

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Research Questions and Objectives

4.1.1 Primary Research Question

Do the catheter infection, causes of ESRD, the presence of DM, low hemoglobin level, serum albumin, blood urea nitrogen level, age, low educational level, type of CAPD bags and systems, and the duration of CAPD associate with the rate of peritonitis?

4.1.2 Secondary Research Questions

(1). Do the catheter infection, causes of ESRD, the presence of DM, low hemoglobin level, serum albumin, blood urea nitrogen level, age, low educational level, type of CAPD bags and systems, and the duration of CAPD associate with the time to first peritonitis episode?

(2).What are the rate of peritonitis, technique survival, and survival time of the CAPD patients who develop catheter infection, or peritonitis from S.aureus?

(3).What are the rate of peritonitis, technique survival, and survival time of the diabetic CAPD patients?

(4). What are the rate of peritonitis, technique survival, and survival time of the middle age CAPD patients (age < 60 year)?

4.1.3 Research Objectives

(1). To examine the association of catheter infection, causes of renal failure, the presence of DM, hemoglobin level , serum albumin, blood urea nitrogen level, age, educational level , type of CAPD bags and systems, and the duration of CAPD with the rate of peritonitis.

(2). To examine the association of catheter infection, causes of renal failure, the presence of DM, hemoglobin, serum albumin, blood urea nitrogen, age, educational level , type of CAPD bags and systems, and the duration of CAPD with the time to first peritonitis episode.

(3). To examine the rate of peritonitis, technique survival and survival time of the CAPD patients who developed catheter infection, or peritonitis from S.aureus.

(4). To examine the rate of peritonitis, technique survival and survival time of the diabetic CAPD patients.

(5). To examine the rate of peritonitis, technique survival and survival time of the middle age CAPD patients,

4.1.4 Hypothesis

Null hypothesis(H_0): Catheter infection, causes of renal failure, DM, hemoglobin, serum albumin, blood urea nitrogen, age, educational level, type of CAPD bags and systems, and duration of CAPD do not associate with the rate of peritonitis.

Alternative hypothesis (H_1): Catheter infection, causes of renal failure, diabetic mellitus, hemoglobin, serum albumin, blood urea nitrogen, age, educational level, type of CAPD bags and systems, and duration of CAPD associate with the rate of peritonitis.

The hypothesis will be tested by using multiple regression analysis, and rate of peritonitis is the main outcome

4.1.5 Operational definition:

(1). Rate of peritonitis

Rate of peritonitis will be calculated for each patient by collecting all episodes of spontaneous peritonitis and divide by the period of time (year).

All episodes of peritonitis will be counted as the outcome except :

(1.1). Peritonitis which are detected within the first three days after the patients are discharged from the admission of inserting the catheter of CAPD, because they are the complications from surgical technique in catheter insertion.

(1.2). Subsequent peritonitis which occur within four weeks after a previous episode, with the same organism in the culture, are defined as the relapses , not the new episodes of peritonitis.

(1.3). Peritonitis after the leakage of catheter or dialysate bag, because these are not spontaneous peritonitis . They are the complication from mechanical causes or from defects of the catheters or bags.

(2). Time to first peritonitis episode

The time to first peritonitis episode is the time from starting CAPD to the first episode of peritonitis.

(3). Uncontrolled peritonitis

Uncontrolled peritonitis are peritonitis that are resistant to treatment with intraperitoneal or the intravenous antibiotics, and eventually follow with removing of the catheters, or death.

(4). Catheter infection

Catheter infection is the infection at the catheter and includes both exit site and tunnel infections. Exit-site infection will be diagnosed if there are erythema, tenderness and purulent drainage. Tunnel infection will have the same symptoms but include the tenderness along the tunnel of the catheter in the subcutaneous tissue.

(5). Technique survival

The technique survival is the time from starting CAPD to the time of discontinuation of CAPD or to the end of the study. Discontinuations of CAPD because of kidney transplantation or transferring to another center will be censored. Death or discontinuation from uncontrolled peritonitis will be considered as an event, and those from the other causes will be considered as censored observation.

(6). Educational level

Educational level is divided into education years, 0, 0-6, 6-12, and more than 6 years.

(7). Laboratory investigation

Laboratory tests that are measured are: hemoglobin(Hb), serum albumin (Alb), and blood urea nitrogen (BUN).

(8). Type of CAPD bags and systems

There are 4 types of bags. They are Baxter standard system, Baxter ultra-bag system, Fresinius safety lock (standard system), Fresinius ANDY plus (twin-bag system).

(9). Middle age

Middle age patients are patients with their age less than 60 years.

(10). Aging

Aging patients in this study are the patients with their age equal to or more than 60 years.

4.2 Research Design

This is a historical cohort study by collecting the new cases of CAPD since January, 1993 to December, 1998.

4.3 Sample

4.3.1 Target population

Thai CAPD patients.

4.3.2 Sample population

All patients who started CAPD at Bhumibol Adulyadej Hospital since January 1993.

