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Original Research

# The Effectiveness of Roy's Adaptation Model for Patients with Chronic Kidney Disease Undergoing Pre-Dialysis in Indonesia

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## ABSTRACT

**Introduction:** Patients with chronic kidney disease (CKD) undergoing pre-dialysis requires a good self-management to control low protein intake and maintain kidney function. Adaptation to the existing stimulus through coping and adjustment mechanisms is important to maintaining good kidney function. However, few studies applied nursing theory based to guide intervention in helping the adaptation of patient CKD with their condition. The purpose of this study is to evaluate the effectiveness of Roy's adaptation model towards physiological and psychological adaptation response among patients with CKD undergoing pre-dialysis.

**Methods:** This study was conducted using a quasi-experiment to patients with CKD pre-dialysis, age over 18 years old. We modified Roy's adaptation model for patients with CKD undergoing pre-dialysis.

**Results:** A total of 70 subjects agreed to join the study, 38 subjects in intervention and 32 subjects in the control group. The mean of eGFR ranged from 26.3 to 26.6 mL/min/1.73 m2. We found that Roy's adaptation model has significantly improved drinking behavior, reduce protein intake, blood creatinine, and psychosocial adaptation response after the intervention.

**Conclusion:** These study findings suggested that Roy's adaptation model is effective to help patients with CKD undergoing pre-dialysis improve their behavior and maintain kidneyfunction . Model dissemination, advocacy to related units, and application in nursing care in patients with chronic kidney disease pre-dialysis are necessary.

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chronic kidney disease; pre-dialysis; physiological adaptation response; psychological adaptation behavior; Roy's adaptation model

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## INTRODUCTION

Chronic Kidney Disease (CKD) is defined as kidney damage over three months with glomerulus filtration rate (GFR) less than 60 ml/minute/1.73 m2 that consists of five stages (Black and Hawk, 2005; Wein, Kanvoussi, Novick, Partin, Peters, 2007; Thomas, 2008). Patients with CKD recommend to perform hemodialysis if they are in stage 5 and pre-dialysis for those in stage 3 or 4 (KDOQI Guidelines, 2000; Wein, Kanvoussi, Novick, Partin and Peters, 2007; Daugirdas, Blake and Ing, 2007; Ignatavicius, 2010). According to the data from Indonesian Nephrology Association in 2011, it's estimated about 25 million Indonesian people had an impairment of kidney function. The Indonesian Hospital Association (PERSI) reported that 500 per one million people diagnosed with chronic kidney disease and 60% of them were adults and older age. Furthermore, according to the Indonesian National Health Insurance data, around 70,000 patients with kidney disease required a dialysis, only 12,804 of them already perform a hemodialysis, and above 30,000 patients is recommended to do pre-dialysis.

Roy's Adaptation model is one of the nursing theories focused on human adaptation based onstimulus from the internal and external environment. It is involved a processed that regulate by subsystem and cognitive as an adaptive system, in the form of physiology function, self-concept, role function, and interdependence (Roy, 1991; Tomey and Alligood, 2006, Meleis, 2007). Roy considers the

patient has adaptability in overcoming the problem, as a living system, open, and able to adjust. The adjustment made due to changes in elements, substances or materials contained in the environment. As a system, human beings are a unity, will get input from the inside and outside environment, namely focal, contextual and residual stimuli (Roy, 1991; Tomey and Alligood, 2006; Meleis, 2007). The role of nurses based on Roy's theory is required to assess the adaptability of patients and help them adapt with changes due to the disease and its consequences (Roy, 1991; Tomey and Alligood, 2006).

