The development of Hemodialysis Units in the Army Hospital

Rudy Dwi Laksono [1*], Titih Huriah[2], Arlina Dewi[3],

[1]Program Studi Magister Administrasi Rumah Sakit, Universitas Muhammadiyah Yogyakarta, Indonesia
[2] Program Studi Magister Keperawatan, Universitas Muhammadiyah Yogyakarta, Indonesia
[3] Program Studi Magister Management, Universitas Muhammadiyah Yogyakarta, Indonesia

[*]Corresponding Author:
Email : rudydwilaksono@gmail.com

Abstract.

Patients with renal disease require special care.This study aims to develop a hemodialysis unit in the Army Hospital that require the act of washing the blood as a form to improve health services for patients with kidney failure. In this study, the majority of patients covered by the National Health insurance. Research methods namely method a case study with quantitative descriptive analysis.The results of this study show that the development of the hemodialysis unit will give a positive impact for the patient and for the hospital. The review will be the addition of hemodialysis machines, the addition of a new building, the addition of shift nurse can be seen that all these options will be profitable in the foreseeable future. This of course can make the best judgment for the Hospital in determining a decision for the sake of improving health care for the patient.

Keywords: *Hemodialysis, financing, kidney krosis,health services*

1. INTRODUCTION

Chronic kidney disease is caused by various diseases, which can last for months or even years and change the function and structure of the kidneys permanently. According to the guidelines of the international latest, chronic kidney disease is classified, namely a decrease in renal function measured by glomerular filtration rate less than 60 cc / min per 1,73 square meter of body surface area, or there are signs of kidney damage, or both for at least 3 months[1].Chronic kidney disease is the cause of death of most common to-18[2].

In Indonesia in 2013, two per thousand of the population or as much as 499.800 Indonesian people suffering from kidney failure[3]. The prevalence of chronic renal failure will increase with increasing age, with a sharp increase of 0.3% in the age group 25-44 years, a sharp increase of 0.4% in the age group 45-54 years, and a sharp increase of 0.4% in the age group 55 years. -74 age group A sharply increased 5% while the highest in the age group ≥75 years, namely 0.6 percent. The prevalence of renal failure was 0.3% in men and 0.2% in women[4].

There are two types of renal replacement therapy, i.e. dialysis (hemodialysis, peritoneal dialysis and haemofiltration) and kidney transplants[5]. End-stage kidney disease or

kidney failure terminal (GGT) [6]requires renal replacement therapy or also known as RRT (renal replacement therapy)[7], one of which is hemodialysis (HD)[8].

The cost for hemodialysis is quite large. The annual cost for patients undergoing hemodialysis achieve 87.600 euros[9]. A study systematic review concluded that the annual cost of hemodialysis for each patient ranged from $ 3.424 up to $ 42.785[10]. Such costs include direct treatment, especially medicines and consumables.

According to the data from the various centers of nephrology, the cost of maintenance hemodialysis for 5 h treatment two times a week is US $ 7.112,73[11]. In Indonesia, the number of new cases increased from year to year[12]. In the year 2015, of the total 4.898 hemodialysis machines recorded, the largest proportion is DKI Jakarta (26%) and West Java (22%). Jawa Tengah 12%, East Java 11%, Sumatera Utara 7%, Bali 4%, West Sumatra 4%, South Sumatra 4%, IN Yogyakarta 3%, Kalimantan 2%, other Provinces Around 1%[13]. In 2017, been a sharp increase in patients on hemodialysis, this show is a lot of patients who undergo hemodialysis longer[14].

Worldwide, chronic kidney disease accounted for 2.968.600 (1,1%) years of life adjusted with a disability, and 2.546.700 (1.3 percent) lives died in 2012[15]. Other personnel. Maintenance hemodialysis[16] different from other medical treatments in some ways. In California, at least one dialysis nurses assigned to each of eight patients, and at least one technician dialysis assigned to each of the three patients. The current situation in California is an average of one nurse dialysis for every 12 patients and one technician dialysis for every 4 patients[17]. In France, there is at least one nurse for every four patients and at least one assistant nurse for every eight patients[18].

