CAPD (87.8%), 1,527 of patients in the treatment of HD (11.8%) and 57 of patients in the treatment of KT (0.4%). Demographic and characteristics of ESRD patients in the treatments of CAPD, HD and KT are showed in the table 4.1-4.4

4.1.1 Year of Registration

Data from the DMIS registration program of Renal Failure Fund of NHSO was ESRD patients who started to register between October 1, 2007 and August 31, 2011. Data were divided the patients according to the year of registration (October to September). The patients was found trended to increase in every year, 7.7% in the year of 2008, 23.7% in the year of 2009, 34.3% in the year of 2010 and 34.3% in the year of 2011 (July to August), respectively.

All of the ESRD patients started to register the treatment of CAPD in the budgeting year of 2009 (October 2008 to September 2009). Most of the patients were received the treatment of KT approximately 50.9%. The patients in the budgeting year of 2010 (October 2009 to September 2010) mostly changed the treatment of being HD approximately 31.1% while estimated 35.8% of the patients continued to receive the treatment of CAPD.

The chi-square test of homogeneity between groups of the treatments and year of registration found the statistically significant difference between the two variables ($p<0.001$).

4.1.2 Birthplace

When divided into a five-region of birthplaces including central region, north region, south region, northeast region and Bangkok, the study found most of the patients lived in the northeast region approximately 34.8% in which the patients who continued to treat with the treatment of CAPD were approximately 35.4%, the patients who changed the treatment of being HD were approximately 30.3% and the patients who received the treatment of KT were approximately 42.1%.

The chi-square test of homogeneity between groups of the treatments and birthplaces found the statistically significant difference between the two variables ($p<0.001$).

4.1.3 Age

The ESRD patients of the study had aged between 15 and 101 years (Mean=52.8, SD=14.0). When grouping the patients' age according to quartile (4 groups) including aged ≤44 years, aged 45-54 years, aged 55-63 years and aged ≥64

years, the study found that the patients who received the treatment of CAPD were mostly aged 55-63 years and continued to receive the treatment of CAPD approximately 27.3%. The patients who received the changed treatment of HD were mostly aged ≤44 years approximately 33.5% and the patients who received the treatment of KT were mostly aged ≤44 years up to 87.7%.

The chi-square test of homogeneity between groups of the treatments and age found the statistically significant difference between the two variables ($p<0.001$).

4.1.4 Gender

The patients were female approximately 51.4% and male approximately 48.6%. The patients who continued to receive the treatment of CAPD were 52.0% in female and 48.0% in male. The patients who received the changed treatment of HD were male approximately 52.5% and female approximately 47.5% and the patients who received the treatment of KT were male up to 70.2% and female approximately 29.8%.

The chi-square test of homogeneity between groups of the treatments and gender found the statistically significant difference between the two group variables ($p<0.001$).

4.1.5 History of Diabetes Mellitus

The study found that ESRD patients had a co-mobid of DM about 63.2%. The patients who received the continued treatment of CAPD had DM approximately 64.2%. The patients who received the changed treatment of HD had DM about 57.9% and the patients who received the treatment of KT had DM approximately 11.1%.

The chi-square test of homogeneity between groups of the treatments and DM found the statistically significant difference between the two group variables ($p<0.001$).

4.1.6 Body Surface Area

The average of BSA of the patients was 1.57 ± 0.19 m^2 (Mean ± SD). The patients who received the continued treatment of CAPD and the level of BSA ≤1.70 m^2 were 77.5%. The patients who received the changed treatment of HD and the level

of BSA ≤1.70 m^2 were 69.4% and the patients who received the treatment of KT and the level of BSA ≤1.70 m^2 were up to 80.6%.

The chi-square test of homogeneity between groups of the treatments and BSA found the statistically significant difference between the two group variables ($p<0.001$).

4.1.7 Type of Public Health Center

When divided into a five-category of type of public health centers including a regional hospital, a general hospital, a community hospital, a private or public organization and a teaching hospital of university and college of medicine found that most public health centers were sixty-three general hospitals (56.8%). Secondary, there was found twenty-nine central hospitals (26.1%), ten teaching hospitals (10.0%), seven community hospitals (6.3%) and two private or public organizations (1.8%), respectively.

The ESRD patients who started to register the treatment of CAPD were mostly in a general hospital about 43.9% and secondary were in a regional hospital approximately 38.9%. The patients who received the continued treatment of CAPD were mostly in a general hospital about 44.4% and secondary were in a regional hospital about 38.1%. The patients who received the changed treatment of HD were mostly in a regional hospital about 44.4% and secondary were in a general hospital about 41.2%. The patients who received the treatment of KT were mostly in a regional hospital about 50.9% and secondary were in a general hospital about 22.8%.

The chi-square test of homogeneity between groups of the treatments and types of public health center found the statistically significant difference between the two group variables ($p<0.001$).

4.1.8 Number of Patients in PD Center

Out of public health centers found the ESRD patients with the treatment of CAPD to be one case of the minimum, 873 cases of the maximum and 102 cases of the average per public health center. When grouping the patients in PD center according to tertile (3 groups) including small size of PD center (≤122 cases), medium size of PD center (123-243 cases) and large size of PD center (≥244 cases) found that the patients

who started to register the treatment for CAPD were similar in all size of PD centers about 33.4%, 33.7% and 32.9%, respectively. The patients who received the continued treatment of CAPD were similar in all size of PD centers about 33.5%, 33.6% and 32.9%, respectively. The patients who received the changed treatment of HD were similar in all size of PD centers about 32.9%, 34.3% and 32.9%, respectively and the patients who received the treatment of KT were mostly in the large size of PD centers about 43.9%.

The chi-square test of homogeneity between groups of the treatments and number of patients in PD center found no statistically significant difference between the two group variables.

4.1.9 Nephrologist

Nephrologists of this study were found in seventy-eight public health centers (69.6%) while in a regional hospital, a teaching hospital and a private or public organization found to be 100%. Secondary, there found in thirty-four general hospitals (54.0%) and three community hospitals (42.9%), respectively.

The patients who started to register the treatment for CAPD were mostly in public health centers where there have nephrologists up to 84.4%. The patients who received the continued treatment of CAPD were mostly in public health centers where there have nephrologists approximately 83.8%. The patients who received the changed treatment of HD were mostly in public health centers where there have nephrologists up to 88.3% and the patients who received the treatment of KT were mostly in public health centers where there have nephrologists up to 89.5%.

The chi-square test of homogeneity between groups of the treatments and nephrologist found the statistically significant difference between the two group variables ($p<0.001$).

4.1.10 Number of PD Nurse

In particular public health centers where provided the treatment for ESRD patients with the treatment of CAPD had PD nurse in PD unit up to 98.2%. Most of them had two of PD nurses in a public health center to be 42.1% and one of PD nurse in a public health center to be 30.8%, respectively.

This study found 1-5 of PD nurse in PD unit of a regional hospital to be 2.8(Mean) and a general hospital to be 1.8 (Mean). There also found 1-2 of PD nurse in a community hospital to be 1.4 (Mean), 3-4 of PD nurse in a private or public organization to be 3.5 (Mean) and 2-4 of PD nurse in a teaching hospital to be 2.7 (Mean).

4.1.11 Proportion of PD Nurse and ESRD Patients

Out of PD centers found ESRD the patients who received the continued treatment of CAPD to be one case of the minimum, 545 cases of the maximum and 67 cases of the average per public health center. The proportion of PD nurse and patients of the study found one PD nurse per 1-136 patients and one PD nurse per 31 patients on average. There was found one PD nurse per 6-135 patients and one PD nurse per 35 patients of the average in a regional hospital, one PD nurse per 4-75 patients and one PD nurse per 28 patients of the average in a general hospital, one PD nurse per 1-82 patients and one PD nurse per 30 patients of the average in a community hospital, one PD nurse per 23-136 patients and one PD nurse per 88 patients of the average in a private or public organization and one PD nurse per 8-36 patients and one PD nurse per 17 patients of the average in a teaching hospital.

This study found one PD nurse per 1-25 patients in PD to be 52.4% and secondary was one PD nurse per 26-50 patients, one PD nurse per 51-75 patients and one PD nurse per 76-136 patients approximately 30.5%, 9.5% and 7.6%, respectively.

4.1.12 Status

Out of 12,939 patients were followed-up at the end of status in January 10, 2012. The study found the patients died 4,478 cases (34.6%) and alive of 8,461 cases (65.4%). The patients who received the treatment of CAPD died 4,146 cases (36.5%) and alive of 7,209 cases (63.5%). The patients who received the treatment of HD died 329 cases (21.5%) and alive of 1,198 cases (78.5%) and the patients who received the treatment of KT died three cases (5.3%) and alive of 54 case (94.7%).

Table 4.1 Number and Percentage of ESRD Patients who received the Treatments of CAPD, HD and KT

Characteristics	Total (n=12,939)	Number(%)			p-value
		Continued CAPD (n=11,355)	Switched to HD (n=1,527)	Underwent KT (n=57)	
Year of Registration					
2008	998 (7.7)	771 (6.8)	215 (14.1)	12 (21.1)	<0.001*
2009	3,067 (23.7)	2,568 (22.6)	470 (30.8)	29 (50.9)	
2010	4,436 (34.3)	3,947 (34.8)	475 (31.1)	14 (24.6)	
2011	4,438 (34.3)	4,069 (35.8)	367 (24.0)	2 (3.5)	
Region (n=12,937)					
North	2,778 (21.5)	2,355 (20.7)	413 (27.0)	10 (17.5)	<0.001*
Central	3,029 (23.4)	2,616 (23.0)	400 (26.2)	13 (22.8)	
Northeast	4,508 (34.8)	4,021 (35.4)	463 (30.3)	24 (42.1)	
South	1,400 (10.8)	1,244 (11.0)	148 (9.7)	8 (14.0)	
Bangkok	1,222 (9.4)	1,117 (9.8)	103 (6.7)	2 (3.5)	
Age(year)					
≤ 44	3,249 (25.1)	2,687 (23.7)	512 (33.5)	50 (87.7)	<0.001*
45-54	3,282 (25.4)	2,899 (25.5)	377 (24.7)	7 (12.3)	
55-63	3,489 (27.0)	3,099 (27.3)	389 (25.5)	0 (0.0)	
≥ 64	2,919 (22.6)	2,670 (23.5)	249 (16.3)	0 (0.0)	
Mean (S.D.)	52.8 (14.0)	53.4 (13.8)	49.6 (14.6)	29.4 (11.4)	
Gender					
Male	6,291 (48.6)	5,450 (48.0)	801 (52.5)	40 (70.2)	<0.001*
Female	6,648 (51.4)	5,905 (52.0)	726 (47.5)	17 (29.8)	
Diabetes Mellitus (n=10,414)					
No	3,832 (36.8)	3,265 (35.8)	535 (42.1)	32 (88.9)	<0.001*
Yes	6,582 (63.2)	5,843 (64.2)	735 (57.9)	4 (11.1)	
Body surface area (m^2) (n=6,883)					
≤ 1.70	5,275 (76.6)	4,735 (77.5)	511 (69.4)	29 (80.6)	<0.001*
1.71-2.00	1,485 (21.6)	1,282 (21.0)	196 (26.6)	7 (19.4)	
≥ 2.01	123 (1.8)	94 (1.5)	29 (3.9)	0 (0.0)	
Mean (S.D.)	1.57 (0.19)	1.57 (0.19)	1.61 (0.21)	1.54 (0.19)	

Table entries are n(%), except intensive indicated, *p<0.05, Chi-square test of homogeneity between characteristic and treatment (Still on CAPD, Change to HD, Received KT)., Age at the registration date with the treatment of CAPD, BSA, Data during the treatment of CAPD, Place where registered for the treatment of CAPD

Table 4.1 Number and Percentage of ESRD Patients who received the Treatments of CAPD, HD and KT (cont.)

