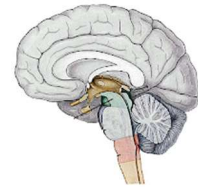


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# EFFECTIVENESS OF USE DIALYZER REUSE ON UREA REDUCTION RATIO IN HEMODIALYSIS PATIENTS AT KARSA HUSADA BATU HOSPITAL

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**ABSTRACT**

Chronic Kidney Disease (CKD) is an end-stage disease of the kidneys, the causes are multiple, can cause to uremia and cannot be renewed. Hemodialysis is a therapy for renal kidney disease. One of the appraisal adequacy of hemodialysis therapy is to use the URR (Urea Reduction Ratio) that assessment by measuring urea before and after hemodialysis therapy. Hemodialysis therapy uses a dialyser that can be used repeatedly in the same patient. The use of dialysers at Karsa Husada Batu Hospital can be used up to 7 times reuse. The research objective was to determine the effectiveness of using a reuse dialyzer to URR. This research design uses comparative descriptive appraisal is a difference between reuse to 1,3,5,7 and using a cross-sectional approach. Sampling using purposive sampling with a sample size of 26 respondents. The different test was used Kruskal Wallis by assessing the URR at the dialyzer in 1,3,5,7 reuse. Significance of 0.802 ( $p > 0.05$ ) was obtained, which means that there is no significant difference in the URR value of chronic renal disease patients with hemodialysis therapy using dialyzer reuse to 1,3,5,7. For the URR assessment, it has decreased and increased but is still in normal limits. The dialyzer reuse up to seven can still be said to be effective in accordance with the guidelines for the management of End-Stage Renal Disease. It is hoped that there will be studies investigating the factors that affect the total volume dilation of dialyser reuse.

**INTRODUCTION**

Chronic Kidney Disease (CKD) in Indonesia is increasing. According to the Indonesian Renal Registry, the prevalence of patients with Chronic Kidney in 2018 saw a 2-fold increase in new patients compared to 2017, which was 30,831 to 66,433 patients. In East Java, the increase in the number of new CKD patients also almost doubled from 2017 which was 4,828 to 9,607 patients (Indonesian, Registry, & Course, 2018) (Indonesian et al., 2017). Chronic Kidney Disease (CKD) is an end-stage kidney disease and the causes are very diverse, where its function cannot function properly so it cannot maintain fluid and electrolyte balance and can also cause uremia and cannot be renewed (Setiasti et al., 2014). The most common causes of kidney are hypertensive kidney disease, diabetic nephropathy, obstructive nephropathy, glomerulonephritis chronic (GNC), pyelonephritis chronic (PNC), uric acid nephropathy, polycystic kidney, systemic lupus erythematosus (SLE) (Indonesian et al., 2018), infectious disease (Diane C. Baughman, 2000).

Hemodialysis is one of the therapeutic mechanisms for CKD which aims to remove uremic toxins, regulate fluid electrolyte and acid-base balance (Tjokropawiro, 2015). Semipermeable membrane or dialyser is a device used to filter blood or can be referred to as a kidney substitute, which consists of a blood compartment and a dialysate compartment (flux) (Tjokropawiro, 2015). Dialysers can be reused

or commonly referred to as dialyzer reuse but are only used by the same patient (Argyropoulos et al., 2015) (Tjokroprawiro, 2015). The use of reuse itself has the advantage of reducing costs for hospitals, besides the use of dialyzer reuse can reduce the incidence of first use syndrome (Dhrolia, Nasir, Imtiaz, & Ahmad, 2014). PERNEFRI Decree no 310/PB PERNEFRI/X/2016 explains that dialyzer reuse can be used or recommended 7 times. However, the number of times the number of times used for dialing reuse still needs to be reviewed because the results of the study show that the use of the 4th dialer reuse has reduced the Urea Reduction Rate (URR) <65% (Mittal, Singh, Yadav, & U. V., 2018). Meanwhile, Argyropoulos et al., (2015) stated that minimal reuse was only done <6 times.