Patients with renal disease require special care[19], which is higher than the workload of caring for patients in the medical ward and a surgical, similar to caring for a patient in the ward care of the high and the intensive care ward. The shortage of nurses cause a decrease in the quality of care more because the nurse does not provide the quality of care desired and interfere with health services in the patient. Objectively workload can be seen from the amount of time used and the number of activities carried out. The level of workload also depends on the type of nursing or his specialty, such as ICU nurse and nurse operating room[20]. When comparing the level of the workload of the nurse with the department or office to which different, then the measurement of the load of work at the level of the job is right.

In a preliminary study at the Army Hospital of the Indonesian National Army Wijaya Kusuma Purwokerto[21], a total of 430 patients using 4 machine for hemodialysis since 2014, and 494 patients who started using 4 machine for hemodialysis in the year 2015 to the year 2018 with 2.503 patients with 20 machines and and 3.314 patients with 33 machine in 2019. The state of the dialysis unit is currently located in the room next to the room of the disease in, there are 30 units to machine non-infectious and 3 units to the patient infection. More and more patients requiring hemodialysis. To expand the services of hemodialysis, faced with the option to build additional units

near the units that already exist, or by adding a machine and using the wards internal in the hemodialysis unit.

II. METHODS

This research uses case study method with quantitative descriptive analysis, namely dig fenomenatertentu in time and activities and as well as collect information in detail and depth by using a variety of data collection procedures during a certain period. This research was conducted in the Hospital of the Indonesian National Army Wijaya Kusuma Purwokerto with the subject of this research is the director of the hospital, the nurse part hemodialysis, the head of the hemodialysis, the staff and the nurse part hemodialysis, and chief financial officer.

The variables in this study, the cost of the expansion of the development of the hemodialysis unit is calculated from the total cost of the expansion of the hemodialysis unit and increase the number of nurses obtained from the analysis of the cost of the use of cost analysis is needed. To expand the hemodialysis equipment, a study of People use the web analysis. To increase the number of nurses is also used analysis of costs for salaries and other parts to support the expertise of the nurse at the hemodialysis. In this study, direct measurement is done by using the method of the research work sampling and stopwatch time. For the incidence of infection, the researchers used data on the number of cases of phlebitis in the hemodialysis unit of the year 2019 and the data of other complications during hemodialysis.

III. RESULT AND DISCUSSION

Hospital of the Indonesian National Army Wijayakusuma Purwokerto have a bed for hemodialysis unit includes 33 pieces consisting of 30 beds for patients non-infectious and 3 beds for the actions of hemodialysis patients infeksiusdengan HIV or Hepatitis B positive. This is in accordance with the prevention of infection to segregate patients with infectious diseases to patients with diseases of non-infectious. Spacious unit hemodialysis is 192 m2 and according to the Laws and Regulations in force, ratio to the engine and the building area is 1:8 m2. Of the regulation, it is seen that the room hemodialysis unit at the Hospital of the Indonesian National Army Wijayakusuma less widespread, it should be around a minimum of 264 m2.

The noise level in the room hemodialysis is still quite high from the standard set by the Ministry of Health. The noise level in the room caused by human activity in the hemodialysis unit. Based on the source of the noise comes from the conversations, the sound of people going back and forth, the sound of hemodialysis machines, the sound of another tool, wheel chair, and feeding wheel. The noise in the hospital environment is a serious problem and must be considered. In accordance with the function of the hospital is to care for the sick person, then the hospital environment desperately needs a quiet, comfortable and free from noise. Efforts to mitigate the

noise in the hospital can be done with a way to control the noise at source, trace perambatannya as well as on the recipient. To Action a maximum of hemodialysis in this study will be in the review of options to add shift nurse, adding a new machine or create a new building Act of initiation of hemodialysis (HD) is done after through examination and consultation with a consultant or Specialist of Disease In the certified hemodialysis. Every action hemodialysis consists of the Preparation of the implementation of the 30 minutes, the implementation of hemodialysis 5 h, the evaluation of post-hemodialysis for 30 minutes. The incidence of complications in hemodialysis units can be seen in the table below.