Previous studies have reported that Roy's adaptation model can be used as a research framework to improve human behavior adaptation. A review of ten studies evaluated Roy's adaptation model as a research framework in various research designs suggested that this model was effective to explore the human adaptation (Sosha and Al Kaladeh, 2012). Rogers and Keller (2010) applied Roy's adaptation model to develop physical activities program and showed improvement in the adaptation of physical strength and endurance. Furthermore, Roy's adaptation model used as a framework for developing intervention programs in patients performed intravenous catheter insertion found a positive adaptation response (Wendler, 2002). Among patients with CKD undergoing hemodialysis, Roy's adaptation model used to develop health education program and showed a significant result in the improvement of physiological and role functions (Afrasiabifar, Karimi, and Hassani, 2013).

Patients with CKD undergoing pre-dialysis requires good self-management to control low protein intake and maintain their kidney function (Kresnawan & Maskun, 2012; Hase, 2012; Branson, 2007). They are required to have the ability to adapt change, to the situation or negative stimulus to maintain the function of the kidney. A study conducted by Fougue (2007) found that well-controlled protein intake can reduce the mortality rate and delayed initiation of dialysis up to 40%. Maintaining good kidney function can be done by adapting to the existing stimulus through coping and adjustment mechanisms. However, few studies applied nursing theory to guide intervention to help patients with CKD undergoing pre-dialysis to adjust their condition. The purpose of this study was to evaluate the effectiveness of the developed Roy's adaptation model for improving physiological and psychological adaptation response.

## MATERIALS AND METHODS

This study was conducted using quasi-exsperimental, pre - post test design with the control group. Three referral hospitals in Indonesia were used to develop intervention and measure outcome from June to December 2016. The outcome measures were assessed at baseline (pre-test), after intervention (post-test), and one month follow up. The inclusion criteria were patients diagnosed with CKD undergoing pre-dialysis phase II and IV, conscious, without severe complication, and able to speak without cognitive and mentally disordered. A consecutive sampling was applied to select participants. A total of 70 patients with CKD pre-dialysis were recruited, 38 in the intervention group and 32 in the control group.

The intervention was modified according to Roy's adaptation theory for patients with CKD undergoing pre-dialysis developed by the author (Agustiyowati et al, 2017). This intervention focus on providing comprehensive health education program which consists of seven steps (Figure 1). The first step is to identify potential stimulus, including physical, psychological, and social, then created a goal setting together with the patients. The second step is a health education program to improve coping mechanism by understanding the disease, how to maintain health condition, and importance of a routine check-up and adherence to medication. The third step is focused on improving physiological adaptation behavior by providing health education related to food, diet, drinking pattern, urinate pattern, itchy management, and activities daily living. The fourth step is managed behavior adaptation of self-concept. The Fifth step is to improve the behavior adaptation of role function. The sixth step is to improve interdependence adaptation behavior. The last step is to create and improve a family support for the patients.

Health education was performed for the patients and family in three sections, eight days for each

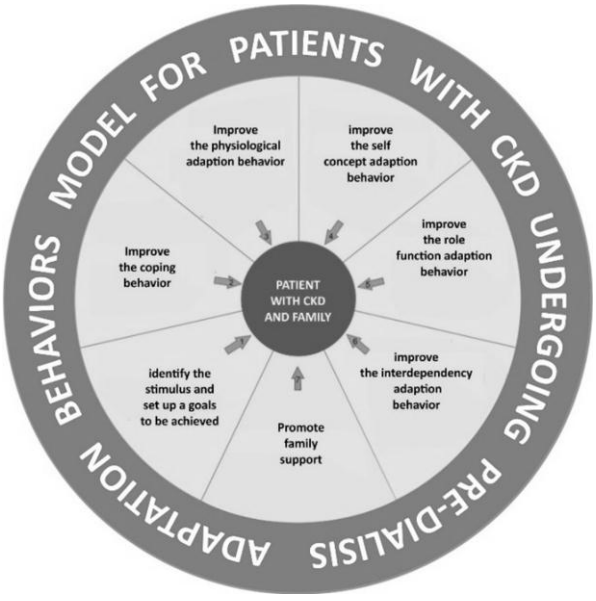


Figure 1. The developed Roy's adaptation behavior model for patients with CKD undergoing pre-dialysis