Hemodialysis therapy must be evaluated for its adequacy which is called adequacy of hemodialysis. Hemodialysis adequacy can be measured using URR (Urea Reduction Ratio) if 65% can be given 3 times a week for 4 hours, while for URR 80% can be given a dose 2 times a week with a range of 4-5 hours hemodialysis therapy (Tuominen et al., 2001). In the results of the research conducted, it was found that the URR of patients undergoing hemodialysis using dialyzer reuse decreased <65% (Mittal et al., 2018), but in a study in Bandung on the 7th dialyser, the URR value was still >65% (Wantoro & Boyoh, 2017). Meanwhile, in the Decree of the Minister of Health of the Republic of Indonesia regarding the National Guidelines for Medical Services for the Management of End Stage Kidney Disease NO HK. 01.07/MENKES /642/2017 recommends that dialysis adequacy can be assessed in two ways. The most frequently used methods are Kt/V and Urea Reduction Rate (URR). Kt/V itself is the urea dialyser clearance (K) times the length of the dialysis session (t, in minutes) divided by the volume of distribution of urea (V, in ml). The desired target Kt/V is 1.4 equivalent to 70% URR (3x HD per week) and 1.8 equivalent to 80% URR (2x HD per week). HD 10-12 hours in 2-3 sessions per week HD. The preliminary study at Karsa Husada Hospital in the hemodialysis room used a reused dialyzer 7 times.

## METHODS

This study uses an analysis of the Urea Reduction Ratio (URR) assessment using a quantitative comparative design. The use of cross sectional was chosen because with this design the researcher wanted to see the difference in URR of CKD patients undergoing hemodialysis therapy using a dialyzer reuse to 1,3,5,7 at Karsa Husada Batu Hospital. So the researchers examined respondents who used dialyzer reuse ranging from 1,3,5,7.

The sample used was 26 and the sampling technique in this study used non-probability sampling. This research uses purposive sampling. This technique was chosen because only respondents who use dialyzer reuse to 1,3,5,7, while those who use a dialyser less than 7 times are not used as research samples. Inclusion criteria, willing to be respondents, patients who use dialyzer reuse to 1,3,5,7, patients aged 15-65 years and over, undergoing regular scheduled hemodialysis. Exclusion criteria, patients with hepatitis C, cyto HD patients, patients with dialyzer reuse less than 7 times. The independent variable is the use of dialyzer reuse to 1,3,5,7. While the dependent is the URR from the use of dialyzer reuse to 1,3,5,7.

The instrument used is urea which has been measured using a urea level measuring instrument for pre and post hemodialysis patients using a dialyzer reuse to 1,3,5,7 using the Sysmex BX-3010 instrument, which was carried out by the laboratory of Karsa Husada Batu Hospital. Data collection was carried out by researchers after receiving a letter of ethics from the KEPK ethics team at Karsa Husada Batu Hospital. The researcher gave an explanation to the respondent and the respondent gave consent to become a respondent after signing the consent letter. After that, blood samples were taken to check urea

pre and post hemodialysis on respondents who used dialyzer reuse to 1,3,5,7. The results were analyzed by coding, scoring from respondents, dialyzer reuse to 1,3,5,7 and the results of urea and URR pre hemodialysis and post hemodialysis. The data is presented in the form of a graph.

## RESULTS AND DISCUSSION

Research was conducted on the campus of the institute of health and science technology (itsk) rs dr. Soepraen kesdam v. The results of the study are presented in the following table:

Table 1 Characteristics of Respondents

Characteristics of Respondents	F	%
Gender		
Man	49	21.3%
Woman	180	78.3%
Total	229	100%
Get information		
Once	18	7.9%
No	211	92.1%
Total	229	100

*Source: Researcher Primary Data*

Based on table 1.1, it is found that the number of respondents is 229 with almost all (78.3%) being women and almost all (92.1%) having never received information.

Table 2 Pretest dan Posttest Result

	N	N. Min	N. Max	mean	Wilcoxon
Pretest	229	0	80	43.41	p = 0.000
Posttest	229	33	95	77.24	
Valid	229				

*Source: Researcher Primary Data*

Based on the table above, the average pretest result is 43.41 and the posttest average is 77.24 with an average difference of + 33.81 and the result of  $p = 0.000 (<0.05)$ , which means  $H_0$  is rejected and  $H_1$  is accepted, namely BLS training effectively improve knowledge of the management of cardiac arrest.

Chronic Kidney Disease is an end kidney and its causes are very diverse, where function experience drop so that no could maintain balance fluid (Setiasti et al., 2014).