Table 1. The incidence of Complications 2019

Months	Phlebitis	Access failed	Hematoma
January	1	-	1
February	1	-	5
March	-	-	3
April	1	-	2
May	-	-	3
June	1	2	2
July	1	-	1
August	-	-	2
September	2	-	1
October	1	-	1
November	-	2	2
December	2	-	1
Total	10	4	24

Source: Data of health Information Hospital Wijaya Kusuma Purwokerto

From the above data show that the incidence of infection (phlebitis), i.e. 10 of 16.343 actions during the year 2019 (0.06%). For hematoma as much 24 the incidence of 0.15% and total fails by 4 incident or 0.02%. The number of medical personnel and Administration in the unit hemodialysis (HD) when it is 1 Specialist consultant Renal Hypertension, 2 internal medicine Specialist certified Hemodialysis, 2 general practitioners certified Hemodialysis, 9 nurses with certified Hemodialysis and 1 technician and concurrent administration. Details of medical personnel and administration can be seen in the table below.

Table 2. Most Hemodialysis Units

No	Name	Gender	Age	Working Period	General Education	Special Education	Status
1	LS	Women	52	3	Sub Spesialis	Ginjal	Konsultan
2	RDL	Male	50	3	Spesialis	HD	Penjab
3	IR	Male	52	4	Spesialis	HD	Pelaksana
4	TBS	Male	48	4	Dokter umum	HD	Pelaksana
5	SR	Women	41	2	Skep Ners	HD	PNS
6	TRS	Male	30	6	Skep Ners	HD	Honorer
7	AP	Male	32	4	Skep Ners	HD	Honorer
8	TM	Women	27	4	Amd. Kep	HD	Honorer
9	FU	Women	26	4	Skep Ners	HD	Honorer
10	ADS	Male	27	3	Skep Ners	HD	Honorer
11	YBA	Male	29	3	Amd. Kep	HD	Honorer
12	YN	Male	30	7	Amd. Kep	HD	Honorer
13	ANP	Male	30	7	Amd. Kep	HD	Honorer
14	AR	Male	30	3	STM	Teknik	Honorer

Based on the above data, it can be seen that the nurses based on gender, 30% (3 people) were women and 70% (7 people) were male. Based on the age, 2 people aged above 30 years, the remaining 8 people under 30 years old. Based on the work experience, it is known that 6 people a new nurse working less than 5 years, while the remaining 3 people already working for over 5 years. Based on education, 40% (4 people) is D3 Nursing graduates and 50% (5 people) is a graduate Degree in Nursing and Nursing profession. Rest (1) is a power engineering concurrent administration. In performing its duties, the Hospital do shift nurses [22]. The morning Shift starts at 07.00 – 14.00 and shift the day from the hours of 11.30 – 18.30. The observations made by the researcher, it can be concluded that the activities of the nurses in Hemodialysis units tend to be homogeneous and routine.

After getting an overview of the activities of the care of hemodialysis of the respondents, it can be seen that the variation of the time spent by each respondent for each of the activities is very small because of the variation of the activity itself was not much. Hemodialysis patients have a regular schedule that is divided into 3 groups: Monday-Thursday, Tuesday-Sunday and Wednesday-Saturday. Each group is divided into 2 shifts that Shit in the morning danshif lunch. Some of the different activities carried out by some of the respondents showed different obligations assumed by each nurse on shift respectively. The nurse that the morning shift usually open up the room and set up the tools and the basic activities, such as turning on a lamp and sweep the room.

Hospitals often refer patients who require the service of washing the blood to another hospital because of the limitations of the tool hemodialysis available so it is possible for the hospital to expand and at the same time add to the tool hemodialysis a new one.

a. The calculation of the Assessment of the Feasibility of Investing in the Expansion of the Hemodialysis Units by the Method of Break Even Point (BEP)

a. Calculation of fixed costs and variable costs over the economic life of the tool hemodialysis

Calculation of variable costs in this study using the method of least square and is estimated for 10 years, in this research, which is included in the variable cost is the expense items, medical facilities and because of the amount each month is changed in accordance with the number of requests the service of the washing of the blood. The assumptions used to estimate the fixed costs for 10 years. Data of fixed costs and variable costs can be seen in table 3 is a table of the estimated unit cost of hemodialysis.