Table 1. Demographic and clinical characteristics of patients with chronic kidney disease undergoing pre-dialysis (n=70)

| Variable | Intervention | | Control | | p value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Gender | | | | | |
| Male | 26 | 68.4 | 17 | 53.1 | 0.193 |
| Female | 12 | 31.6 | 15 | 46.9 | |
| Education | | | | | |
| Not finished | 1 | 2.6 | 2 | 6.3 | 0.851 |
| Elementary school | 10 | 26.3 | 6 | 18.8 | |
| Junior high school | 6 | 15.8 | 7 | 21.9 | |
| Senior high school | 12 | 31.6 | 6 | 18.8 | |
| Diploma III/Bachelor | 9 | 23.7 | 11 | 34.4 | |
| Employment | | | | | |
| Government officer | 2 | 5.3 | 1 | 3.1 | 0.278 |
| Business | 3 | 7.9 | 3 | 9.4 | |
| Private officer | 6 | 15.8 | 1 | 3.1 | |
| Retired | 13 | 34.2 | 14 | 43.8 | |
| Unemployed | 6 | 15.8 | 7 | 21.9 | |
| Housework | 8 | 21.1 | 6 | 18.8 | |
| Health coverage | | | | | |
| National health insurance | 34 | 89.5 | 29 | 90.6 | 0.856 |
| Company coverage | - | - | 1 | 6.3 | |
| Private insurance | 2 | 5.3 | 2 | 3.1 | |
| Non-insurance | 2 | 5.3 | - | - | |
| | Mean | SD | Mean | SD | |
| Age (years) | 60.1 | 14.8 | 65.2 | 11.1 | 0.111 |
| eGFR (ml/minute/1.73 m2) | 26.3 | 12.7 | 25.6 | 13.1 | 0.710 |
| Protein intake (gram) | 39.7 | 13.6 | 31.1 | 11.4 | 0.176 |
| Creatinine (Umol/L) | 2.9 | 1.3 | 2.8 | 1.1 | 0.704 |

Table 2. The effectiveness of Roy's adaptation behaviour for patients with chronic kidney disease undergoing pre-dialysis on physiological adaptation response (n=70)

| | Intervention (n=38) | | control (n=32) | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Protein intake | | | | | |
| Pre-test | 39.7 | 13.6 | 31.1 | 11.4 | 0.006 |
| Post-test 1 | 34.8 | 11.3 | 35.1 | 9.8 | 0.932 |
| Post-test 2 | 38.6 | 4.1 | 39.5 | 12.4 | 0.705 |
| Creatinine | | | | | |
| Pre-test | 2.9 | 1.3 | 2.8 | 1.1 | 0.693 |
| Post-test 1 | 2.6 | 1.3 | 2.4 | 1.5 | 0.423 |
| Post-test 2 | 2.5 | 1.2 | 3.2 | 1.3 | 0.036 |
| Ineffective of fluid intake (%) | | | | | |
| Pre-test | 37 | 97.4 | 32 | 100 | 0.543 |
| Post-test 1 | 36 | 94.7 | 32 | 100 | 0.056 |
| Post-test 2 | 1 | 2.6 | 30 | 93.7 | 0.001 |

Table 3. The effectiveness of Roy's adaptation behaviour for patients with chronic kidney disease undergoing pre-dialysis on psychological adaptation response (n=70)