## Characteristics respondents at Installation Hemodialysis at Karsa Husada Batu Hospital.

## 1. Gender

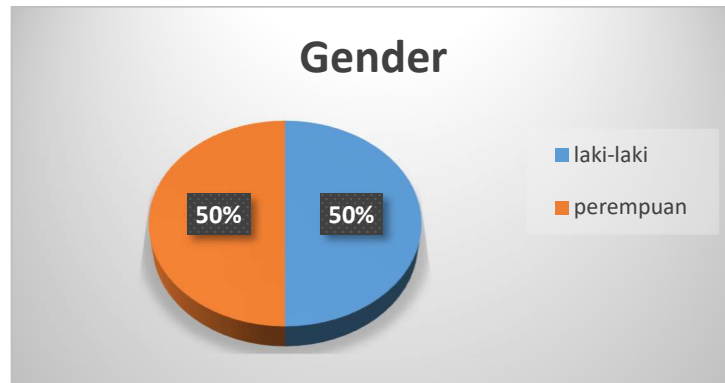


Figure 1. Gender

Based on results analysis descriptive is known that total respondent as many as 26 people consisting of of 13 people (50%) male and 13 people (50%) female.

## 2. Age

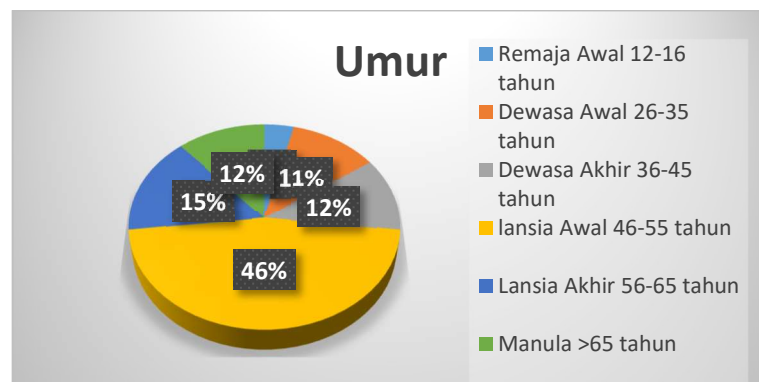


Figure 2. Age

Based on results analysis descriptive, known that respondent with total the most is respondent 46-55 years old 12 people or by 46.15%.

## 3. Vascular Access



Figure 3. Vascular Access Respondent.

Based on results analysis descriptive obtained results that as many as 20 people or by 76.9% of respondents is respondent with AV Shunt access.

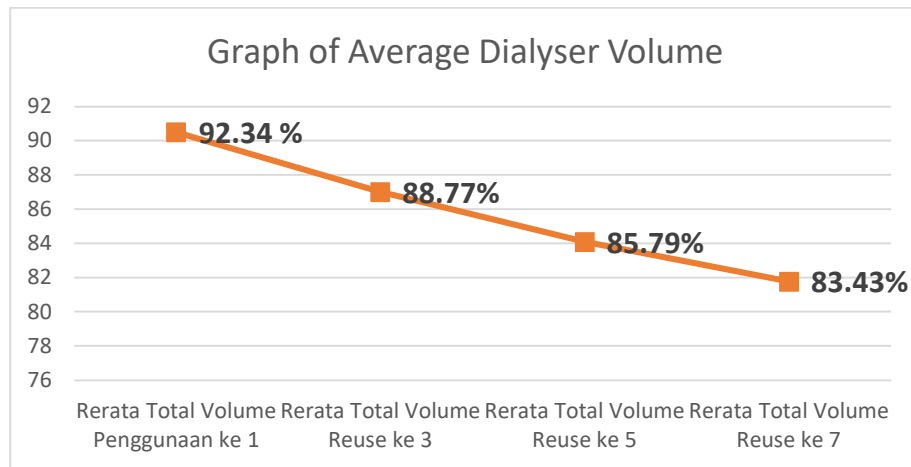
**Special Data Respondent****Total Dialyser Volume**

Figure 4. Total Dialyser Reuse Volume

Based on results analysis by descriptive, can be seen that the total volume on dialyzer usage to 1,3,5 and 7 continues experience decline.