Characteristics	Total (n=12,939)	Number(%)			p-value
		Continued CAPD (n=11,355)	Switched to HD (n=1,527)	Underwent KT (n=57)	
Type of public health center					
Community Hospital	518 (4.0)	464 (4.1)	51 (3.3)	3 (5.3)	<0.001*
General Hospital	5,724 (44.2)	5,075 (44.4)	629 (41.2)	13 (22.8)	
Regional Hospital	4,988 (38.6)	4,288 (38.1)	678 (44.4)	29 (50.9)	
Teaching Hospital	663 (5.1)	552 (4.9)	105 (6.9)	6 (10.5)	
Public organization	1,046 (8.1)	976 (8.6)	64 (4.2)	6 (10.5)	
Center size					
≤ 122	4,321 (33.4)	3,801 (33.5)	502 (32.9)	18 (31.6)	0.428
123-243	4,357 (33.7)	3,820 (33.6)	523 (34.3)	14 (24.6)	
≥ 244	4,261 (32.9)	3,734 (32.9)	502 (32.9)	25 (43.9)	
Nephrologist					
No	2,018 (15.6)	1,834 (16.2)	178 (11.7)	6 (10.5)	<0.001*
Yes	10,921(84.4)	9,521 (83.8)	1,349 (88.3)	51 (89.5)	

Table entries are n(%), except intensive indicated, *p<0.05, Chi-square test of homogeneity between characteristic and treatment (Still on CAPD, Change to HD, Received KT). Center size=number of patients in peritoneal dialysis center

Table 4.2 Characteristics of Public Health Center

Type of public health center	Number of public health center* (%)	Number of public health center with region					Number of Nephrology** (%)	Number of Patients*** (Min-Max)
		Central	Northeast	South	Bangkok	North		
Community Hospital	8 (7.1)	-	4	1	-	3	3 (37.5)	518 (1-253)
General Hospital	63 (56.3)	23	15	11	2	12	34 (54.0)	5,724 (1-317)
Regional Hospital	29 (25.9)	9	6	6	3	5	29 (100.0)	4,988 (21-376)
Teaching Hospital	10 (8.9)	2	1	1	4	2	10 (100.0)	663 (8-128)
Public organization	2 (1.8)	1	-	-	1	-	2 (100.0)	1,046 (103-873)
Total	**112**	**35**	**26**	**19**	**10**	**22**	**78**	**12,939**
(%)		**(31.3)**	**(23.2)**	**(17.0)**	**(8.9)**	**(19.6)**	**(69.6)**	**(1-873)**

***Public health center where the ESRD patients registered to receive the treatment of CAPD through the registration program (DMIS) of NHSO, ** Special for nephrologist regularly in PD center, *** The ESRD patients who were the initial treatment of CAPD**

Table 4.3 Characteristics of PD Center

Type of public health center	Number of public health center	Number of Patients in public health center* (Min-Max)	Number of PD nurse in public health center** (Min-Max)	Mean of PD nurse in public health center	PD nurse: Case (Mean)
Community Hospital	7	303 (1-164)	10 (1-2)	1.4	1:1-82 (1:30)
General Hospital	62	3,191 (8-224)	114 (1-6)	1.8	1:4-75 (1:28)
Regional Hospital	28	2,656 (17-271)	77(1-5)	2.8	1:6-135 (1:35)
Teaching Hospital	6	265 (16-108)	16 (2-4)	2.7	1:8-36 (1:17)
Public organization	2	613 (68-545)	7 (3-4)	3.5	1:23-136 (1:88)
Total	**105**	**7,025 (1-545)**	**224 (1-6)**	**2.1**	**1:1-136 (1:31)**

***The patients who received the continued treatment of CAPD and alive at January 10, 2012, ** Special for PD nurse regularly in PD center**

Table 4.4 Number of Public Health Center Classified by Proportion of PD Nurse and Types of Public Health Center

PD nurse : Case	Number of public health center					Total (%)
	Community Hospital	General Hospital	Regional Hospital	Teaching Hospital	Public organization	
1:1-25	3	32	14	5	1	**55 (52.4)**
1:26-50	3	23	5	1	-	**32 (30.5)**
1:51-75	-	7	3	-	-	**10 (9.5)**
1:76-136	1	-	6	-	1	**8 (7.6)**
Total	**7**	**62**	**28**	**6**	**2**	**105**

4.2 Comparison of ESRD Patients' Survival Rate by Factors Using Kaplan-Meier Method and Log-Rank Test

The mortality rate of the ESRD patients who received the treatment of CAPD was 255.6/1000 person-year and 3.2 years of median survival time. Survival rates in a period of 1, 2, 3, and 4 years were 74.5, 61.5, 52.4 and 44.8, respectively (Figure 4.1).

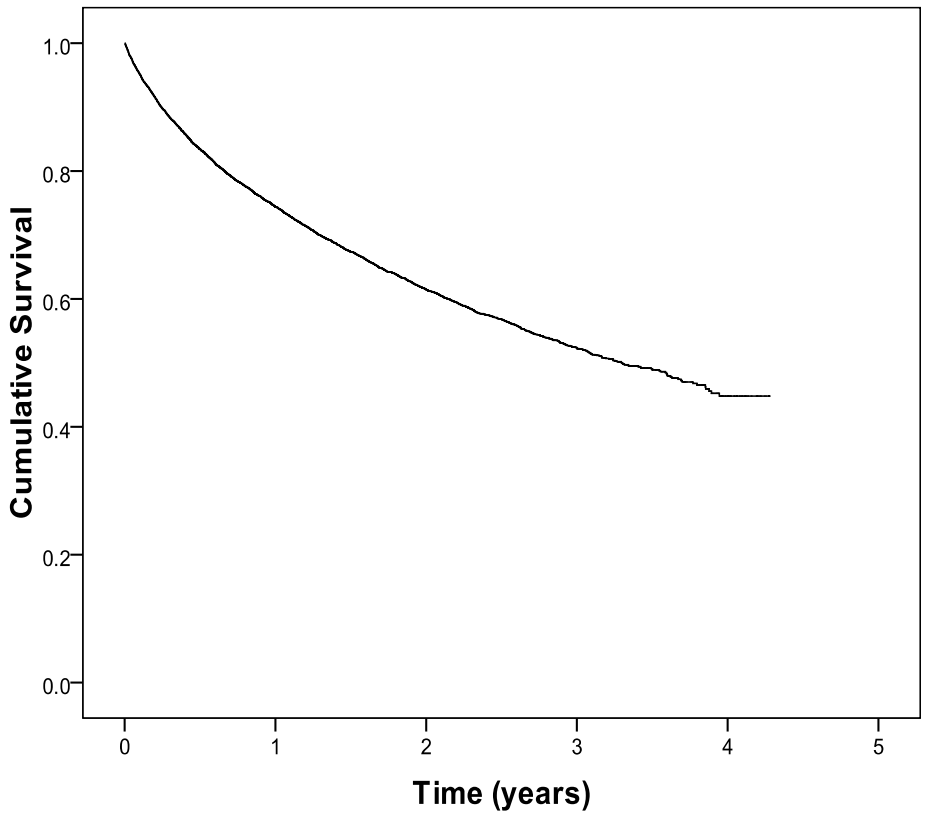


Figure 4.1 The cumulative of survival for ESRD patients who received the treatment of CAPD

4.2.1 Finding results from comparison of survival rates of ESRD patients, who had health insurance of Thai universal coverage with the treatment of CAPD, classified by factors with analyses of Kaplan-Meier method and Log-Rank test as shown in table 4.5

4.2.1.1 Treatment

Survival rates of patients that classified into three treatments including the treatment of CAPD, the treatment of HD and the treatment of KT found that the mortality rates were 287.1/1000 person-year in patients with the treatment of CAPD, 112.2/1000 person-year in patients with the treatment of HD and 20.2/1000 person-year in patients with the treatment of KT. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 72.2, 58.7, 48.8 and 40.4 in the treatment of CAPD, 89.5, 78.6, 71.0 and 65.1 in the treatment of HD and 100, 98.2, 96.1 and 87.4 in the treatment of KT. When compared the survival rate classified by treatments with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.2A).

4.2.1.2 Age

When divided ESRD patients into four age-groups, the mortality rate of patients who aged ≤44 years was 143.3/1000 person-year, 45-54 years of age was 228.7/1000 person-year, 55-63 years of age was 290.0/1000 person-year and ≥64 years of age was 442.1/1000 person-year. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 83.9, 75.4, 68.8 and 59.5 of the age of ≤44 years, 77.2, 64.4, 54.7 and 45.9 of the age of 45-54 years, 72.4, 58.0, 47.3 and 41.7 of the age of 55-63 years and 62.8, 44.8, 31.4 and 25.6 of the age of ≥64 years. When compared the survival rate classified by age groups with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.2B).

4.2.1.3 Gender

The mortality rates of patients were 241.7/1000 person-year in male and 269.4/1000 person-year in female. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 75.3, 63.3, 54.6 and 46.7 in males and 73.6, 59.7, 50.3 and 42.7 in female. When compared the survival rate classified by gender with

using Log-rank test, it was statistically significant difference at 95% of confidence interval (p=0.002) (Figure 4.2C).

4.2.1.4 History of Diabetes Mellitus

The ESRD patients with DM had 334.4/1000 person-year of mortality rate and patients without DM had 241.7/1000 person-year of mortality rate. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 70.0, 52.8, 40.8 and 33.9 of patients with DM and 80.8, 71.3, 63.3 and 53.6 of patients without DM. When compared the survival rate classified by history of DM with using Log-rank test, it was statistically significant difference at 95% of confidence interval (p<0.001) (Figure 4.2D).

4.2.1.5 Body Surface Area

The mortality rates of ESRD patients were 197.9/1000 person-year of patients with BSA ≤1.70 m^2, 162.8/1000 person-year of patients with BSA 1.71-2.00 m^2 and 216.6/1000 person-year of patients with BSA ≥2.01 m^2. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 80.2, 67.3, 58.1 and 50.3 of patients with BSA ≤1.70 m^2, 84.9, 72.4, 62.0 and 53.5 of patients with BSA 1.71-2.00 m^2 and 84.2, 66.3, 51.2 and 37.6 of patients with BSA ≥2.01 m^2. When compared the survival rate classified by BSA with using Log-rank test, it was statistically significant difference at 95% of confidence interval (p=0.002) (Figure 4.2E).