| | Intervention (n=38) | | Control (n=32) | | p value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Self-concept | | | | | |
| Pre-test | 41.7 | 6.2 | 44.6 | 6.2 | 0.058 |
| Post-test 1 | 47.7 | 4.6 | 45.5 | 6.9 | 0.162 |
| Post-test 2 | 53.3 | 3.1 | 45.5 | 6.9 | <0.001 |
| Role Function | | | | | |
| Pre-test | 20.6 | 3.6 | 22.2 | 3.3 | 0.059 |
| Post-test 1 | 22.6 | 3.8 | 21.5 | 3.5 | 0.212 |
| Post-test 2 | 25.8 | 2.9 | 21.5 | 3.5 | <0.001 |
| Interdependency | | | | | |
| Pre-test | 16.9 | 3.7 | 17.5 | 3.1 | 0.489 |
| Post-test 1 | 17.4 | 3.1 | 16.6 | 3.5 | 0.317 |
| Post-test 2 | 20.0 | 2.3 | 16.6 | 3.5 | <0.001 |

section, and 80 minutes to 120 minutes per days. We provide a book of the adaptive behavior for patients with CKD undergoing pre-dialysis that consists of a workbook for nurses, learning materials for nurses and booklets for patients and families.

The demographic information was collected on enrolment: this information included age, gender, level of education, employment, and health coverage. The primary outcome of this study was the physiological and psychological adaptation response. The secondary outcome was knowledge and attitude chronic kidney disease pre-dialysis

Physiological adaptation response. The outcome measures of physiological adaptation response are protein intake, drinking pattern, and blood creatinine. Laboratory data were exctracted from medical records including, blood creatinine, blood urea, and eGFR. We also recorded 24 hours urine. In addition, patients required to fill out the sheet of food recalls to record 24 hour fluid, calories, and protein intake. To illustrate the amount of food intake using the household size that later converted to gram unit.

Psychosocial adaptation response questionnaire. The questionnaire was used to measure the behavior of psychosocial adaptation of patients with chronic kidney disease pre dialysis including a behavioral adaptation of self-concept, role function, and interdependence. This instrument was modified from the instrument of nursing assessment and intervention for adult hemodialysis patient: application of Roy's adaptation model developed by Keen, et al. (1998). A total of 27 items covered a 14 question about the self-concept, seven questions for role function, and six items questions for interdependency adaptation. The questionnaire is a Likert scale from 1 to 4, one means never, and four is always. The total score for self-concept, role function, and interdependency adaptation ranged from 13 to 56, 7 to 28, and 6 to 24, respectively. The higher score reflected high or good adaptation behavior. Item correlation ranged from 0.371 to 0. 680, and the Cronbach alpha in the present study ranged from 0.673 0.729.

This research has been approved by the Ethics Committee of the Faculty of Nursing, Universitas Indonesia (0342/UN2.F12.D/HKP.02.04/2015). Respondents who were willing and meeting inclusion criteria were given a pre-test as baseline data, post-test, and one month follows up. Researcher and research assistant conducted an intervention and divided into three sections. The first section was an 80 minutes discussion to identify stimulus or stressor, established the goals to be achieved, and improves the coping mechanism. The second section was 120 minutes health education program focused on improving the adaptation behavior of physiology, self-concept, role function and interdependence and improve family support. The last section was evaluation and reviewed the educational materials.

The comparation of characteristics and clinical variables in patients with CKD between intervention and control groups were determined using the chi squared and independent t test. The Paired t-test was used to test the mean different out the outcome interest before and after the intervention. A general linear model with repeated measure was used to evaluate the effectiveness of the intervention after controlling the confounding factors. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.00 for Windows.

## RESULTS

### Demographic and clinical characteristic of patients with CKD undergoing pre-dialysis

The majority of the subjects were male (68.4%) in the intervention group and 53.1% in the control group (Table 1). The mean age of the two groups were 60.1 (SD=2.35) and 65.2 (SD=3.57), respectively. Above 15% of the subjects were graduated from senior high school and almost half of the subjects were retired with over 90% covered by the national health insurance. The mean of eGFR for the intervention groups was 26.3 (SD=12.7), 39.7 (SD=13.6) for protein intake, and 2.9 (SD=1.3) for creatinine. There were no significant differences between intervention and control group in term of a demographic characteristic, eGFR, protein intake, and creatinine.