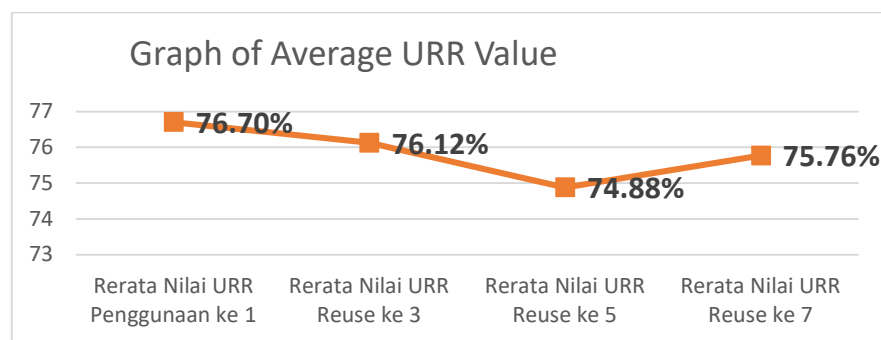
**URR value**

Figure 5. Response URR Value

Based on results analysis by descriptive, can be seen that there is drop mark *URR* on dialyzer reuse to 5 but experience enhancement back to dialyzer reuse 7.

Table 3 Kruskal Wallis Test Results

KRUSKAL WALLIS TEST	
<i>p value</i>	0.802
Test Decision	no significant difference ( $p > 0.05$ )

The results of the analysis using the Kruskal Wallis test, obtained a significance result of 0.802 ( $p > 0.05$ ), which means that there is no significant difference in the URR value of CKD patients with hemodialysis therapy using dialyzer reuse to 1,3,5,7 at the Karsa Husada Batu Hospital.

In this study, 13 male and 13 female respondents were found. This is obtained based on the number of respondents who use dialyzer reuse up to 7x. so that the respondents are very homogeneous because they have the same proportions between men and women. This study found that the youngest age is between 12-16 years and the oldest is more than 65 years old, while at the age of 46-55 years as many as 12 respondents (46.2%). This is in accordance with the reporting of the Indonesian Renal Registry where the number of patients undergoing hemodialysis therapy aged 46-55 is 30.31% (Indonesian et al.,

2018). The results of the Riskesdas stated that those aged >50 years had a high risk of suffering from kidney disease. Meanwhile, according to the results of Riskesdas in 2018, the most ages who received hemodialysis therapy were between 55-64 years old as much as 26.45% (Riskesdas, 2019). The average age of the respondents was >40 years old. This is because the production of the hormone testosterone and androgens in men has decreased. Likewise, the hormones estrogen and progesterone in women will also decrease up to >35%, this process occurs progressively until in the end it is not produced at all. So that women experience a period of menopause while men experience an andropause at this time the body will experience a decline, including the kidneys (Dickson, Buck, & Riegel, 2013).

The use of access in hemodialysis is very mandatory. Vascular access that can be used include AV shunt, AVG (Arteriovenous Graf) and CVC (Central Venous Catheter). In this study, 76.9% used vascular access with AV Shunt. Installation of an AV shunt is an SOP for hemodialysis at Karsa Husada Batu General Hospital after the patient was diagnosed with CKD to get CVC temporary vascular access first. After that, patients who received routine hemodialysis therapy were recommended to install an AV shunt. In the decision of the Ministry of Health, it was recommended to install permanent vascular access to be used as access in hemodialysis therapy (Sumiahadi et al., 2017).

#### **Identification the value of URR (Urea Reduction Ratio) in in Hemodialysis Patients with Dialyzer Reuse to 1,3,5,7**

One of the factors that can affect the adequacy (adequacy) in patients with hemodialysis therapy is URR (Urea Reduction Ratio). Where this is done using urea assessment before and after hemodialysis therapy (Barzegar, Moosazadeh, Jafari, & Esmacili, 2016) (Sumiahadi et al., 2017). The results showed that the highest URR was 76.7% while the lowest was 74.8% with 10 hour hemodialysis therapy with 2 therapy sessions in one week. This result is higher than the dose set by KDOQI (2006), which is 65% and lower than that recommended by the decision of the Minister of Health in 2017 which is 80% with hemodialysis therapy for 10-12 hours.