Table 3. Fixed costs and variable costs per year

Tahun	Fixed Cost (Rp)	Variable Cost (Rp)
2019	2,203,416,301	7,256,711,310
2020	2,295,747,496	8,349,152,161
2021	2,341,913,093	8,895,372,587
2022	2,364,995,892	9,168,482,800
2023	2,376,537,291	9,305,037,906
2024	2,382,307,991	9,373,315,459
2025	2,385,193,340	9,407,454,236
2026	2,386,636,015	9,424,523,624
2027	2,387,357,353	9,433,058,318
2028	2,387,718,022	9,437,325,665
2029	2,387,898,356	9,439,459,339

From the table above, that the fixed cost is the total of the cost of medical services, the honor employees, the cost of electricity and water, the amount of which is still smaller compared to variable costs. Variable costs consist of the cost of the BHP, the cost of Facilities and Waste. Such costs will increase along with the increase in the number of patients each year.

b. The calculation of income for the service of the washing of the blood during the economic life of the tool hemodialysis

The calculation of the income unit hemodialysis dollars/patient for the service of the washing of blood based on the amount of income one year divided by the number of patients for one year. The calculation of income for the service of the washing of the blood for 10 years can be seen in the table below.

Table 4. Revenue of hemodialysis services

Years	Outpatient Income (Rp)	Outpatient Income (Rp)	Total (Rp)	Number of Patients	Income (Rp/person)
2019	11,828,355,300	2,788,511,800	14,616,867,100	3,014	4,849,657
2020	11,922,952,950	3,016,146,469	14,939,099,419	3,143	4,752,436
2021	11,970,251,775	3,129,963,804	15,100,215,579	3,208	4,706,768
2022	11,993,901,188	3,186,872,471	15,180,773,659	3,241	4,684,618
2023	12,005,725,894	3,215,326,805	15,221,052,699	3,257	4,673,708
2024	12,011,638,247	3,229,553,972	15,241,192,219	3,265	4,668,293
2025	12,014,594,423	3,236,667,555	15,251,261,978	3,269	4,665,596
2026	12,016,072,512	3,240,224,347	15,256,296,858	3,271	4,664,250
2027	12,016,811,556	3,242,002,743	15,258,814,298	3,272	4,663,578
2028	12,017,181,078	3,242,891,941	15,260,073,018	3,272	4,663,242
2029	12,017,365,839	3,243,336,539	15,260,702,378	3,273	4,663,074

c. The calculation of the feasibility of investment by the method of BEP

Break even point analysis / Break-Even Point was conducted to determine the break-even point is the state where no profit or no loss. This analysis needs to be done in the feasibility of investing in the expansion of hemodialysis unit so that the hospital find out the number of patients served per year so that the hospital did not experience losses due to investment return hemodialysis machines such. The feasibility of the investment by the method of BEP is determined by comparing the number of patients the results of the calculation method of the BEP with the sum of the estimated demand for services washing the blood during the economic life of the tool hemodialysis.

Table 5. Calculation of Break Event Point (BEP)

Years	Fixed Cost (Rp)	Variable Cost (Rp)	Number of Patients	Variable Cost (Rp/Person)	Income (Rp/Person)	BEP
2019	2,203,416,301	7,256,711,310	3,014	2,314,132	4,849,657	866
2020	2,295,747,496	8,349,152,161	3,143	2,565,081	4,752,436	1,045
2021	2,341,913,093	8,895,372,587	3,208	2,682,960	4,706,768	1,153
2022	2,364,995,892	9,168,482,800	3,241	2,740,134	4,684,618	1,212
2023	2,376,537,291	9,305,037,906	3,257	2,768,294	4,673,708	1,243
2024	2,382,307,991	9,373,315,459	3,265	2,782,270	4,668,293	1,258
2025	2,385,193,340	9,407,454,236	3,269	2,789,232	4,665,596	1,266
2026	2,386,636,015	9,424,523,624	3,271	2,792,706	4,664,250	1,270
2027	2,387,357,353	9,433,058,318	3,272	2,794,442	4,663,578	1,272
2028	2,387,718,022	9,437,325,665	3,272	2,795,309	4,663,242	1,274
2029	2,387,898,356	9,439,459,339	3,273	2,795,743	4,663,074	1,274