4.2.1.6 Type of Public Health Center

The ESRD patients who treated in a public health center were 243.8/1000 person-year of mortality rate in a regional hospital, 273.2/1000 person-year of mortality rate in a general hospital, 298.1/1000 person-year of mortality rate in a community hospital, 264.7/1000 person-year of mortality rate in a private or public organization and 177.9/1000 person-year of mortality rate in a teaching hospital. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 75.0, 62.8, 53.9 and 46.4 of a regional hospital, 73.4, 59.8, 50.2 and 44.1 of a general hospital, 71.8, 58.3, 52.3 and (NA) of a community hospital, 75.1, 59.4, 47.9 and 35.3 of a private or public organizations and 79.2, 70.0, 63.2 and 54.5 of a teaching hospital. When compared the survival rate classified by type of public health center

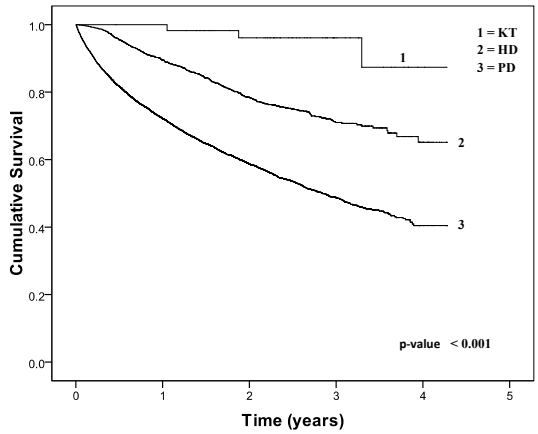
with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.2F).

4.2.1.7 Number of Patients in PD Center

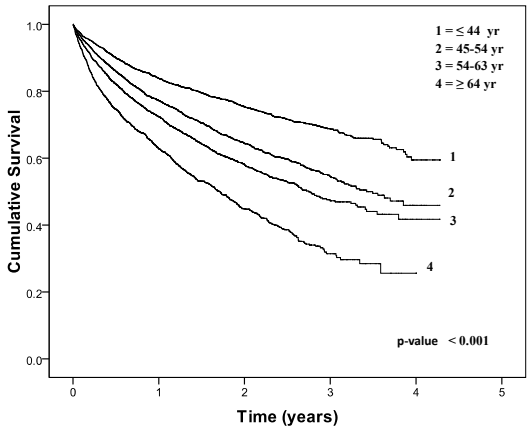
When grouped the patients in PD center according to three-groups, the mortality rate of patients who were a small size of PD center (≤122 cases) was 261.9/1000 person-year, the mortality rate of patients who were a medium size of PD center (123-243 cases) was 272.0/1000 person-year and the mortality rate of patients who were a large size of PD center (≥244 cases) was 234.0/1000 person-year. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 73.5, 61.5, 51.2 and 41.0 in a small size (≤122 cases), 73.2, 59.3, 51.2 and 45.5 in a medium size (123-243 cases) and 76.5, 63.7, 54.4 and 46.4 in a large size (≥244 cases). When compared the survival rate classified by number of patients in PD center groups with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.2H).

4.2.1.8 Nephrologist

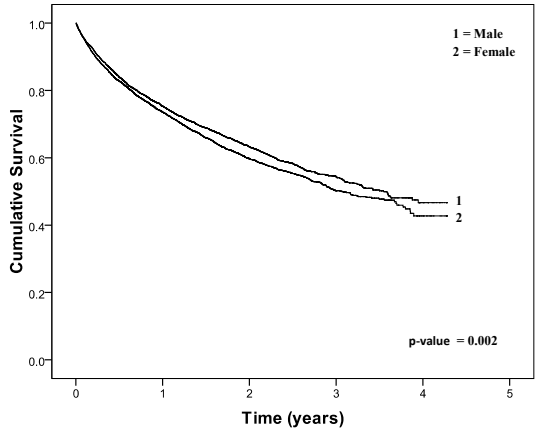
The mortality rates of patients were 250.2/1000 person-year of whom were treated by the nephrologist in a public health center and 290.2/1000 person-year of whom were not treated by the nephrologist in a public health center. Survival rates in a period of 1, 2, 3 and 4 years of patients were respectively 73.0, 59.6, 47.6 and (NA) of whom were treated by the nephrologist in a public health center and 74.7, 61.8, 52.9 and 45.2 of whom were not treated by the nephrologist in a public health center. When compared the survival rate classified by the nephrologist with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p=0.019$) (Figure 4.2I).



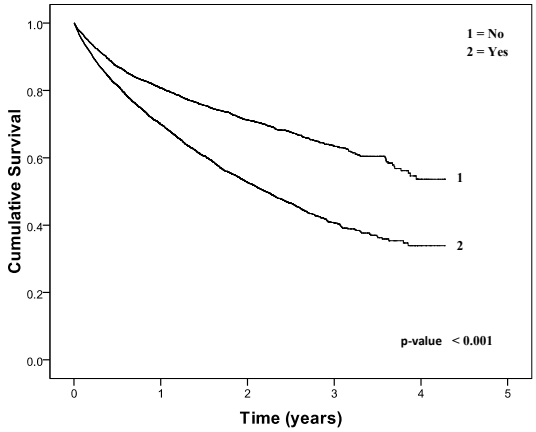
(A) Treatment



(B) Age

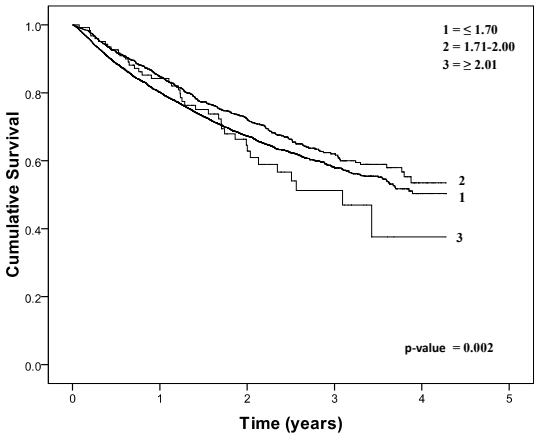


(C) Gender

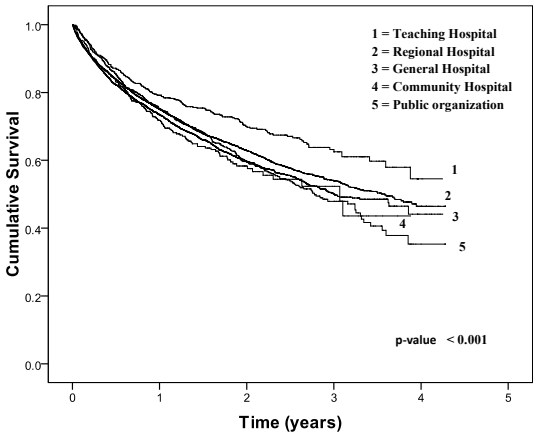


(D) Diabetes Mellitus

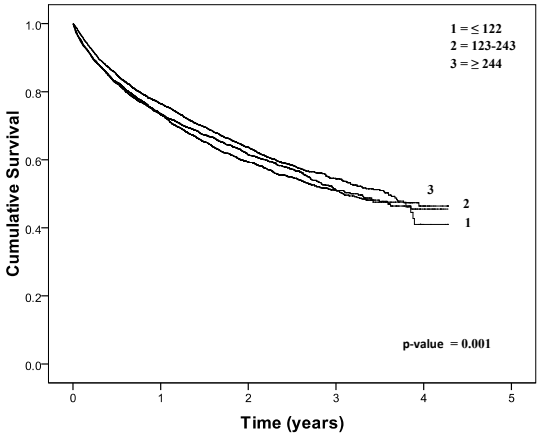
Figure 4.2 The cumulative of survival rates for ESRD patients classified by different factors



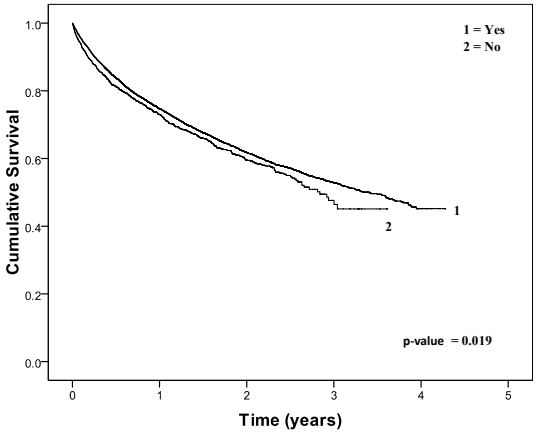
(E) Body surface area (m^2)



(F) Type of public health center



(H) Center size



(I) Nephrologist

Figure 4.2 The cumulative of survival rates for ESRD patients classified by different factors (cont.)

Table 4.5 Survival Rates of ESRD Patients with Using the Kaplan-Meier Method and Log-Rank Test

Factors	Number	Survival Rate				Death Rate (/1000 Person-year)	p-value (Logrank)
		1 yr	2 yr	3 yr	4 yr		
Treatment							<0.001*
Continued CAPD	11,355	72.2	58.7	44.8	40.4	287.1	
Switched to HD	1,527	89.5	78.6	71.0	65.1	112.2	
Underwent KT	57	100	98.2	96.1	87.4	20.2	
Age (year)							<0.001*
≤ 44	3,249	83.9	75.4	68.8	59.5	143.3	
45-54	3,282	77.2	64.4	54.7	45.9	228.7	
55-63	3,489	72.4	58.0	47.3	41.7	290.0	
≥ 64	2,919	62.8	44.8	31.4	25.6	442.1	
Gender							0.002*
Male	6,291	73.6	59.7	50.3	42.7	269.4	
Female	6,648	75.3	63.3	54.6	46.7	241.7	
Diabetes Mellitus							<0.001*
No	3,832	80.8	71.3	63.3	53.6	176.5	
Yes	6,582	70.0	52.8	40.8	33.9	334.4	
Body surface area (m^2)							0.002*
≤ 1.70	5,275	80.2	67.3	58.1	50.3	197.9	
1.71-2.00	1,485	84.9	72.4	62.0	53.5	162.8	
≥ 2.01	123	84.2	66.3	51.2	37.6	216.6	
Type of public health center							<0.001*
Community Hospital	518	71.8	58.3	52.3	NA	298.1	
General Hospital	5,7249	73.4	59.7	50.2	44.1	273.2	
Regional Hospital	4,988	75.0	62.8	53.9	46.4	243.8	
Teaching Hospital	663	79.2	70.0	63.2	54.5	177.9	
Public organization	1,046	75.1	59.4	47.9	35.3	264.7	
Center Size							0.001
≤ 122	4,321	73.5	61.5	51.2	41.0	261.9	
123-243	4,357	73.2	59.3	51.2	45.5	272.0	
≥ 244	4,261	76.5	63.7	54.4	46.4	234.0	
Nephrologist							0.019*
No	2,018	73.0	59.6	47.6	NA	290.3	
Yes	10,921	74.7	61.8	52.9	45.2	250.2	

*** p<0.05, Center size = Number of patients in PD center.**

4.2.2 Finding results from comparison of survival rates of ESRD patients classified by different factors and treatments (the treatments of CAPD, HD and KT) by analysis of Kaplan-Meier method and Log-Rank test as shown in table 4.6

4.2.2.1 Age

Mortality rates of the patients aged ≤44 years were 166.9/1000 person-year in the treatment of CAPD, 72.5/1000 person-year in the treatment of HD and 15.4/1000 person-year in the treatment of KT. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 81.6, 72.8, 65.8 and 54.9 in the treatment of CAPD, 94.0, 85.7, 79.4 and 74.0 in the treatment of HD and 100, 97.6, 97.6 and 88.7 in the treatment of KT. When compared the survival rates of the patients who had aged ≤44 years with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.3A).

