

FEASIBILITY STUDY ON THE DEVELOPMENT OF THE HEMODIALYSIS SERVICES AT XY TEACHING HOSPITAL

Rochmah TN¹, Rochiati², Mad Arabe ID¹

¹Department of Health Policy and Administration, Faculty of Public Health, Universitas Airlangga, Indonesia

²General Hospital Darmo of Surabaya, Indonesia

Correspondence:

Iriana Depung Mad Arabe

Department of Health Policy and Administration,
Faculty of Public Health, Universitas Airlangga, Indonesia

Email: Iriana.dm-2018@fkm.unair.ac.id

Abstract

Background: Despite new advancements, renal failure patients continue to require hemodialysis services or treatments in hospitals in Indonesia. Due to this, it is essential that hospitals consider offering this kind of services. Therefore, a thorough and accurate calculation is needed to examine the commercial feasibility of this treatment.

Objective: This study aims to conduct a feasibility study of the hemodialysis services for a teaching hospital.

Method: The feasibility study for the hemodialysis services has to be identified from a number of aspects such as lands for constructing the buildings, the infrastructure, human resources, equipment, and finance.

Results: Based on the forecasted calculation, it is estimated that the number of patients requiring regular hemodialysis in the said teaching hospital by the year 2027 would have risen to 59,727 and to cater to this need, an estimated number of 103 beds would be needed for such hemodialysis services. The feasibility analysis also indicated that the projected construction would require various kinds of investments such as land, infrastructure, and equipment for the hospital management's information system, diverse communication system for internal and external services as well as training for service quality improvement. The calculation indicated that the investment would require US\$2,790,567.51 to develop the XY Teaching Hospital.

Conclusion: Nevertheless, the feasibility study of the hemodialysis services also showed that there is a considerable potential for developing the hemodialysis services in XY Teaching Hospital.

Keywords: *Feasibility study, Hemodialysis service, Teaching Hospital*

Introduction

Renal disease is a degenerative disease but it can be managed in various ways, ranging from blood pressure control, diet regulation, pharmacological therapy, fluid and electrolyte restriction, to renal replacement therapy (*Renal Replacement Therapy*). This may include hemodialysis, peritoneal dialysis, or renal transplantations. Patients who experience stage 5 of the CKD/ESRD (*End Stage Renal Disease*)/end-stage renal disease/terminal renal failure (GGT) require renal replacement therapy (*Renal Replacement Therapy*), one of which is hemodialysis (HD) (1,2) and this would serve very well for a teaching hospital.

A Teaching Hospital is a hospital that has an integrated function as a place for education, research, and health services in the field of medical and / or dentistry education, continuing education, and other health education; it encompasses teaching and learning in a multi-professional manner (3). The XY Teaching Hospital has more than 400 patients suffering from chronic renal disease and undergoing hemodialysis treatments. During such treatments, patients had to queue for the hemodialysis services. Based on the number of patients currently seeking medical treatment at the XY Teaching Hospital, it is forecasted that the hospital may need to address as many as 38,400 actions/year, with each patient requiring at least several actions of the hemodialysis. To date, the XY Teaching Hospital is able to treat 70 dialysis patients per day on average. In order to meet this need, the hemodialysis treatments had to be scheduled for up to three shifts of action. The *morning shift* action is from 6:30am to 11:00am; the *afternoon shift* action is from 12.00pm to 4.00 pm while the *night shift* action is from 5:00pm to 8:00pm. This tight schedule suggests that the hemodialysis services provided by the teaching hospital needs to be enhanced for improved services. For this reason, a comprehensive analysis of the logistics is needed hence, this study developed the *Feasibility Study* so as to assess if it is possible for the teaching hospital to develop the hemodialysis treatment services. This will be

an important part of the hospital's quality improvement effort since it allows for a change to be incrementally accepted by staff and patients (4).

The general aim of this study is to perform a feasibility study on the development of the hemodialysis services in the XY Teaching Hospital, thus the objectives are to:

1. Conduct an analysis of the hemodialysis service requirements in the XY teaching General Hospital,
2. Conduct an analysis of the feasibility of the land for construction, the infrastructure, human resources, and the equipment needed, in accordance with the hemodialysis service regulatory standards, and
3. Conduct an analysis of the financial aspects for developing the hemodialysis services.

Study Methods

This study is qualitative in approach as data were collected based on interviews, observations, and document reviews. Following the approval of the Health Research Ethics Committee, Faculty of Public Health Airlangga University, approval no. 15-KEPK, the problem was explored. Various information was obtained from the relevant units i.e department of population and civil registration, district health office, finance, facilities, infrastructure and human resources both inside and outside the hospital.