4.3.3 Inclusion criteria

All new cases of CAPD patients who began treatment since January 1993, in Nephrology unit, Medical Department, Bhumibol Adulyadej Hospital, Bangkok, Thailand.

4.3.4 Exclusion criteria

- (1) HIV positive
- (2) Systemic lupus erythromatosus (SLE)
- (3) Immunocompromised host or patient
receiving steroid treatment
- (4) Post kidney transplantation
- (5) Previous chronic hemodialysis
- (6) Post catheter removal from CAPD failure

Immunocompromised patients such as patients who received steroid, or who were HIV positive or SLE disease, or post transplantation were excluded because the immune mechanism that protect peritonitis will be interfered.

Patients with previous chronic hemodialysis and post catheter removal from CAPD failure were excluded because the patients were not in the same condition as new cases of CAPD.

4.3.5 Sample size calculation

Sample size in multiple regression analysis was calculated from the formula of Jacob Cohen, 1988 (55)

$$N = \frac{I (1 - R^2_{Y.B})}{R^2_{Y.B}}$$

I = non centrally parameter come from the formula

$$V = I - \frac{u - 1}{f^2}$$

u = number of independent variables = 10

v = degree of freedom

= 69 (Values from table of F test , give $\alpha = 0.01$, power 0.99 ,
and degree of freedom = 20) .

$R^2_{Y,B}$ = Coefficient of determination

Because the data of $R^2_{Y,B}$ cannot be found from the previous researches so the pilot study was performed. In the pilot study , the 15 patients were random selected from 1993. Multiple regression analysis was analyzed by SPSS for windows. $R^2_{Y,B}$ was 0.630. The calculated sample size was 40 cases.

4.4 Data Collection

All new CAPD patients who attended the program at Bhumibol Adulyadej Hospital from January 1993 were included in the study. The data were collected from the dialysis charts that were recorded by nephrology staff in the Nephrology Unit. Hospital charts were reviewed in cases who developed complications or changed to other treatment, or died. Patients who lost follow up or died, data were collected by interviewing the relatives.

4.5 Data Analysis

Independent variable	unit	type of data
Catheter infection	number	interval scale
Presence of DM	yes / no	nominal scale
Causes of ESRD	type	nominal scale
Age	year	interval scale

Educational level	1-4	ordinal scale
Hemoglobin level	gm / dl	interval scale
BUN level	mg / dl	interval scale
Albumin level	gm / dl	interval scale
Duration of CAPD	year	interval scale
Type of CAPD bags	type	nominal scale

Dependent variables	unit	type of data
Rate of peritonitis	episode per year	interval scale
Time to first peritonitis	year	interval scale
Survival time for patient	year	interval scale
Survival time for technique	year	interval scale

Catheter infection , causes of ESRD, the presence of DM, laboratory investigation , age, educational level, duration , and type of CAPD bags, and systems were analyzed by the multiple regression analysis, and logistic regression analysis. The rate of peritonitis was the main outcome. Time to first peritonitis episode was secondary outcome. Technique survival, and survival time were analyzed by Kaplan-Meier technique, and Log Rank Test. The statistical technique in comparison between groups were Chi-Square Test , Independent-Sample T-Test, and Mann-Whitney Test.

4.6 Ethical Considerations

Because this study is an observational study, so the ethical problem is not likely to occur.

4.7 Limitation

This study is a historical cohort study. Some data were collected from dialysis charts since January 1993, so there were some limitations. Firstly, some probable factors associated with the risk of peritonitis can not be studied because they were not recorded in the charts. Secondly, some data were incomplete recorded, especially in cases who lose followed up or died. Incomplete data from the cases that lose followed up may effect the survival analysis. Contact with the relatives to get more information and intention to treat analysis are the ways to minimize this problem.

4.8 Assumptions

All episodes of peritonitis were recorded correctly and completely. Definition and diagnosis of peritonitis were uniform throughout the study period.

4.9 Expected Benefit of the Study

This study will give some information and new knowledge in Thai CAPD patients. There was only one study on the risk of peritonitis in Thailand. Chan-O, and Sumethkul, found some factors that increased risk of peritonitis. However, many factors such as the presence of catheter infection, infection from S.aureus, type of CAPD bags and systems, duration of CAPD, and the survival analysis were not analyzed .

Catheter infection and peritonitis from S.aureus are the quite interesting issues. If catheter infection from S.aureus associates to the risk of peritonitis , or affects long term outcome. The further researches to prevent or get rid of this infection should be done. In this study , technique survival and survival analysis

are performed. The effects of DM, aging, and S.aureus infection to the survival will be analyzed. The knowledge from this study may help in making the policy in selection the CAPD cases in the future.

4.10 Obstacles

Uncompleted recorded data in the patients who lost follow up , and died in other hospitals will be the major obstacles. These data may affect the survival analysis. Contact with the relatives to get more information, and intention to treat analysis are the ways to minimize this problem.

4.11 Administration and Time Schedule

This study took about 9 months for data collection, two months for data analysis, one month for writing the thesis and one month for correction and preparation for final presentation. The study began from March, 1998 to April 1999.