Mortality rates of the patients aged 45-54 years were 248.1/1000 person-year in the treatment of CAPD, 127.9/1000 person-year in the treatment of HD and 65.6/1000 person-year in the treatment of KT. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 75.8, 62.6, 52.5 and 43.3 in the treatment of CAPD, 87.4, 76.4, 67.4 and 59.3 in the treatment of HD and 100, 83.3, 83.3 and (NA) in the treatment of KT. When compared the survival rates of the patients who had aged 45-54 years with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.3B).

Mortality rates of the patients aged 55-63 years were 320.4/1000 person-year in the treatment of CAPD and 129.4/1000 person-year in the treatment of HD. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 70.6, 55.5, 42.8 and 36.2 in the treatment of CAPD and 86.6, 75.4, 70.4 and 68.1 in the treatment of HD. When compared the survival rates of the patients who had aged 55-63 years with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.3C).

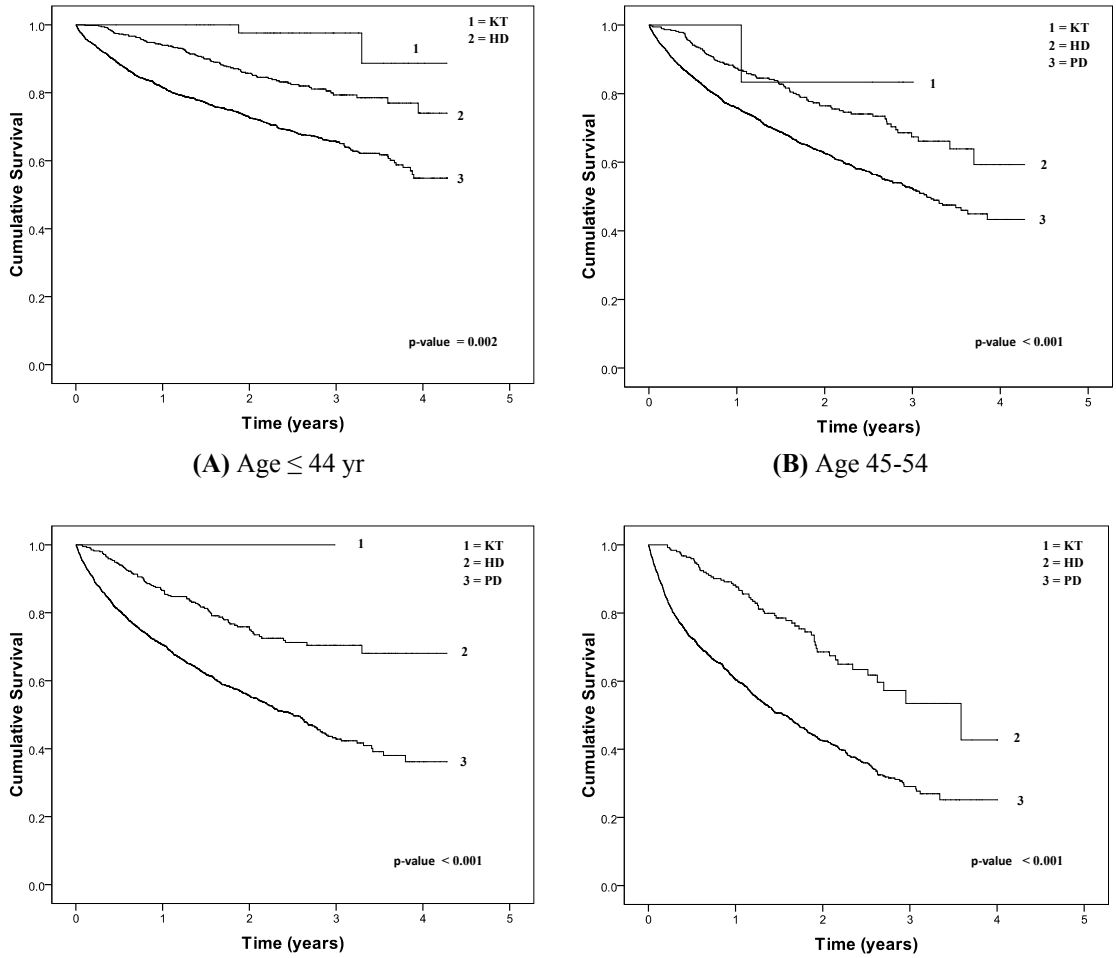
Mortality rates of the patients aged ≥64 years were 480.2/1000 person-year in the treatment of CAPD and 169.3/1000 person-year in the treatment of HD. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 60.4, 42.5, 29.1 and 25.2 in the treatment of CAPD and 88.2, 68.6, 53.4 and 42.7 in

the treatment of HD. When compared the survival rates of the patients who had aged ≥64 years with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.3D).

4.2.2.2 History of Diabetes Mellitus

Mortality rates of the patients DM were 371.1/1000 person-year in the treatment of CAPD, 144.0/1000 person-year in the treatment of HD and no mortality rate was found in patients in the treatment of KT. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 67.5, 49.7, 36.8 and 29.2 in the treatment of CAPD and 88.2, 73.6, 63.7 and 59.9 in the treatment of HD. When compared the survival rates of the patients with DM by using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p < 0.001$) (Figure 4.4A).

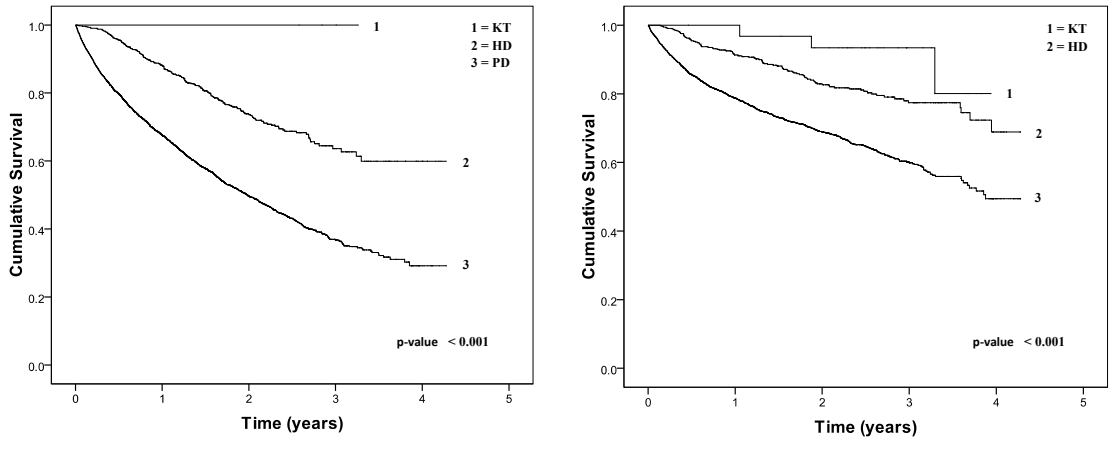
Mortality rates of the patients without DM were 201.7/1000 person-year in the treatment of CAPD, 84.8/1000 person-year in the treatment of HD and 35.6/1000 person-year in the treatment of KT. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 78.8, 69.0, 60.1 and 49.4 in the treatment of CAPD, 91.3, 83.0, 77.4 and 68.9 in the treatment of HD and 100, 93.4, 93.4 and 80.1 in the treatment of KT. When compared the survival rates of the patients without DM by using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.4B).



(A) Age ≤ 44 yr **(B)** Age 45-54

(C) Age 55-63 yr **(D)** Age ≥ 64 yr

Figure 4.3 Effect of treatments on Survival rates of ESRD patients stratified by age



(A) Diabetes Mellitus **(B)** Non-Diabetes Mellitus

Figure 4.4 Effect of treatments on survival rates of ESRD patients stratified by DM

4.2.2.3 Type of Public Health Center

The ESRD patients who received the treatment of CAPD had a mortality rate to be 281.2/1000 person-year of a regional hospital, 303.9/1000 person-year of general hospital, 322.0/1000 person-year of a community hospital, 278.8/1000 person-year of a private or public organization and 199.1/1000 person-year of a teaching hospital. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 72.2, 59.6, 49.6 and 41.8 of a regional hospital, 71.5, 57.1, 46.6 and 39.3 of a general hospital, 69.6, 57.5, 51.1 and (NA) of a community hospital, 74.5, 58.2, 46.0 and 31.7 of a private or public organization and 75.9, 67.4, 62.2 and 52.7 of a teaching hospital. When compared the survival rates of the patients classified by type of public health center with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.5).

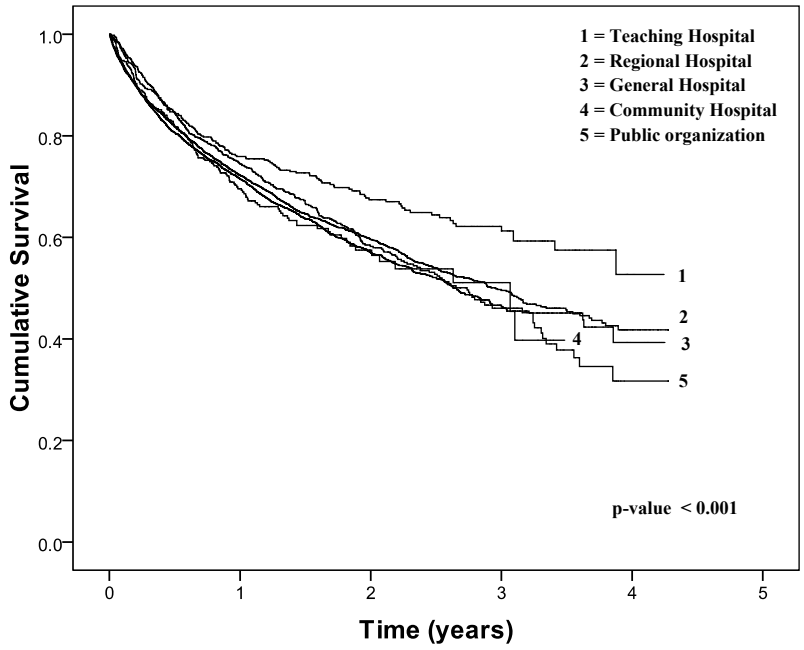


Figure 4.5 The cumulative of survival for ESRD patients with type of public health center

4.2.2.4 Number of patients in PD center

Mortality rates of the patients who received the treatment of CAPD were 295.8/1000 person-year in a small size (≤122 cases), 304.8/1000 person-year in a medium size (123-243 cases) and 261.9/1000 person-year in a large size (≥244 cases). Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 71.3, 58.2, 48.0 and 34.2 in a small size of (≤122 cases), 70.8, 56.6, 47.4 and 41.8 in a medium size of (123-243 cases) and 74.5, 61.3, 50.8 and 42.5 in a large size of (≥244 cases). When compared the survival rate classified by size of PD center groups with using Log-rank test, it was statistically significant difference at 95% of confidence interval ($p<0.001$) (Figure 4.6).