### Effectiveness the behavior adaptation model to the outcome interest among patients CKD undergoing pre-dialysis

The creatinine was reduced significantly from 2.9 (SD=1.3) before intervention to 2.5 (SD=1.2) after one month follow up (p value=0.036) (Table 2). The proportion of patients who has ineffectiveness of fluid intake was decreased significantly among intervention group before and after intervention group (97.4% at baseline to 2.6% after one month follow up) compared to control group (100% at baseline to 93.7% after one month follow up). Although protein intake did not show statistically significant, it's decreased from 39.7 to 38.6 at one month follow up compared to a control group that showed an increase in protein intake at follow up time.

Table 3 showed the effectiveness of Roy's adaptation behavior model of psychological adaptive response, including self-concept, role function, and interdependence among patients CKD undergoing pre-dialysis. In the intervention group, the mean score of self-concept was increased significantly from 41.8 (SD=6.2) in pre-test to 53.4 (SD=3.1) at follow up (p<0.001).The mean score of role function and interdependency was improved in the intervention group after intervention from 20.6 (SD=3.6) to 25.8 (SD=2.9) and 16.9 (SD=3.7) to 20.0, respectively.

## DISCUSSION

We found that Roy's adaptation model was effective to improve fluid intake and creatinine among patients with chronic kidney disease (CKD) undergoing pre-dialysis. Patient adherence to fluid intake is crucial for maintain kidney function (Pang & Chang, 2001). If they are non-adherence to fluid intake restriction, can lead to a greater risk of complications such as cardiovascular diseases and hypertension (Barnett, Yoong, Pinikahana, Si-Yen, 2007). Our health education program was designed to not only provide the information regarding how much the appropriate fluid for the patient with CKD undergoing pre-dialysis. A Pprevious study suggested that education should also be accompanied by encouragement and support so that patients are willing to adhere on the restriction of fluid intake (Barnett, Yoong, Pinikahana, Si-Yen (2007). Therefore, health education guided by Roy's adaptation model is important to develop in a routine clinic setting to improve patient's outcome.

Roy's adaptation model for patients with chronic kidney undergoing pre-dialysis was significantly effective to improve psychological adaptation behavior, including self-concept, role function, and interdependency. Self-concept refers to an understanding of how the individual views or judges his own personality as it really is. The process of forming self-concept is considered as a major asset and the main determinant of individual behavior. Mental health problems, such as depression, loss of hope, demoralization, fear, anxiety, and stress were very common in patients with CKD (Clarke., Kissane., Trauer., Smith. 2005; Cukor., Cohen , Peterson, Kimmel, 2007). Therefore, effective stress management and utilizing social support is essential to assist patients having good self-management (Novak., Constantini., Schneider., Beanlands, 2013).

The role function is to recognize as the patterns of one's social interactions in relation to others, reflected in the primary, secondary and tertiary roles. The focus is on how one can act in society according to his position. Chronic kidney disease is a condition that requires a treatment which are time-consuming, high demanding, and even difficult for some patients and their families. These conditions have psychosocial consequences such as isolation from social life, career and occupational disruptions, lifestyle restrictions, decreased independence, declined expectations to meet long-term life goals (White, McDonnell, 2014). Several studies from other countries highlight that patients with CKD unable to continue their work due to their physical condition (Van Manen, et al., 2001, Ekelund, et al. 2007 in White, McDonnell, 2014). This limitation can lead to economic difficulties, thus the role of self-management is very important to overcome the psychosocial constraints of the patients (Novak, M., Constantini., Schneider., Beanlands, 2013).

