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Evaluation of the Design of Hemodialysis Patient Monitoring System at Lestari Kidney and Hypertension Clinic Semarang

Lutfatila Masitoh[1]*, Cahya Tri Purnami[2], Aris Puji Widodo[3]

[1]Master Student in Public Health Faculty of Public Health, Diponegoro University Semarang Indonesia, fafamasitoh@gmail.com

[2]Master of Public Health Faculty of Public Health, Diponegoro University Semarang Indonesia, cahyatp68@gmail.com

[3]Master of Public Health Faculty of Public Health, Diponegoro University Semarang Indonesia, arispw@gmail.com

*Corresponding Author: Lutfatila Masitoh

ABSTRACT

Introduction: Patients diagnosed with kidney disease are very difficult to accept and are not ready to undergo haemodialysis treatment.

Objective: Effectiveness is needed to make patients with chronic kidney disease more obedient to treatment and to ask about kidney treatment and important health information for kidney failure patients.

Method: The aim of this research is to evaluate the design of a patient's haemodialysis monitoring system in the Gingival Clinic and the Pressure of Current Lester, by conducting research based on methods and qualitative descriptive types of research.

Result: Research has shown that Clinical Kidney and Concurrent Lestari Hypertension require a haemodialysis patient monitoring system to facilitate healthcare in patient monitoring and facilitate physicians in decision making.

Keywords: Design of Monitoring System; Usabilty Sytem; Hemodialysis; Kidney Disease; Renal Failure

INTRODUCTION

Hemodialysis plays an important role in ensuring the survival of kidney failure patients.(1)The latest data according to the Report of Indonesian Renal Registry 2019, every year Indonesia experiences an increase in patients undergoing hemodialysis, an estimated 17,193 new patients and 11,689 active patients with a mortality rate reaching 2,221. The Indonesian Nephrology Association (Pernefri) in 2019, stated that the prevalence of Chronic Kidney Disease was 12.5% caused by hypertension (37%), diabetes mellitus or diabetic nephropathy (27%), congenital abnormalities or primary glomerulopathy (10%), urinary tract obstruction disorders or obstructive nephropathy (7%), gout (1%), lupus disease (1%) and other causes (18%)(2)

The phenomenon of increasing need for hemodialysis services is associated with the large number of patients experiencing kidney failure.(1). Data from the Health Insurance Administering Agency (BPJS) in 2019 showed that there were 1.93 million cases of kidney failure with a cost of 2.79 trillion, even during the Covid pandemic in 2020 there were still 1.79 million cases with a cost of 2.24 trillion JKN participants received services for hemodialysis therapy services.(3)This is the cause of the increasing number of kidney failure patients undergoing hemodialysis, so that more health financing is needed.(4)

Chronic kidney failure can be treated by receiving hemodialysis or transplantation. Hemodialysis is a kidney replacement with the aim of removing toxins, and metabolic waste in the body when the kidneys can no longer function normally which is done 2 to 3 times a week, hemodialysis is done for 4 to 5 hours(5). Since 2018, new patients undergoing hemodialysis have increased to 35,602 people and every year there has always been a 42% increase in deaths with the highest cardiovascular complications.(6).

In The implementation of hemodialysis services requires good monitoring so that hemodialysis services can be utilized by all people who need them.(2) Hemodialysis is performed by monitoring blood pressure, pulse, temperature, and breathing which needs to be done before, during or after hemodialysis as a form of preventing intradialytic hypotension and other complications.(7)This monitoring will have a major impact on patient symptoms, quality of life, and cardiovascular complications.(8,9)

Limited monitoring, limited data, lack of framework, shortage of health workers, will hamper the achievement of hemodialysis results and quality of care.(10)Monitoring dialysis adequacy as the best solution in achieving high quality of medical care and resource efficiency.(11). Monitoring of hemodialysis patients is carried out hourly to provide a warning when the patient experiences a change in condition, during the hemodialysis process until completion so that the doctor can take action quickly and accurately. Monitoring of hemodialysis patients can be done by utilizing an information system to increase the efficiency of monitoring hemodialysis patients, especially in terms of scheduling and routine monitoring of each patient examination that has been integrated into the monitoring system.(12)The use of information systems will save time and energy for health workers to search for physical records or fill out forms manually because the documentation of information is clear and centrally available for doctors to ensure that reports from nurses to doctors are complete. This will make them more focused on providing patient care.(12).

The results of a preliminary study conducted at the Lestari Kidney and Hypertension Clinic by conducting interviews with clinic managers and health workers in charge of the hemodialysis room showed that the monitoring information system at the Lestari Kidney and Hypertension Clinic in Semarang was limited to recording in electronic medical records that recorded patient examination history along with diagnoses and treatments given by doctors and were also available at the Lestari Kidney and Hypertension Clinic.In addition, pReporting the results of monitoring hemodialysis patients is still done by recording on paper both monitoring during hemodialysis. This has an impact on the possibility of data loss, delays in health workers in analyzing, evaluate the patient's health condition, identify potential problems and determine the emergency medical interventions needed by the patient. In addition, manual recording can cause differences in understanding between doctors and nurses. If this is not immediately addressed, it can affect the quality of patient care.

Based on the background of the problem above, the researcher is interested in conducting research on "Evaluation of the Design of a Hemodialysis Patient Monitoring System" which can be used for management purposes containing reports, making it easier for doctors to monitor patient history, helping doctors provide advice and decision making and facilitating the service process for patients in monitoring or consultation.