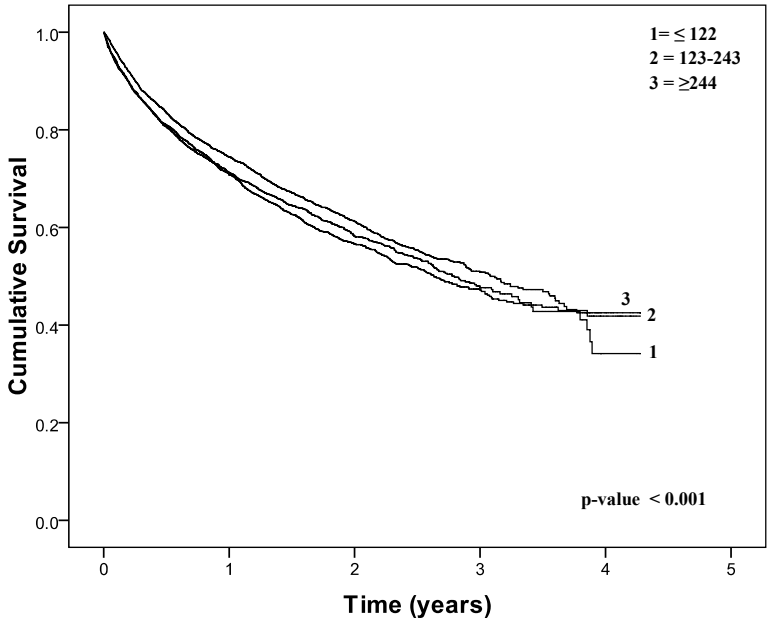


Figure 4.6 The cumulative of survival rates for ESRD patients with number of the patients in PD center

4.2.2.5 Nephrologist

Mortality rates of the patients who received the treatment of CAPD were 283.3/1000 person-year in whom were treated by the nephrologist and 309.9/1000 person-year in whom were not treated by the nephrologist. Survival rates in a period of 1, 2, 3 and 4 years of the patients were respectively 72.2, 58.9, 49.1 and 40.7 in whom were treated by the nephrologist in a public health center and 72.0, 57.7, 45.8 and (NA) in whom were not treated by the nephrologist in a public health center. When compared the survival rates of the patients classified by the nephrologist by using Log-rank test, it was not statistically significant difference at 95% of confidence interval (p=0.249) (Figure 4.7).

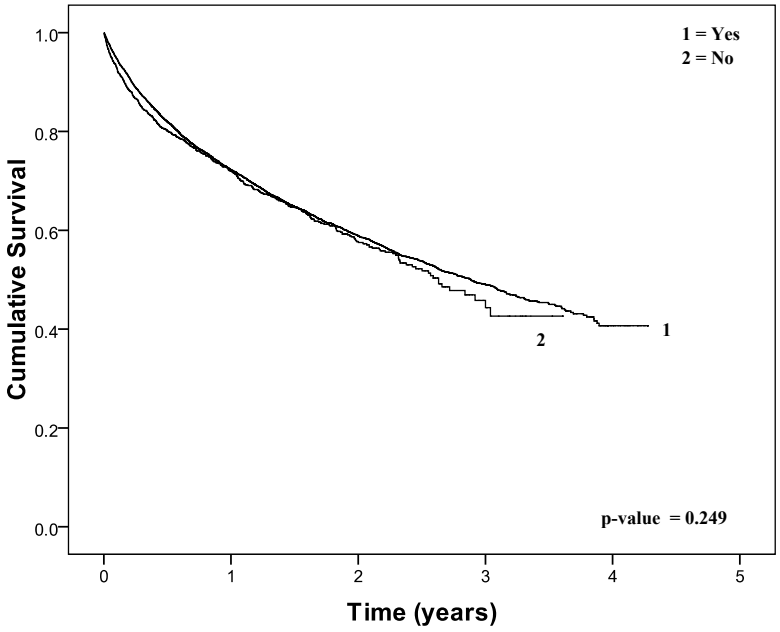


Figure 4.7 The cumulative of survival rates for ESRD patients with nephrologist

Table 4.6 Survival Rates of ESRD Patients with Using the Kaplan-Meier Method and Log-Rank Test

Factors	Treatment	Number	Survival Rate				Death Rate (/1000 Person-year)	p-value (Logrank)
			1 yr	2 yr	3 yr	4 yr		
Age ≤ 44 yr	Continued CAPD	2,687	81.6	72.8	65.8	54.9	166.9	<0.001*
	Switched to HD	512	94.0	85.7	79.4	74.0	72.5	
	Underwent KT	50	100	97.6	97.6	88.7	15.4	
Age 45-54 yr	Continued CAPD	2,899	75.8	62.6	52.5	43.3	248.1	<0.001*
	Switched to HD	377	87.4	76.4	67.4	59.3	127.9	
	Underwent KT	6	100	83.3	83.3	NA	65.6	
Age 55-63 yr	Continued CAPD	3,099	70.6	55.5	42.8	36.2	320.4	<0.001*
	Switched to HD	389	86.6	75.4	70.4	68.1	129.4	
	Underwent KT	1	100	100	100	-	0.0	
Age ≥ 64 yr	Continued CAPD	2,670	60.4	42.5	29.1	25.2	480.2	<0.001*
	Switched to HD	249	88.2	68.6	53.4	42.7	169.3	
	Underwent KT	-	-	-	-	-	-	
Diabetes Mellitus	Continued CAPD	5,843	67.5	49.7	36.8	29.2	371.1	<0.001*
	Switched to HD	735	88.2	73.6	63.7	59.9	144.0	
	Underwent KT	4	100	100	100	-	0.0	
Non-Diabetes Mellitus	Continued CAPD	3,265	78.8	69.0	60.1	49.4	201.7	<0.001*
	Switched to HD	535	91.3	83.0	77.4	68.9	84.8	
	Underwent KT	32	100	93.4	93.4	80.1	35.6	
Type of public health center								
Community Hospital	Continued CAPD	464	69.6	57.5	51.1	39.8	322.0	<0.001*
General Hospital		5,075	71.5	57.1	46.8	39.3	303.9	
Regional Hospital		4,288	72.4	59.6	49.5	41.7	281.2	
Teaching Hospital		552	75.9	67.4	62.2	52.7	199.1	
Public organization		976	74.5	58.2	46.0	31.7	278.8	
Center Size								
≤ 122	Continued CAPD	3,801	71.3	58.2	48.0	34.2	295.8	0.001
123-243		3,820	70.8	56.6	47.4	41.8	304.8	
≥ 244		3,734	74.5	61.3	50.8	42.5	261.9	
Nephrologist								
No	Continued CAPD	1,834	72.0	57.7	45.8	NA	309.9	0.249
Yes		9,521	72.2	58.9	49.1	40.7	283.3	

*** p<0.05, Center size = Number of patients in PD center.**

4.3 Univariate Analysis of Associated Factors Using Cox's Proportional Hazard Model

Finding results of association between different factors and risk of death of the ESRD patients by univariate analysis as shown in Table 4.4 as follows:

4.3.1 Treatment

The patients with the treatment of HD had a 0.42-time lower risk of death compared to those with the treatment of CAPD statistically significant at the 95% of confidence interval (HR=0.42, 95%CI=0.38-0.47, p<0.001). The patients with the treatment of KT had a 0.08-time lower risk of death compared to those with the treatment of CAPD statistically significant at the 95% of confidence interval (HR=0.08, 95%CI=0.03-0.25, p<0.001).

4.3.2 Age

The patients with aged 45-54 years had a 1.54-time risk of death compared to those with aged ≤44 years statistically significant at the 95% of confidence interval (HR=1.54, 95%CI=1.41-1.69, p<0.001). The patients with aged 55-63 years had a 1.92-time risk of death compared to those with aged ≤44 years statistically significant at the 95% of confidence interval (HR=1.92, 95%CI=1.75-2.10, p<0.001). The patients with aged ≥64 years had a 2.58-time risk of death compared to those with aged ≤44 years statistically significant at the 95% of confidence interval (HR=2.82, 95%CI=2.58-3.08, p<0.001).

4.3.3 Gender

The patients who were female had a 1.09-time risk of death compared to those who were male statistically significant at the 95% of confidence interval (HR=1.09, 95%CI=1.03-1.16, p=0.002).

4.3.4 History of Diabetes Mellitus

The patients with DM had a 1.81-time risk of death compared to patients without DM statistically significant at the 95% of confidence interval (HR=1.81, 95%CI=1.68-1.94, p<0.001).

4.3.5 Body Surface Area

The patients with BSA 1.71-2.00 m^2 had a 0.83-time lower risk of death compared to those with BSA ≤1.70 m^2 statistically significant at the 95% of confidence interval (HR=0.83, 95%CI=0.74-0.92, p<0.001). The patients with BSA ≥2.01 m^2 had a 1.09-time risk of death compared to those with BSA ≤1.70 m^2 but not statistically significant at the 95% of confidence interval (HR=1.09, 95%CI=0.80-1.49, p=0.578).

4.3.6 Type of Public Health Center

The patients who had treated in a general hospital had a 0.95-time lower risk of death compared to those who had treated in a community hospital but not statistically significant at the 95% of confidence interval (HR=0.95, 95%CI=0.82-1.11, p=0.550). The patients who had treated in a regional hospital had a 0.87-time lower risk of death compared to those who had treated in a community hospital but not statistically significant at the 95% of confidence interval (HR=0.87, 95%CI=0.75-1.12, p=0.090). Patients who had treated in a teaching hospital had a 0.66-time lower risk of death compared to those who had treated in a community hospital statistically significant at the 95% of confidence interval (HR=0.66, 95%CI=0.54-0.81, p<0.001). The patients who had treated in a private or public organization had a 0.94-time lower risk of death compared to those who had treated in a community hospital but not statistically significant at the 95% of confidence interval (HR=0.94, 95%CI=0.78-1.12, p=0.484).

4.3.7 Number of Patients in PD Center

A medium size of PD center (123-243 cases) had a 1.05-time risk of death compared to those with a small size of PD center (≤122 cases) but not statistically significant at the 95% of confidence interval (HR=1.05, 95%CI=0.98-1.12, p=0.199). A large size of PD center (≥244 cases) had a 0.91-time lower risk of death compared to those with a small size of PD center (≤122 cases) statistically significant at the 95% of confidence interval (HR=0.91, 95%CI=0.85-0.98, p=0.016).