The wasting of urea during hemodialysis can show the adequacy of hemodialysis in the excretion of urea (Rocco et al., 2015). Assessment of urea is very important in evaluating the therapy of CKD. Urea comes from the catabolism of protein compounds that neutralize toxins in the liver, but in too many amounts will cause toxins in the body, which is known as uremia. Uremia syndrome which is one of the early signs of deterioration in the respondent's body with CKD. This study found an increase and decrease in the URR value. The increase in the URR value on the 7th reuse can be influenced by the very good access factor during dialysis and the speed of blood flow (Quick of Blood/Qb) (Silaen & Tarihoran, 2019). In line with this study (Wantoro & Boyoh, 2017) states that there is a significant difference in the URR results on dialyzer reuse. Research conducted by (Mittal et al., 2018) states that there is a decrease in URR in the fourth reuse where the URR value is 61.39%, while in this study the figure in the URR assessment on the seventh dialyser was 75.66%. These results are said to be still effective according to the dosage from KDOQI and the Decree of the Minister of Health of the Republic of Indonesia Number Hk.01.07/Menkes/642/2017 concerning National Guidelines for Medical Services for the Management of End-Stage Kidney Disease. Because the therapy in patients with CKD is given for 2 sessions in 1 week for 10 hours. This results is the same as research from Wantoro & Boyoh (2017), but in this study only differentiated on the second and seventh dialyzer reuse. Meanwhile, the research conducted at Karsa Husada Batu Hospital was assessed to be dialing reuse to 1,3,5, and 7 so that an up and down graph was

obtained. This is in accordance with research conducted by Hamid, Dhrolia, Imtiaz, Qureshi, & Ahmad (2019) which states that the use of dialyzer reuse and single use does not affect adequacy in hemodialysis therapy, so that the effectiveness of using dialyzer reuse in research can be used as a reference. in making savings that can be made by the hospital.

### **Identify the Total Volume of Dialyzer Reuse to 1,3,5,7**

The dialyzer has a role as a kidney replacement. The membrane contained in the dialyzer is a semipermeable membrane that is made in such a way that it resembles the basement membrane of the glomerulus. Initially the dialyzer was made from cellulose material, to improve its biocompatibility and permeability it was developed with substituted cellulose. Hemodialysis therapy can use a dialyzer using a high flux or low flux membrane (Himmealfart & Ikizler, 2019). The use of dialyzer reuse is still a polemic, in which the Decree of the Minister of Health of the Republic of Indonesia Number Hk.01.07/Menkes/642/2017 concerning National Guidelines for Medical Services for the Management of End-Stage Kidney Disease does not prohibit the use of reused dialyzers and there is also no recommendation for the use of reused dialyzers. Meanwhile, the PERNEFRI decision no. 310/PB PERNEFRI/X/2016 states that the dialyzer can be reused or commonly referred to as reuse up to 7 times with a dialyzer volume of more than 80%. This study found that the total volume of dialyzer reuse to 1,3,5,7 used by hemodialysis patients decreased from reuse to 1,3,5,7. According to Suhardjono (2017) it was stated that a decrease in the total volume did occur in the dialyzer reuse but as long as the total volume was more than 80% it was still said to be safe for reuse. This is not in accordance with the research conducted by (Sukardi & Rofii, 2013) which states that the dialyzer can only be used 6 times because in his research it was found that the total volume reduction was less than 80% so that it did not only reach the 6th reuse. In 2018 it was stated that the use of dialyzer reuse 1-5 times was used as much as 66% (Indonesian et al., 2018). Researchers assume that the most reuse in reporting is 1-5 times. This could be because the total volume is not up to 80%. Actually, the use of dialyzer can reduce the occurrence of first use syndrome (Jaelani et al., 2016), besides that it can also improve the quality of life of CKD patients who use hemodialysis therapy with dialyzer reuse, from research conducted (Wahab et al., 2015) says that new dialyzer users have a 2.0 chance of worse quality of life than patients who use reused dialyzers. The use of dialyzer reuse can reduce costs incurred by hospitals, making it cost-effective (Upadhyay, 2019) (Mittal et al., 2018). Reuse itself is also safe to do if it is in accordance with the applicable standards in AAMI. In the IRR reports carried out by dialysis service providers, there are still many reports of the use of dialysis reuse. In the Regulation of the Minister of Health of the Republic of Indonesia Number: 812/MENKES/PER/VII/2010 concerning the Implementation of Dialysis Services in Health Service Facilities, it is stated that every manufacture of dialysis services requires the availability of automatic or manual reuse machines (Ministry of Health RI, 2010).