The proportion of patients with CKD undergoing pre-dialysis showed improvement in the interdependency from 70.41 in pre-test to 83.30% after one month follow up. This research proves that Roy's adaptation behavior model developed for patients with CKD undergoing pre-dialysis is effective on interdependence adaptation behavior. Interdependence is the balance between dependence and independence in receiving something for theirself. Interdependence adaptation behavior focuses on relationships with others (individuals and groups) and the ability to give love, appreciation, values, guidance, knowledge, skills, commitments, possessions, time and talents (Roy & Heather 1991, Roy & Andrew, 1991 in Tomey & Alligood, 2006; Roy, 2009).

## CONCLUSION

Roy's adaptation model developed for patients with CKD undergoing pre-dialysis was an effective model to improve physiological, especially fluid intake and creatinine level, and psychological adaptation response including self-concept, role function, and interdependency. This model can be applied in a clinical setting to guide nurse providing health education for patients with CKD undergoing pre-dialysis. Future study to test using rigorous methods and long-term follow up is warranted.

## REFERENCES


Agustiyowati, T.H.R., Sitorus, R., Waluyo, A. and Besral, B. (2017) *Efektifitas Model Perilaku Adaptasi Pasien Penyakit Ginjal Predialisis, Dissertation*, Universitas Indonesia

Bodenheimer, T., Lorig, K., Holman, H., & Grumbach, K. (2002). Patient self-management of chronic disease in primary care. *JANA*, (288), 2460–2475.

Branson M. (2007). *Pre dialysis CKD patient education*. Renal Business Today May 2007 Well Bound 401 Castro Street

Chen, S., Tsai, Y., Sun, C., Wu, T., & Lee, C. (2011). The impact of self management support on the progression of chronic kidney disease- a prospective randomized controlled trial. *Nephrol Dial Transplant*, 26, 3560–3566.

Clarke, D., Kissane, D., Trauer, T., & Smith, G. (2005). Demoralitation, anhedonia and grief in patients with severe physical illness. *Word Psychiatry*, 4, 96–105.

Cukor, D., Cohen, S., Peterson, R., & Kimmel, P. (2007). Psychological aspects of chronic disease: ESRD as paradigmatic illness. *J Am Soc Nephrol*, 18, 3042–3055.

Daugirdas, john t, Blake, peter g, & Ing, todd s. (2015). *Handbook of dialysis fifth edition*.

Devins, G., Mendelssohn, D., & Yitzchak, M. (2003). Predialysis psychoeducational intervention extends survival in CKD: A 20 year follow up. *American Jornal of Kidney Disease*, 42(4), 693–703.

Feehally, J., & Khosravi, M. (2015). *Effects of acute and chronic hypohydration on kidney health and functio*n. Oxford University Press on Behalf of

International Life Sciences Institute, 73(52), 110–119.

Finkelstein, F., Story, K., & Firank, C. (2008). Perceived knowledge among patients cared for by nephrologis about chronic kidneys disease and stage renal disease therapies. *Kidney Inc*, 74, 1178–1184.

Fisher, E., Thorpe, C., DeVilles, B., & Devilles, R. (2007). Healthy coping, negative emotions, and diabetes management : a systematic review and appraisal. *Diabetes Educ*, 33, 1080–1103.

Fougue, D., & Aparicio, M. (2007). Eleven reason to control the protein intake of patients with chronic kidney disease. *Natur Clin Practice Nephrol*, 3(7), 383–92.

Hase. (2012). Chonic kidney disease management: the action plan. *Medicine Update* Vol 22

Ignatavicius, D., & Workman, M. (2010). *Medical-surgical nursing: patient-centered collaborative care (6th ed.).* St. Louis Misouri: Saunders Elsevier.