4.3.8 Nephrologist

The patients who were treated by the nephrologist in a public health center had a 0.91-time lower risk of death compared to those who were not treated by the nephrologist in a public health center statistically significant at the 95% of confidence interval (HR=0.91, 95%CI=0.83-0.98, p=0.019).

Table 4.7 Association of Different Factors and Risk of Death of ESRD Patients with Renal Replacement Therapy: Univariate Analysis Using Cox's Proportional Hazard Model

Factors	Number	HR	95% CI	p-value
Treatment				
Continued CAPD	11,355	1.00		
Switched to HD	1,527	0.42	0.38-0.47	<0.001*
Underwent KT	57	0.08	0.03-0.25	<0.001*
Age (year)				
≤ 44	3,249	1.00		
45-54	3,282	1.54	1.41-1.69	<0.001*
55-63	3,489	1.92	1.75-2.10	<0.001*
≥ 64	2,919	2.82	2.58-3.08	<0.001*
Gender				
Male	6,291	1.00		
Female	6,648	1.09	1.03-1.16	0.002*
Diabetes Mellitus				
No	3,832	1.00		
Yes	6,582	1.81	1.68-1.94	<0.001*
Body surface area (m^2)				
≤ 1.70	5,275	1.00		
1.71-2.00	1,485	0.83	0.74-0.92	0.001*
≥ 2.01	123	1.09	0.80-1.49	0.578
Type of public health center				
Community Hospital	518	1.00		
General Hospital	5,724	0.95	0.82-1.11	0.550
Regional Hospital	4,988	0.87	0.75-1.12	0.090
Teaching Hospital	663	0.66	0.54-0.81	<0.001*
Public organization	1,046	0.94	0.78-1.12	0.484
Center size				
≤ 122	4,321	1.00		
123-243	4,357	1.05	0.98-1.12	0.199
≥ 244	4,261	0.91	0.85-0.98	0.016*
Nephrologist				
No	2,018	1.00		
Yes	10,921	0.91	0.83-0.98	0.019*

*** p<0.05, Center size = Number of patients PD center.**

4.4 Multivariate Analysis of Associated Factors Using Cox's Proportional Hazard Model

According to results of association between different factors and risk of death of ESRD patients by univariate analysis found that the risk of death was statistically significant associated with treatment, age, gender, history of DM, BSA, type of public health center, Number of patients in PD center and nephrologist at the 95% of confidence interval. To determine the association between treatment and patients' risk of death was used multivariate analysis of Cox's proportional hazard model in order to control potential confounders as shown in the following.

Treatment

Age

Gender

History of Diabetes Mellitus

Body Surface Area

Type of Public Health Center

Number of patients in PD center

Nephrologists

Results of the study found that treatment, age, history of diabetes mellitus, body surface area and type of public health center were significant associated with patients' risk of death. Meanwhile, gender and number of patients in PD center were not associated with the risk of death of ESRD patients as shown in following Table 4.7

4.4.1 Treatment

The patients with the treatment of HD had a 0.47-time lower risk of death compared to those with the treatment of CAPD statistically significant at the 95% of confidence interval (HR=0.47, 95%CI=0.39-0.56, $p<0.001$). The patients with the treatment of KT had a 0.21-time lower risk of death compared to those with the treatment of CAPD statistically significant at the 95% of confidence interval (HR=0.21, 95%CI=0.51-0.83, $p=0.026$).

4.4.2 Age

The patients aged 45-54 years had a 1.32-time risk of death compared to those aged ≤44 years statistically significant at the 95% of confidence interval (HR=1.32, 95%CI=1.13-1.53, p<0.001). The patients aged 55-63 years had a 1.55-time risk of death compared to those aged ≤44 years statistically significant at the 95% of confidence interval (HR=1.55, 95%CI=1.34-1.80, p<0.001). The patients with aged ≥64 years had a 2.13-time risk of death compared to those aged ≤44 years statistically significant at the 95% of confidence interval (HR=2.13, 95%CI=1.83-2.48, p<0.001).

4.4.3 History of Diabetes Mellitus

Patients with DMs had a 1.63-time risk of death compared to those without DM statistically significant at the 95% of confidence interval (HR=1.63, 95%CI=1.46-1.82, p<0.001).

4.4.4 Body Surface Area

The patients with BSA 1.71-2.00 m^2 had a 0.84-time lower risk of death compared to those with BSA ≤1.70 m^2 statistically significant at the 95% of confidence interval (HR=0.84, 95%CI=0.74-0.95, p=0.005). The patients with BSA ≥2.01 m^2 had a 1.24-time risk of death compared to those with BSA ≤1.70 m^2 but not statistically significant at the 95% of confidence interval (HR=1.24, 95%CI=0.89-1.73, p=0.204).

4.4.5 Type of Public Health Center

The patients who had treated in a general hospital had a 0.89-time lower risk of death compared to those who had treated in a community hospital but not statistically significant at the 95% of confidence interval (HR=0.89, 95%CI=0.68-1.17, p=0.403). The patients who had treated in a regional hospital had a 0.91-time lower risk of death compared to those who had treated in a community hospital but not statistically significant at the 95% of confidence interval (HR=0.91, 95%CI=0.69-1.20, p=0.517). Patients who had treated in a teaching hospital had a 0.47-time lower risk of death compared to those who had treated in a community hospital statistically significant at the 95% of confidence interval (HR=0.47, 95%CI=0.32-0.68, p<0.001). The patients who had treated in a private or public

organization had a 0.42-time lower risk of death compared to those who had treated in a community hospital statistically significant at the 95% of confidence interval (HR=0.42, 95%CI=0.25-0.69, p=0.001).

4.4.6 Nephrologist

The patients who were treated by the nephrologist in a public health center had a 1.18-time risk of death compared to those who were not treated by the nephrologist in a public health center statistically significant at the 95% of confidence interval (HR=1.18, 95%CI=1.01-1.36, p=0.033).

Table 4.8 Association of Different Factors and Risk of Death of ESRD Patients with Renal Replacement Therapy: Multivariate Analysis Using Cox's Proportional Hazard Model

Factors	Number	HR	95% CI	p-value
Treatment				
Continued CAPD	4,847	1.00		
Switched to HD	607	0.47	0.39-0.56	<0.001*
Underwent KT	26	0.21	0.51-0.83	0.026*
Age (year)				
≤ 44	1,443	1.00		
45-54	1,434	1.32	1.13-1.53	<0.001*
55-63	1,507	1.55	1.34-1.80	<0.001*
≥ 64	1,096	2.13	1.83-2.48	<0.001*
Gender				
Male	2,600	1.00		
Female	2,880	0.99	0.89-1.09	0.836
Diabetes Mellitus				
No	2,274	1.00		
Yes	3,206	1.63	1.46-1.82	<0.001*
Body surface area (m^2)				
≤ 1.70	4,093	1.00		
1.71-2.00	1,276	0.84	0.74-0.95	0.005*
≥ 2.01	111	1.24	0.89-1.73	0.204
Type of public health center				
Community Hospital	185	1.00		
General Hospital	2,561	0.89	0.68-1.17	0.403
Regional Hospital	2,354	0.91	0.69-1.20	0.517
Teaching Hospital	258	0.47	0.32-0.68	<0.001*
Public organization	122	0.42	0.25-0.69	0.001*
Center size				
≤ 122	1,992	1.00		
123-243	1,893	0.95	0.84-1.07	0.393
≥ 244	1,595	0.97	0.85-1.10	0.595
Nephrologist				
No	1,024	1.00		
Yes	4,456	1.18	1.01-1.36	0.033*

*** p<0.05, Center size = Number of patients in PD center.**

CHAPTER V
DISCUSSION

This research was to study the survival rates of ESRD patients who were initial treatment of CAPD comparing to patients who received the treatment of HD or patients who received the treatment of KT, and study its associations with different factors affecting to death including treatment, age, gender, history of diabetes mellitus, body surface area (BSA), type of public health center, number of patients in PD center and nephrologists. The study had to follow the patients from their enrollment until the end of status or end of the study. This study used data from 112 of public health centers for studying as a retrospective cohort study.

Samples of the study were ESRD patients who had the right of universal health coverage. These patients started to register with the treatment of CAPD initially in between October 1, 2007 and August 31, 2011 with the specified criteria through the DMIS's registration program of Renal Failure Fund of NHSO. The data was a secondary data which was limited in a public health center where recorded in the registration program only. Out of 12,939 patients then were classified into three of treatment groups including 11,355 cases of patients who received the treatment of CAPD, 1,527 cases of patients who received the changed treatment of HD and 57 cases of patients who received the treatment of KT. Data of the study were used to analyze as survival analyses.

Statistical analyses used a descriptive statistics to describe characteristic and demographic data including percentage, mean and standard deviation. Kaplan-Meier survival curve and Log rank test were used for comparisons between different factors and Cox's proportional hazard model was used for the association.

5.1 Discussion of the Results

5.1.1 Characteristics

Patients with the treatment of CAPD had trend to increase for every year and most of them were in northeast region. Most of ESRD patients were middle age and initially registered with the treatment of CAPD in a general hospital (43.9%) and a regional hospital (38.9%). The most patients were treated by the nephrologist in public health centers and also have a PD nurse in PD unit.

The patients who registered for the treatment with CAPD in the beginning mostly treated with CAPD more than those who changed the treatment of being HD or KT. The higher rate of the treatment with CAPD showed that the patients were accepted the treatment and without a severe complication, but the patients who changed the treatment from CAPD to HD most likely caused by infection of peritoneum (Peritonitis) that affects to death[48,152,180].

Most of public health centers with the treatment of CAPD were sixty-three general hospitals (56.3%). Seventy-eight public health centers had nephrologists in the unit (69.6%) which there found in a central hospital, a teaching hospital and a private or public organization to be 100%. The patients who received the treatment of CAPD that treated in a public health center by the nephrologist were 83.8% and those who were not treated by the nephrologist up to 16.2%. For the PD nurse in PD unit was found two PD nurses in a unit 42.1%. There found patients in PD unit for minimum one case and 545 cases of maximum and the proportion was one PD nurse per 1-136 patients. The proportion between nurse and patient generally was one nurse per fifteen patients for sufficiency but an overview of Asia region was one nurse per 25-50 patients in a PD unit. Some of public health centers may require a practitioner lower than the level of nursing professional. However, they should be monitored by a supervisor of the experienced nurse[170]. In this study found eighty seven of public health centers with the proportion of one PD nurse per 1-50 per patients to be 82.9% which there found this proportion everywhere of all teaching hospitals of university and college of medicine.