Based on the above table, the results of the calculation of the BEP from the year 2019 to the year 2029 its value is always smaller when compared with the estimated demand for services hemodialysis then the investment expansion of the hemodialysis unit at the Hospital feasible.

b. The addition of shift nurse

For the addition of shift nurse, do the assumptions of the overall coupled with one-third of the existing data. Starting from the income and expenditure for medical services, the honor employees, spending on electricity, water and waste, use of consumables, expenditure health facilities, and the income of both outpatient and inpatient. To the income and expenditure can be seen in the table below.

Table 6. The estimated Cash Flow for the 3 shift Nurse

Years	Income (Rp)		Expenses (Rp)		Cash flow (Rp)		Difference
	2 shift	3 shift	2 shift	3 shift	2 shift	3 shift	
2019	14,616,867,100	19,562,359,833	9,400,146,861	12,533,529,148	5,216,720,239	7,028,830,685	1,812,110,446
2020	14,939,099,419	19,899,090,537	10,580,916,243	14,107,888,325	4,358,183,176	5,791,202,213	1,433,019,037
2021	15,100,215,579	20,067,455,889	11,171,300,935	14,895,067,913	3,928,914,644	5,172,387,976	1,243,473,332
2022	15,180,773,659	20,151,638,565	11,466,493,280	15,288,657,707	3,714,280,379	4,862,980,858	1,148,700,480
2023	15,221,052,699	20,193,729,903	11,614,089,453	15,485,452,604	3,606,963,246	4,708,277,299	1,101,314,054
2024	15,241,192,219	20,214,775,572	11,687,887,539	15,583,850,052	3,553,304,679	4,630,925,520	1,077,620,840
2025	15,251,261,978	20,225,298,407	11,724,786,582	15,633,048,777	3,526,475,396	4,592,249,630	1,065,774,234
2026	15,256,296,858	20,230,559,824	11,743,236,104	15,657,648,139	3,513,060,754	4,572,911,685	1,059,850,931
2027	15,258,814,298	20,233,190,532	11,752,460,865	15,669,947,820	3,506,353,434	4,563,242,713	1,056,889,279
2028	15,260,073,018	20,234,505,887	11,757,073,245	15,676,097,660	3,502,999,773	4,558,408,226	1,055,408,453
2029	15,260,702,378	20,235,163,564	11,759,379,435	15,679,172,581	3,501,322,943	4,555,990,983	1,054,668,040
Total	**166,586,349,206**	**221,247,768,513**	**124,657,770,544**	**166,210,360,725**	**41,928,578,662**	**55,037,407,788**	**13,108,829,126**

From the above calculation, to the addition of 3 shift nurses will add to the increase in cash flow amounted to 31,35%. This is similar to the increase in income and expenditure.

c. The addition of hemodialysis machines

The addition of hemodialysis machines with the use of the room the banngunan hemodialysis units that already exist, which is currently used as a ward of the disease in the. The size of the building that is 264 m2. By using the basis of

existing regulations, the size of the building area that can accommodate as many as 25 beds for hemodialysis (1 bedroom with an area of 8 m2 and with the room supporting). With the addition of medical personnel as much as 9 people who are similar to hemodialysis units that already exist. On the table with the base 25 of the bed, so that the calculations for the addition of income and expenses as in the table below.

Table 7. Cash flow for the addition of a new tool

Years	Income (Rp)	Expenses (Rp)	Cash Flow (Rp)
2019	11,073,384,167	7,496,714,857	3,576,669,310
2020	11,317,499,560	8,394,269,437	2,923,230,123
2021	11,439,557,257	8,843,046,727	2,596,510,530
2022	11,500,586,105	9,067,435,372	2,433,150,733
2023	11,531,100,529	9,179,629,695	2,351,470,835
2024	11,546,357,741	9,235,726,856	2,310,630,885
2025	11,553,986,347	9,263,775,436	2,290,210,911
2026	11,557,800,650	9,277,799,727	2,280,000,924
2027	11,559,707,802	9,284,811,872	2,274,895,930
2028	11,560,661,378	9,288,317,945	2,272,343,433
2029	11,561,138,166	9,290,070,981	2,271,067,185