This study is divided into two stages. In the first stage, a needs analysis of the hemodialysis services covering the geographical, demographic, socio-economic and environmental aspects, was conducted. In the second stage, the feasibility analysis of the land, the construction and buildings, infrastructure, human resources, and the hemodialysis equipment was performed,

In analyzing the service requirements, for the teaching hospital, we performed the calculation *forecast* so as to get an overview of the hemodialysis services and other needs. Based on the prevalence and calculations

forecast, we were able to acquire the normative values. To analyse the feasibility of the land for construction and building, the facilities and infrastructure as well as human resources and equipment, a comparison between the standard hemodialysis services and the real conditions in the Hemodialysis Installation was made (5).

Following the above, a feasibility analysis of the financial aspects was then performed. Among others, this included an estimation of the investment fund, the funding sources, income projection for the estimated number of hemodialysis actions, fixed cost projections and variable costs, cash flow projections for the next 10 years, profit projections and losses for the next 10 years, and finally, we performed the ratio analysis.

Service Standards

The Indonesian Nephrology Association (INA) in 2003, had clearly mentioned that standard services for hemodialysis should include adequate workforce, suitable services, correct equipment, right medicines, fitting buildings and supportive infrastructure, sufficient financing, correct waste disposal systems, occupational health and safety measures as well as a system for evaluating, recording and reporting the activities.

Hemodialysis (HD) is a renal replacement therapy that uses a special device that is aimed at helping patients to overcome the symptoms and signs of the renal failure disease due to a low glomerular filtration rate (6). This practice is expected to extend life and to improve the quality of life for patients. A standard hemodialysis service center should consist of at least four dialysis machines, supported by units of *water treatment*, and other supportive equipment. There should also be medical personnel consisting of at least two nurses who are HD nurses, and a HD certified doctor who is supervised by a HD certified internist. The structure of the center is monitored by an internist who is a specialist in Internal Medicine, Renal Consultant and Hypertension. For treatment purposes, the standard for hemodialysis services must be adhered to, i.e,

the concept of hemodialysis services, the procedure for hemodialysis services, the flow of patients for hemodialysis service, minimum requirements for medicine, and medical devices needed (7). Various medical devices in the hemodialysis service also need to be in the hospital's control system at all times. The use of the medical devices must also follow the principles of patient safety and standard precautions.

Results and Discussion

This study is divided into two stages. In the first stage, a needs analysis of the hemodialysis services covering the geographical, demographic, socio-economic and environmental aspects, was conducted. In the second stage, the feasibility analysis of the land, the construction and buildings, infrastructure, human resources, and the hemodialysis equipment was performed

1. Needs Analysis of the Hemodialysis Services in XY Teaching Hospital

The results from first stage obtained for this study were based on interview, observation, and review the geographical and demographic data generated from the XY Teaching Hospital which was located in the middle of the district, and surrounded by regency cities. The population of the XY teaching General Hospital in 2015 was 2,117,278 and the district had a projection of a 2-year population increase of 4.7%.

Based on the calculations, the *forecasting* data obtained were stretched to until 2027, and it was then estimated that the number of patients with regular hemodialysis would encompass around 574 patients per year. On that normative assumptions, we predicted in 10 years that the highest estimation by 2027 for hemodialysis actions would be as many as 59,727 actions. Thus, by 2027 the highest estimation for the need of the hemodialysis machine and patient beds would be about 103. This takes into consideration that there would be at least three infectious patients.

Based on the current hourly arrangement of the hemodialysis services that had been

divided into three sessions the need appears to be very high. In accordance with the consensus of the renal failure disease, it had been emphasized that maximum or adequate results are better gained from treatment that is given within five hours. Thus, this would require more hemodialysis machines to be added if the XY teaching hospital is aiming to provide hemodialysis services.

From the needs analysis conducted of the internal aspects, it can be deduced that the XY teaching Hospital needs to develop a hemodialysis service that can offer 103 machines and beds.

2. Feasibility Analysis of Land Requirements needed for Construction and Buildings, Infrastructure, Human Resources, and Equipment in accordance with the Service Regulatory Standards

Based on the feasibility analysis of the land requirements for construction and building, it can be concluded that the XY Teaching Hospital is able to meet its hemodialysis services fulfilment because it has already prepared an area of 1700m² according to the management planning scheme and based on its current normative needs. From the feasibility analysis of the infrastructure, there are still some areas that do not meet the standards. This can be traced to several quality indicators including: integrated hospital information system, communication system for external telephone used for the Hemodialysis installation.