5.1.2 Survival rates

Survival rates at 1, 2, 3 and 4 years of the patients were respectively 72.2, 58.7, 48.8 and 40.4 in the treatment of CAPD, 89.5, 78.6, 71.0 and 65.1 in the treatment of HD and 100, 98.2, 96.1 and 87.4 in the treatment of KT. When classifying the patients by age group and DM according to the treatments, there also found that the survival rate of the patients who received the treatment of CAPD lower than the patients who received the treatments of HD and KT. The cause of lower rate of the treatment with CAPD is due to the patients have an old age and DM condition to be 64.2%. It is a major cause of increased patient death from CVD.

Additionally, there found that most of the PD unit according to the policy of PD-first project just opened the service as first time. The health personnel are lacked adequate of experiences and skills on the performance. Frequency of meeting the physician in the patients who received the treatment of CAPD was lesser than the patients who received the treatment of HD. These may result to the diagnosis and its complication treatment is delayed. The patients who received the treatment of HD had better prognosis of the disease due to a younger of age which is more likely to have a co-morbidity of the kidney disease as a little and without any serious complications before turning the treatment. However, before the policy of PD-first project opened, most of public health centers has serviced by the treatment of HD. Team of doctor and nurse has more likely to have skills on the treatment. Frequency of meeting the doctor in the patients who received the treatment of HD also was rather than the patients who received the treatment of CAPD. This result is to making diagnosis and complication treatment. In a part of the patients who received the treatment of KT found the best of survival rates because of the most patients has received KT at a younger of age and without any serious complications.

As the study found that survival rates of the patients who received the treatment of CAPD were lower than the patients who received the treatment of HD and also found the risk of death by its treatment over contributing factors (patient, co-morbidity, complication and health personnel, etc.). It may be due to a limitation of the policy of PD-first project that provides in the right of universal health coverage for the patients to receive the treatment of PD as first choice (unless there have a prohibition or receiving KT). Some patients had unwilling but they had needed for the treatment

of CAPD because they had a no choice. Some patients may be not appropriate for receiving the treatment of CAPD at first but they had a no choice because the cost issue, so they must be continuously treated with the treatment of CAPD. Thereafter, the problems of the treatment of CAPD are happened, then the patients have needed to change the treatment to be HD for using HD machine, but they cannot be changed by what any problems of the patients such as old age, cost issue, caregiver and relative, traveling, etc. Even some patients cannot find a dialysis center; they must be treated with the treatment of CAPD further (which found that 73.0% of public health centers can provide the HD for patients with peritonitis and temporary HD in the same hospital while estimated 12.5% of them have referred to a dialysis unit outside the hospital. In a permanent HD, only 35.0% of public health centers can accommodate for the patients, 28.0% of them are referred to private hospitals, and the remaining patients have to find out the dialysis by themselves). As the above causes may result in a survival rate of the patients who received the treatment of CAPD was lower than the patients who changed treatment methods by HD machine.

This study showed that patients who received the treatment of KT had survival rates better than those with the treatments of HD and CAPD. This consisted with the studies of Kramer et al[104] and Stel et al[113]. The patients who received the treatment of KT of this study had survival rates better than other studies[50, 104-113] but patients who received the treatment of CAPD had survival rates lower than several studies[23, 25, 31, 33, 35, 45-47, 62-63, 65-69, 71-72, 76-79, 81, 83, 86-87, 90-93, 96-98, 104]. Meanwhile, patients who received the treatment of HD had survival rates similar to many studies[23, 35, 69, 72, 76, 102-103] and it was better than some studies[25, 77, 99-100, 104].

In the current, KT is widely accepted as the best treatment for ESRD which the patients are living nearly normal people better than other methods. When comparing the treatment of PD and HD, some evidences have reported a no difference of survival rates in the patients[23, 25, 31, 34, 46, 69, 121, 128-129] but some evidences reported[122-127] that the treatment of HD is better than the treatment of CAPD. However, the outcomes of RRT depend on the skills of medical team, patients' individual factors including socioeconomic status, social conditions and environment surrounding the patients. On choosing the method of RRT should be considered by individual of the patients.

5.1.3 Factors Associated with Risk of Death

5.1.3.1 Treatment

This study showed that the patients who received the treatment of KT had a better survival rate. Secondary, there were the patients who received the treatment of HD and the patients who received the treatment of CAPD, respectively. When controlled potential confounding factors with using multivariate analysis at the 95% of confidence interval found that patients who received the treatment of HD and KT had significant lower-risk of death compared to patients with the treatment of CAPD (HD vs. CAPD: HR = 0.47, 95% CI = 0.39 to 0.56, $p < 0.001$; KT vs. CAPD: HR = 0.21, 95% CI = 0.51 to 0.83, $p = 0.026$). Because of the treatment of CAPD resulted to patients lose protein from PD treatment approximately 8-10 g. If protein is not sufficient to body needs due to patient's eating. It influenced that total protein level is low in their blood and malnutrition is occurred. Patients may have an increased triglyceride influencing to worse hardening of the arteries and potassium is usually higher in ESRD patients. Moreover, low of caused PD also affects to muscle weakness and cardiac arrhythmias and any problem of abdominal infection in patients with the treatment of CAPD. The repeated infection is an important complication causing to patients to be admitted in hospital which is a chance of other infections such as pneumonia, sepsis, and etc, which these may result to death in patients. This study finding consisted with the study of Kririthichai et al[33], Van Manen et al [118], Locatelli et al[122], Disney et al[123] and Ganesh et al[126] that found the patients who received the treatment of CAPD had a statistically significant higher risk of death. Whereas many studies[23, 25, 28, 31, 34, 46, 69, 70, 121, 130] had a no significant difference of risk of death in the treatments of PD and HD.

5.1.3.2 Age

When controlled potential confounding factors by using multivariate analysis at the 95% of confidence interval that there found patients aged 45-54 years had a statistically significant increased risk of death compared to those aged ≤44 years (HR = 1.32, 95%CI = 1.13-1.53, $p < 0.001$), the patients aged 55-63 years had a 1.55-time risk of death compared to those with aged ≤44 years statistically significant at the 95% of confidence interval (HR = 1.55, 95%CI = 1.34-1.80, $p < 0.001$). The patients aged ≥64 years had a 2.13-time risk of death compared to those

aged ≤44 years statistically significant at the 95% of confidence interval (HR = 2.13, 95%CI = 1.83-2.48, p < 0.001).

This study found that the risk of death inflated with age in patients with both of CAPD treatment and HD treatment. These consisted with several studies[31, 33, 45-47, 69, 71, 73, 85, 87, 96, 102-103, 130, 142-145, 147, 181] that found elderly of age were a statistically significant increased risk of patients' death. Because of kidney filtration is declined by reduction of renal blood flow causing for decreased GFR which results creatinine clearance is decreased. Reduction of renal excretion then results to waste retention in the body more than a younger patient. In particular elderly CKD patient, the disease affects to worse prognosis that may have an increased risk of death.

5.1.3.3 History of Diabetes Mellitus

According to multivariate analysis at the 95% of confidence interval found that patients with DM had a statistically significant increased risk of death compared to patients without DM (HR = 1.63, 95%CI = 1.46-1.82, p < 0.001). This consisted with the study of Van Manen et al[118] and Liem et al[127].

Beyond DM can affect to the pathogenesis of large blood vessels (Macrovascular complication) and small blood vessels (Microvascular complication) throughout the patient's body resulting to kidney's pathogenesis (Glomerulosclerosis), it may cause the blood vessels of the heart (Coronary Heart Disease) which affects to MI and stroke or partial brain death is caused by atherosclerosis in the brain. If there happens in the peripheral vascular (PVD) it results to a necrosis. As the study of Choy et al[152] found that the cause of death in diabetic patients after the treatment of PD was a CVD (32.9%), an infection (29.4%) and a cerebrovascular disease (8.2%), in the treatment of HD was a CVD (27.0%), an infection (10.0%) and a cerebrovascular disease (10.0%), and the treatments of KT found the main cause of death in diabetic patients was an infection (100.0%). Meanwhile, the cause of death in patients without DM who received RRT was an infection (33.2%), CVD (23.3%) and a cerebrovascular disease (6.0%).

Its association of a study found a statistically significant 1.51-to 5.65-time risk of death in patients who received RRT; particularly, there found a statistically significant 1.10-to 4.78-time risk of death in patients with the treatment of

CAPD, a 1.26-to 1.58-time risk of death in the treatment of HD and a 3.41-time risk of death in the treatment of KT[120] when compared to patients without DM.

5.1.3.4 Body Surface Area

In this study found the BSA ranging from 0.88 to 2.55 m^2. When analyzed by using multivariate model at the 95% of confidence interval found that patients with BSA 1.71-2.00 m^2 had a statistically significant decreased-risk of death to be 53.0% compared to those with BSA ≤1.70 m^2(HR = 0.84, 95%CI = 0.74-0.95, p = 0.005) but patients with BSA ≥2.01 m^2 had a no significant risk of death compared to those with BSA ≤1.70 m^2 (BSA ≥2.01 m^2 vs. ≤1.70 m^2: HR = 1.24, 95%CI = 0.89-1.73, p = 0.204). The finding indicated that a median size (BSA 1.71-2.00 m^2) was associated with a decreased risk of death. It was not consistent with the study of Brown et al[153] and Rocco et al[154] showed that levels of BSA were not associated with risk of death.

5.1.3.5 Type of Public Health Center

As the analysis of multivariate model at the 95% of confidence interval found that patients who had initially registered to treat in both general and regional hospitals had a no significant risk of death compared to those who had treated in a community hospital (HR = 0.89, 95%CI = 0.68-1.17, p = 0.403 and HR = 0.91, 95%CI = 0.69-1.20, p = 0.517, respectively). Patients who had treated in a teaching hospital had a statistically significant decreased-risk of death to be 53.0% compared to those who had treated in a community hospital (HR = 0.47, 95%CI = 0.32-0.68, p < 0.001). There were consistent with the study of Udom Krairithichai et al[155] showed that ESRD patients of governmental and private institutions and charities were associated with an increased risk of death compared with a teaching hospital. This may be due to differences, including the quality of hospital service and number of health professional in each of hospital and level/type of public health center and a limitation of capability's hospital service such as a tertiary hospital (general hospital and central hospital), a teaching hospital and a large private hospital, that provide the medical care for a severe and complicated patient with using an advanced technology and specialist physician and nurse in the treatment. These may result to the operating unit regarding the body's response to the illness integrated with a treatment technology for the achievement.

Meanwhile, the univariate analysis model found that patients who had treated in a private or public organization had not statistically significant risk of death compared to those who had treated in a community hospital (HR = 0.94, 95%CI = 0.78-1.12, p = 0.484), but when analyzed by multivariate analysis found that the patients who treated in a public organization had statistically significant decreased-risk of death to be 58.0% compared to those were in a community hospital (HR = 0.42, 95%CI = 0.25-0.69, p = 0.001). The findings showed that in a private or public hospital is more likely to have a treatment better than a community hospital. When considered in a private or public health organization of this study, there comprised with Banphaeo hospital (Samut Prakan) and Banphaeo hospital (Prommit) because the hospitals were recruited by NHSO and Nephrology Society of Thailand to be the one of pilot projects that collaborated with a teaching hospital of two medicine schools. This indicated that Banphaeo hospital (Public Organization) have the ability of treatment care for CKD patients equivalent to a teaching hospital. There also found a large of PD center[176] and a lot of health professionals to be 873 people that results for much experience on the patient care sufficiently. Its treatment is trended to be a good way. There was consistent with the study of Fenton et al[120] that found a large center where provides peritoneal dialysis treatment (≥400 beds) is better than a small centre (≤399 beds).