Keen et al. (1998). Nursing assessment and intervention for adult hemodialysis patients: application of Roy's adaptation model. *Nephrology nursing Journal. ANNA Journal* 25(3), 311-319

Kidney Disease Outcome Quality Initiative (K/DOQI). (2000). Guidelines to chronic kidney disease. *American Journal of Kidney Disease*, 35(6)

Kidney Disease Outcome Quality Initiative (K/DOQI). (2000). *Guidelines nutrition to chronic kidney disease.* 3 Desember 2012. www.kidney.org/professionals/kdoqi/pdf/KDOQI2000

Kresnawan T, Markun MHS. *Diet rendah protein dan penggunaan protein nabati pada penyakit ginjal kronik*. Instalasi Gizi dan Divisi Ginjal Hipertensi RSCM Jakarta

Lai, SE et al. (2015). Effect of pertsonalized dietary intervention on nutritional, metabolic and vascular indices in patients with chronic kidney disease. *Europian Review for Medical and Pharmacological Sciences*. 19, 3351- 3359

Leddy, S., & Pepper, J. (1993). *Conceptual bases of professional nursing (3rd ed.).* Philadelphia: Lippincott.

Lendray, MJ et al. (2010). Prediction of esrd and death among people with ckd: the chronic renal impairmant in Birmingham. *AMJ Kidney Disease*. 56(6-2), 1082-1094

Lopez-Vargas, P et al. (2014). Knowledge deficit of patients with stage 1-4: a focus group study. *Asian pasific Sociaty Nephrology*. 19, 234-243

National Kidney Foundation (NKF). (2000). Clinical guideline for chronic kidney disease outcome: Evaluation, classification, and stratification kidney disease outcome quality initiative. *AMJ Kidney Dis*. 39(1)

Novak, M., Constantini, L., Schneider, S., & Beanlands, H. (2013*). Patient education in chronic kidney disease and dialysis*. Seminars in Dialysis, 26(2), 188–194.

Nygardh, A., Malm, D., Wikby, K., & Ahlstrom, G. (2012). Empowerment intervention in outpatient care of persons with chronic kidney disease pre-dialysis. *Nephrology Nursing Journal*, 39(4), 285–294.

Orlando, L., Owen, W., & DB, M. (2007). Relationship beetwen Nephrologist care and progession of ckd. *NC Med Journal*, 68(1), 9–16.

Pernefri. (2011). *Report of Indonesia renal registry*.

Polsingchan, S. (2010). *Promoting behaviors in thai persons with chronic renal failure*. University of Texas.

Price, S.,A &Wilson L.,M. (2000). *Patofisiologi konsep klinis proses-proses penyakit*. edisi 4. Jakarta: EGC

Roy, S. (2009). *The Roy Adaptation model (3rd ed.)*. New Jersey: Pearson Education Inc.

Roy, S., & Heather, A. (1991). *The Roy Adaptation model – The definitive statement*. USA: Appleton & Lange.

Sacher, R., Mc.Pherson, & Richard, A. (2002). *Tinjauan Klinis Hasil Pemeriksaan Laboratorium*. Jakarta: EGC.

Tomey, AM., & Alligood, MR. (2006). *Nursing theorists and their work*. (6th ed). St. Louis, Missouri: Mosby Elsevier

Tong, A., Sathsburg, P., & Chadbon, S. (2009). Patients experiences and perspectives of living with CKD. *Am J Kidney*, 53, 689–700.

Tsai, Y et al. (2013). Is fluid overload more important than diabetes in renal progression in late chronic kidney disease. *Plos One* 8 (12), 1-7

Tucker, B., Fabbian, F., & Giles, M. (1997). Left ventricular hyperthropy and ambulatory bllod prssure monitoring in chronic renal failure. *Nephrology Dialysis Transplantation*, 12, 724–728.

Walker, R., Mark, R., Marshall, & Polascheck, N. (2013). Improving self-management in chronic kidney disease: a pilot study. *Renal Society of Australasia Journal*, 9(3), 116–125.

Wein, Kanvoussi, Novick, Partin, & Peters. (2007). *Campbell-walsh urology (9th ed.).* Philadelphia: Saunders Elsevier.

White, C., & McDonnell, H. (2014). Psychosocial distress in patients with end stage kidney disease. *Journal of Renal Care*, 40(1), 74–81.