With regards to the feasibility analysis of the human resources required, it appears that this aspect was also in accordance with national standards, hence the XY Teaching Hospital has the eligibility to develop the hemodialysis services for as many as 103 machines.

Based on the feasibility analysis of the equipment and drugs required, it appears that the XY Teaching hospital is currently appropriate. Nonetheless, the addition of other equipment is still needed so as to be able to address the treatment and drug *emergency* cases. In this regard, the XY Teaching Hospital is able to meet the equipment and drugs

requirement, according to its current normative needs.

Based on the above analyses, it can be concluded that it is worthwhile for the XY Teaching Hospital to develop its own hemodialysis services consisting of 103 machines and bed

3. Feasibility Analysis of the Financial Ability of the XY Teaching Hospital for Hemodialysis Services

Much funding is needed for developing the hemodialysis services in the XY Teaching Hospital. This includes the lands for construction, the facilities tied to the services offered, the human resources to run the operations, and the equipment and drugs to sustain the services provided. An estimated calculation showed that the amount totaled to US\$2,790,567.51 The hospital has to find ways of raising this amount because the government will be unable to support this project, based on the INA CBG's tariff (8). Majority of the patients who are using the hemodialysis services are under the Social Insurance organization which contributions are a number of fees that are paid regularly by participants, employers and / or governments (9,10)

The amount of investment costs, and the amount of direct and indirect costs for operating the hemodialysis services can be extremely heavy, starting from the lands needed for construction to the direct and indirect costs incurred such as the cost of distributing medical services, purchasing equipment, and so on. In this regard, a discussion is needed so as to obtain efficient solutions.

Among the calculations made for the alternative financing is the possibility of reducing the HD medical services to 10% of the current HD rate, and also to reduce costs of consumption by 10%. From the calculation, it was noted that the NPV is (-) US\$1,160,233.61. This result suggests that the assessment of developing the Hemodialysis Installation was financially not feasible.

The calculation derived from other alternative financing scenarios can be used as the consideration to evaluate whether the current HD tariff is too low, or the *unit costs*, investment costs, and the determination of the rates of medical services are not proportional.

Conclusion

Based on the description of the feasibility analysis stated above, it seems clear that the XY Teaching Hospital needs a number of support, such as adequate lands for construction, facilities, human resources, and equipment. Based on the analysis of data, it can be concluded that XY Teaching Hospital can fulfill those needs, but the cost would be high.

The benefits of the hemodialysis services are divided into two categories:

1. *Benefit of Tangibles*
 - a. Reduced treatment costs for patients with chronic renal failure.
 - b. Reduced transfusion costs for patients with chronic renal failure.
 - c. Reduced financial burden for in-hospital patients with chronic renal failure.
2. *Intangible Benefits*
 - a. Increased *Quality Adjusted Life Years* for hemodialysis patients.
 - b. Increased *Brand Image* for XY Teaching hospital with superior services such as HD.
 - c. Doctors and medical personnel at XY Teaching Hospital are trained in the hemodialysis services.
 - d. XY Teaching Hospital can be a pilot hospital with superior HD services, there by serve as a model teaching school for research and development.

The development of the Hemodialysis services, based on the analysis of the financial aspects, is not feasible. Nonetheless, the Hemodialysis services have *tangible* and *intangible benefits* which may be further examined for better validation. Therefore, it cannot be denied that the development of the Hemodialysis services is still essential.

From the discussion provided, it can thus be concluded that the important points are as follows:

1. Based on the needs and feasibility analysis of the hemodialysis services, there is considerable potential for the developing the hemodialysis services.
2. The number of hemodialysis machines that would be required to serve this by the year 2027 is 103 machines only, thus there is still time to raise the funds.
3. There are additional requirements needed such as infrastructure, human resources, medical and non-medical equipment as well as drugs needed so as to complete this project.
4. The funding needed for the development of the hemodialysis services appears to be high, a total of US\$2,790,567.51. It may not be possible for the government to sponsor all the costs because majority of the patients using the hemodialysis services are covered by the Social Insurance organization.
5. From the analysis of the financial aspects, it appears that it may not be worth the effort for the XY Teaching Hospital to proceed with the project. Nonetheless, this may be off-set by the *tangible* and *intangible* benefits as explained above. Future studies may need to examine these two categories of benefits in detail.
6. The financial aspect of the analysis implied that developing the Hemodialysis services may not be feasible. Nonetheless, this disadvantage may be off-set by the *tangible* and *intangible benefits*. The reason is because it is still imperative for XY Teaching Hospital to develop this project for the sake of the renal failure patients.

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