5.1.3.6 Nephrologist

This study found that the patients who had treated by the nephrologist in a public health center had a statistically significant increased-risk of death compared to those who were not treated by the nephrologist in a public health center (HR = 1.18, 95%CI = 1.01-1.36, p = 0.033). However, in some studies of Schmidt et al[156], Roubicek et al[158] and Ismail et al[159] found that a delayed-nephrologist meeting was associated with an increased risk of death. It may be due to meeting the nephrologist early is a positive impact on patient's treatment rather than at the time of PD treatment only. Even public health centers of this study had a no nephrologist in a public health center but there has a physician and PD nurse who has passed a 4-month of PD training for working in PD center. The practitioners can be advised and teaching a proper practice to their patients correctly, and verify its accuracy as a consultant to patients and providing a treatment for the complication. However, if any problem occurs in the center that exceeds the capacity of practitioners

to take care of the patient, the referral system is continued to the next public health center where obtains the specialist physician. Therefore, keeping timely and accurate treatment by practitioners can reduce the complication's severity, time to admit in hospital and risk of death in patients[8]. In addition, practitioners' proficiency on patient care is another factor leading to better patient's survival rate[7].

5.2 Limitations of the Study

1. This study was a retrospective cohort study using a backed data from the DMIS's registered program. It may receive an incomplete data as the study required. In case of data was not recorded or may have incorrect information due to the record that results to some data may be lost and a lot of unknown data for example, BSA (due to the high and weight not recorded), the date to started PD or KT (using the date of initial registration with the treatment of CAPD), cause of death with CKD and its complication, and etc. When data were analyzed, the results were probably error from the real; therefore, it should be notified to the author to be concerned on records for beneficial treatment and further study.

2. Samples in the present study were the ESRD patients, who had health insurance with the right of NHSO, and were initial registration with the treatment of CAPD in between October 1, 2007 and August 31, 2011 with the inclusion criteria. Out of 12,939 cases were classified as estimated of 11,355 patients who received the treatment of CAPD treatment, estimated of 1,527 patients who received the treatment of HD treatment and only 57 of patients who received the treatment of KT treatment. It was difference in between a number of patients in each treatment methods due to using a database of the initial registration particularly in the treatments of CAPD. The data may have an under estimation than the real number of patients with the treatments of HD and KT resulting to the analysis error. So there should be a similar study using data from a database of registered patients keeping all three methods to compare the results with no partiality.

3. This study used data of the Renal Failure Fund of NHSO according to the policy of PD-first project from participated 112 of public health centers. Patients were registered through the DMIS's registration program that represented of obtained

data in Thailand. Due to there was a macro study level that may result to a conclusion in the population level because the treatment methods and its standard treatment in each hospital was different.

As the study's results, there found factors affecting to the survival of the ESRD patients that are many factors. Due to the individual are not only one-caused factor affecting to the survival but there are several integrated-factors that may directly or indirectly result to a patient. The completeness of data is very important to analyze the survival of patients; specifically, a study is required a large number of data in order that is to representative patients of Thailand. Therefore, to study similar retrospective cohorts study for example, a diagnosed method and its standard, a treatment method, a patient follow-up and a data record should be completeness and be the same approach in all hospitals on performing as the PD-First project.

CHAPTER VI
CONCLUSION

This study was a retrospective cohort study in the ESRD patients who had the right of universal health coverage and initially treated with continued peritoneal dialysis (PD). A total of 12,939 patients were enrolled to the PD-First project through DMIS's registration program of Renal Failure Fund of NHSO in between October 1, 2007 and August 31, 2011 from 112 hospitals. The study used data from the DMIS's registration program of Renal Failure Fund of NHSO to study patients' survival rate and risk of death including treatment, age, gender, history of DM, BSA, type of public health center, number of patients in PD center and nephrologist and following the end of status by the DMIS's registration program (from Renal Failure Fund of NHSO by using data of registration office of Ministry of Interior) for survival analyses.

6.1 Conclusion

6.1.1 Characteristics

The ESRD patients who started to register the treatment for CAPD as the policy of PD-first project were a total of 12,939 cases that classified including the treatment of CAPD to be 11,355 cases, the changed treatment of being HD to be 1,527 cases and the treatment of KT to be 57 cases. These patients have increased to register the treatment for CAPD in every year. Most of them were in the northeast region. The study sample was aged 52.8 years of average. The average of age was difference in each other treatments, the patients who received the treatment of CAPD were 53.4 years of average, the patients who received the treatment of HD were 49.6 years of average and the patients who received the treatment of KT were 29.4 years of average. Most of the patients were females more than males, but only the patients who received the treatment of KT were males more than females. Most of them had BSA to be 1.57

m^2 on average, the patients who received the treatment of CAPD had BSA to be 1.57 m^2 on average, the patients who received the treatment of HD had BSA to be 1.61 m^2 on average and the patients who received the treatment of KT had BSA to be 1.54 m^2 on average. DM was a disease that together found in ESRD patients up to 63.2%.

The patients who started to register the treatment for CAPD were mostly in a general hospital and secondary were in a regional hospital. Most of the patients were received treatments from public health centers where there have nephrologists regularly in PD centers.

The most PD centers had two PD nurse regularly in each other centers which the ratio of between PD nurse and the patients was 1 PD nurse per 1-31 cases of average.

Following at the end of status found that all of ESRD patients were 34.6% of death and 65.4% of alive. Patients who received the treatment of CAPD found 36.5% of death and 63.5% of alive, patients who received the treatment of HD found 21.5% of death and 78.5% of alive and patients who received the treatment of KT found 5.3% of death and 94.7% of alive.

Lacked-information factors of ESRD patients were birthplace only 0.03%, BSA approximately 46.8% and history of DM approximately 19.5%. There found that lacked-information factors of patients who received the treatment of CAPD were BSA, history of DM, no PD nurse in a PD center and PD nurse to be 46.2%, 19.8%, 1.9% and 3.6%, respectively. Patients who received the treatment of HD were BSA, history of DM and type of public health center to be 51.8%, 16.8% and 100%, respectively. Patients who received the treatment of KT were BSA, history of DM and type of public health center to be 36.8%, 36.8% and 100%, respectively.

6.1.2 Comparison of survival rates of the ESRD patients classified by different factors including treatment, age, gender, history of DM, BSA, type of public health center, number of patients in PD center and nephrologist.

When analyzed by using Log rank test at the 95% of confidence interval found that associated factors to survival rates of ESRD patients who had treated RRT were including treatment, age, gender, history of DM, BSA, type of public health center and nephrologist.

6.1.3 Associated Factors

There were association of risk factors including treatment, age, gender, history of DM, BSA, type of public health center, number of patients in PD and nephrologists in the ESRD patients.

When analyzed the associations with univariate analysis model by using Cox's proportional hazard model at the 95% of confidence interval found that risk of death in patients who had treated RRT associated with factors including treatment, age, gender, history of DM, BSA, type of public health center, number of patients in PD center and nephrologist.

When analyzed the associations with multivariate analysis model by using Cox's proportional hazard model at the 95% of confidence interval also found that risk of death in patients who had treated RRT associated with factors including treatment, age, history of DM, BSA, type of public health center and nephrologist.

6.2 Recommendations

6.2.1 Recommendations for Nursing Practice

1. Survival rates of patients with the treatment of CAPD of this study were lower than some evidences of Nephrology Society in Thailand and other countries. Because of the study of Nephrology Society in Thailand found most of patients were a civil servant medical benefit scheme (CSMBS), a social security scheme (SSS) and a voluntary health insurance (VHI). This study especially focused on patients who had the right of universal health coverage which was health insurance mostly in Thailand. Most patients who had the right of health insurance had rather poor income and poor education. These patients may lack of understanding on the treatments of PD. Both physician and nurse who given such as knowledge to patients must be giving more time and focus on renal education as well as considering a home environment of these patients because of they may have a condition different from the one who had the right of health insurance. To advice patients and their caregivers on arranging suitable home environment for peritoneal dialysis. Patients thus should be

received a home visit regularly. These may help to reduce the infectious rate which is cause of death another.

2. To achieve equality of accessing health service underlying the right of universal health coverage for RRT, the PD first-policy therefore has been established. The ESRD patients must be received a treatment of PD as first choice, which can be made a public health center of RRT with the treatment of CAPD are increased. As a previous year, its treatment primarily was a cluster particular in urban area and a teaching hospital of university and college of medicine only. However, in the present, the treatment has been spread in all regions and every public health centers including a central hospital, a general hospital and a community hospital. Many of public health centers now opened for the first of CAPD that resulting the staffs are lack of experience on patient health care. Anyway, inappropriate proportion of between patients and number of PD nurses on the treatment and selecting patients in the beginning treatment of RRT are decreased such as elderly patient, CVD patient, DM patient, family's background and patients' society, etc. Therefore, it should be improving a quality of health service and sufficient of PD's staff in a center.

3. There should be observed patients with BSA ≤ 1.70 m^2 (a small of body size) and in particular patients with BSA ≥ 2.01 m^2 (a large of body size). Due to except for the condition affecting to prediction of the disease, this may increase a risk of death in patients. However, should be making an understanding of pathogenesis included its prevention and treatment of overweight or obesity that may reduce an incidence of renal disease and reducing mortality rate.

4. Patients with diabetes mellitus are more risk of death. These patients should be observed by controlling a proper of blood sugar level and screening a complication on risk detection and curing soon. These may reduce for risk of death and increase a prolonged survival.

5. Although patients who had treated PD either of CAPD or HD that might not yet recovered from the disease. We should have to control the disease seriously for reducing the incidence of patients.

6. According to completeness and accuracy on data collection of this study are very important. All public health centers should have to improve the registration system and some reports for working staffs and service used in practice.

6.2.2 Recommendations for Further Study

1. This study used data from Renal Fund of NHSO. Out of 112 hospitals in the project of PD-first policy were participated by registering through the DMIS's program. Results of the study were representative of ESRD patients who had the right of universal health coverage of the country. In order to improve a specific result, quality of public health service, standard of diagnosis, treatment and patient following all public health centers should be similar.

2. This study was a survival of patients that should be studied quality of life of patients thereafter diagnosis and treatment due to the quality of life of patients is the best of treatment evaluation.

3. There should have to study other related-factors including complications of the disease, causes of death, causes of treatment changing and other diseases that related to renal disease such as coronary heart disease, hypertension, infectious diseases and etc.

4. There should have to study a cause of different types of public health center which treated patients with the treatment of CAPD in order to improve the quality of public health service especially in a community hospital, a general hospital and a central hospital.

5. There should have to study as a prospective cohort study measuring affecting risk factors to treatment and finding an incidence of complications of the disease. Public health center should be a similar standard of the treatment.

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