From the above table, it is seen that the flow of cash to perform additional tool new look that will always be profitable. So this could make a part of the consideration.

d. The manufacture of Building a new hemodialysis unit

If there is the addition of a new tool of course disertaipembangunan a new building next to the hemodialysis unit in accordance with the strategic plan of the hospital. The cost for the construction of the Building for 25 beds hemodialysis with an area of 400 m2 and 25 m2 for supporting hemodialysis then the cost in the know of the draft charges were filed by the implementation of construction amounted to Rp 1.275.000.000. With the Building area that can accommodate 25 beds in accordance with existing regulations. The calculation of income as in table 33 to 25 beds dialysis.

Table 8. Cash flow for the new building

Years	Income (Rp)	Expenses (Rp)	Cash Flow (Rp)
2019	11,073,384,167	8,771,714,857	2,301,669,310
2020	11,317,499,560	8,394,269,437	2,923,230,123
2021	11,439,557,257	8,843,046,727	2,596,510,530
2022	11,500,586,105	9,067,435,372	2,433,150,733
2023	11,531,100,529	9,179,629,695	2,351,470,835
2024	11,546,357,741	9,235,726,856	2,310,630,885
2025	11,553,986,347	9,263,775,436	2,290,210,911
2026	11,557,800,650	9,277,799,727	2,280,000,924
2027	11,559,707,802	9,284,811,872	2,274,895,930
2028	11,560,661,378	9,288,317,945	2,272,343,433
2029	11,561,138,166	9,290,070,981	2,271,067,185

In the table above, with the construction of a new building, cash flow first year alone, which reduced a number of the construction of the building hemodialysis a new one. But next it can run more smoothly. How to build a new building, can also by the method of installment payments or build is a third-party.

Each of these options, it can be assumed the action for each choice, as in the table below. Action an action hemodialysis can be done optimally. For the addition of shift nurse, can be done 3 times hemodialysis multiplied by the number of bed for a month to 6 working days. For the addition of new machinery and the manufacture of a new building, the actions of the portfolio with a long tool a total of 33 machine and coupled with 25 new machine for a month with 6 days working (both options to add a new machine or making a new building). If the actions of the maximum can be met, then the income will also be maximized.

Table 9. Action maximum hemodialysis

No	Development Options	Number of Beds	Maximum action/month
1	The present	33	1584
2	Addition of nurse shifts	33	2376
3	New engine additions	58	2784
4	Construction of a new building	58	2784

The results of this study show that the development of the hemodialysis unit will give a positive impact for the patient and for the hospital. Based on the analysis of data from the financial aspect with the use of trend-monthly, it is known that the expansion of the hemodialysis unit at the Hospital worth it to be implemented. The results of the analysis feasible due to the estimated demand of hemodialysis services continues to increase. The number of requests that its value is always higher compared with the calculation of the BEP, which if you do the addition of tools hemodialysis then the hospital's revenues will increase. In accordance with previous research, that the development of the hemodialysis unit and the development of the hospital become more widely judged worthy to be developed from the results of the calculation.The review will be the addition of hemodialysis machines, the addition of a new building, the addition of shift nurse can be seen that all these options will be profitable in the foreseeable future. When done the calculation of each of the options, then the most favorable option is the construction of a new building.

IV. CONCLUSION

The cost required for the expansion of the indoor unit hemodialysis is more efficient compared to building a new building. Sedangkanbiaya necessary to add shift nurse is more efficient compared with the adding machine. The results of the analysis the feasibility study of the financial and technical then the most profitable is to build a new building a special unit hemodialysis compared to just add shift nurse and add a new machine with the existing room. The development carried out if the hospital does not have the space or building that is in use, If you have a room or building tentaunya the addition of units and the addition TBSP much better.This of course can make the best consideration for Hospital in menentukansebuah decisions for the sake of improving health care for patients, especially for chronic kidney disease patients.

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