The use of dialyzer reuse is still a debate regarding cost savings. Because (Denny & Golper, 2014) states that very small savings are obtained from reuse. In addition, the rinsing process for blood clots in the dialyzer does not guarantee that it is sterile so that hepatitis C virus contamination is still possible and there is also no license or certification that can guarantee that the reused dialyzer is sterile from bacteria and viruses (Gabbay & Meyer, 2017). So far, the standard used is of a total volume of more than 80%. According to researchers at Karsa Husada Batu Hospital, almost 90% of patients use regular heparin (5000 IU) in every session of hemodialysis therapy. This is done because it prevents rapid blood clotting

in the dialyzer so that the total volume in the dialyzer can reach >80%. In addition, the rinsing process is clean so that the remaining blood clots in the dialyzer can be minimized. If there is still a blood clot in the dialyzer, then 3% H<sub>2</sub>O<sub>2</sub> can be added to the blood compartment and the dialysate compartment (Jaelani et al., 2016). Blood clots in the dialyzer which can cause a decrease in the membrane permeability of the dialyzer flux so that the reuse process causes a decrease in the total volume of the dialyzer. However, there is still a lack of research on the factors that affect blood clotting in the dialyzers that's been studied.

### **URR Analysis in Patients Using Dializer Reuse with Total Volume On Dializer Reuse To 1,3,5,7**

The results of the study stated that the URR (Urea Reduction Rate) in respondents who used dialyzer reuse the lowest result was 74.8% in the use of the fifth dialyzer reuse, while the highest result was 76.7% in the use of the 1st dialyzer reuse. This is similar to the results of the study. from (Wantoro & Boyoh, 2017) which stated that there was a decrease in the URR value, however, the research conducted by Wantoro did not mention the results of the total volume of dialysers that had been reused, while the results of the assessment of the total volume of dialyzer reused to 1,3,5, 7 has decreased where the first dialyzer reuse value is 90.5% while the total reuse volume of the seventh is 81.7%. It is still effective, the reuse guide states that if the total volume of more than 80% of the dialyser can be reused (Jaelani et al., 2016).

In accordance with the dose from KDOQI which states that the URR value is >65%. Meanwhile, according to the recommendation from the Decree of the Minister of Health of the Republic of Indonesia Number Hk.01.07/Menkes/642/2017 concerning the National Guidelines for Medical Services for the Management of End-Stage Kidney Disease, it is stated that the URR is 70% with hemodialysis 3 times per week, while the URR value is 80% with hemodialysis. 10-12 hours in 2-3 sessions per week. The analysis concluded by the researcher is that the use of dialyzer reuse to 1,3,5,7 is still effective as evidenced by the value of the total volume of the dialyser which is more than 80% and the result of the URR which is more than 70%. The URR is higher than that recommended by KDOQI but slightly lower than that recommended by the Decree of the Minister of Health of the Republic of Indonesia Number Hk.01.07/Menkes/642/2017 concerning National Guidelines for Medical Services for the Management of End-Stage Kidney Disease. There are many factors influencing the URR value, including the area of the membrane used. There are 2 types of dialyzers, namely standard (low flux) and high flux dialyzers. What is meant by a low flux dialyzer is a dialyser that has a kF capability of <15ml/mmHg/hour, and a urea clearance of <200ml/minute, and has a blood flow rate of less than 250ml/minute. While the high flux dialyzer has a large membrane surface area, large pores so that it can clean larger molecules, has the ability to clear urea >200ml/minute, usable blood speed >250ml/minute, kuf>15ml/mmHg/hour. The high flux dialyzer has a higher permeability to water. So that the choice of a dialyzer membrane greatly affects urea clearance (Colussi, Brunati, Gervasi, & Montoli, 2020).



## CONCLUSIONS AND RECOMMENDATIONS

The value of the Uremic Reduction Ratio (URR) on the dialyzer reuse to 1,3,5,7 has decreased but is still within the normal value. The total volume of dialyzer reuse 1,3,5,7 decreased. The results of the URR analysis of hemodialysis patients who use dialyzer reuse with a total volume of 1, 3, 5, 7 are still good, effective and can be used up to the seventh reuse.

Future researchers are expected to be able to conduct further research on the factors that affect the total volume of dialyzer reuse. In addition, it is expected that there will be research on the cost-effectiveness of hemodialysis therapy. This research can also be used as a reference for further research.

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