LITERATURE REVIEW

Hemodialysis

Hemodialysis is a treatment performed to improve the quality of life of chronic kidney failure patients who utilize the help of a machine to clean metabolic waste, excess fluid, and sodium and help maintain blood pressure due to problematic kidney function. Hemodialysis is also called dialysis therapy which is carried out outside the body by flowing blood into an artificial kidney tube. In patients with kidney disease, the kidney organ experiences a decrease in function until it is no longer able to work. Although it does not replace all kidney function, hemodialysis

provides a better quality of life and increases life expectancy.(13)

Purpose of Hemodialysis

Hemodialysis has the main purpose of replacing the function of the kidneys for the excretion process (removing metabolic waste products in the body), controlling uremia and creatinine, excess fluid and electrolyte imbalances that occur in patients undergoing hemodialysis. Hemodialysis is usually performed 2-3 times a week and takes about 3.5-5 hours.

System Design Evaluation using Usability Testing

Usabilityis part of the science of Human Computer Interaction which focuses on studying interface design and interaction between humans and computers.(14). This usability study will discuss the user experience in learning and using a particular technology, application or website.(15).

There are five indicators(16,17)which is contained in usability and can be used to determine the quality of a system in interacting with its users. As follows:

Learnability

LearnabilityThis is one of the usability indicators used to determine how easy it is for users to learn the system used to complete existing tasks.(16,17). This factor has indicators or criteria that are able to show that an application is able to fulfill the learnability factor as one of the factors of the success of the usability factor performance.(18).

Memorability

Memorabilityis an indicator used to find out how easy it is for users to remember how to use the system if they haven't used it for a long time(16,17). This indicator is to see how quickly users regain their skills in using the design when returning after some time. This factor has indicators or criteria that are able to show that an application has met the memorability factor as one of the factors of the success of the performance of the usability factor.(18).

Efficiency

Efficiencyis an indicator used to determine how efficient users are in carrying out several tasks available in the application.(16,17). This indicator is to measure the speed of completing a particular task after studying the design. This factor has indicators or criteria that are able to show that an application has met the efficiency factor as one of the factors of the success of the performance of the usability factor.(18).

Errors

Errorsis an indicator used to find out how many errors are made by users when using the system, and is related to how users correct errors.(16,17). This indicator can show that an application is able to fulfill the error detection factor as one of the factors of successful performance of the usability factor.(18)

Satisfaction

Satisfactionis an indicator that explains the level of user satisfaction in using a design.(16,17). This factor has indicators or criteria that are able to show that an application is able to fulfill the error detection factor as one of the factors of the success of the usability factor performance.(18).

METHOD

Types of research

The type of research used in this study is a qualitative descriptive research method. Qualitative descriptive research is a research method that utilizes qualitative data and is described descriptively.

Place and Time of Research

This research was conducted inLestari Kidney and Hypertension Clinic Semarang. The research was conducted in June-July 2024.

Data Sources and Data Collection Techniques

Data collection in this study used one source, namely the primary data source, namely: the results of interviews with several informants at the Clinic.Kidney and Hypertension Lestari Semarang.Data collection techniques in this study are interviews and documentation.

Methods and Process of Analysis

Data analysis used in this study uses qualitative descriptive techniques. The following are the steps in evaluating the data that has been obtained: 1) The first stage, collecting information in the form of data from the Lestari Kidney and Hypertension Clinic, 2) The second stage, conducting interviews. 3) The third stage is to examine the interview results and evaluate the data. 4) The fourth stage, conducting a discussion with the interview results, 5) The final stage, based on the results obtained in the previous stage, we start to draw conclusions.

RESULTS

The Hemodialysis Patient Monitoring Information System at the Lestari Kidney and Hypertension Clinic in Semarang is a system designed to facilitate health workers, especially doctors, to record patient diagnosis results, facilitate doctors to monitor patient conditions and assist doctors in making decisions about hemodialysis patients. The system designed by the researcher is equipped with examination results such as patient vital signs (TTV), patient diagnosis and further actions to be taken are also recorded in the monitoring system designed by the researcher. This system is designed to only be logged in on a computer that can be accessed by the user or other health workers, such as doctors, nurses who are responsible for the hemodialysis polyclinic. Previously, the Lestari Kidney and Hypertension Clinic in Semarang did not have a special system for monitoring hemodialysis patients, but they had an electronic medical record system to record patient diagnosis results.

Evaluation of the design of the hemodialysis patient monitoring system using the usability testing method. The evaluation aims to assess the monitoring design that has been designed according to user needs through in-depth interviews. Informants for the evaluation of the hemodialysis monitoring system consist of health workers, doctors, nurses and IT.

Learnability

This indicator describes the informant's perception of assessing the overall content of the design including features, logos, displays for ease of use of the system implemented by the researcher. Based on the results of the interview, the majority of informants said that the system design implemented was easy to understand, understandable and very informative, this is evidenced by the informant's statement in the following box:

“Yes, this feature is very informative, considering that the features contained in the design of this hemodialysis patient monitoring system are very well designed. so that it is easy to understand for me, maybe also for my other nurse friends" (P1)

"Yes, in general the whole design is easy to understand from its features. The features were also explained well for each function so I was helped by every feature here (Dr)

"From the dashboard display and navigation, this feature is quite clear, it can help me understand the monitoring design quickly" (IT)

Memorability

In terms of memorability (reminder) based on the interview results, it can be concluded that the majority of informants said that the overall design starting from the logo, features, design colors, etc. according to informants is easy to remember and easy to find the image layout, this is proven by the following statement:

"In my opinion, the design, shape and features are quite good, but the color could be made brighter and more solid, so that it shines brighter" (IT)

“My first impression is very positive. The design looks modern. The features seem complete and the content. Especially in the design of using vital sign monitoring graphics can provide color graphics to make it easy to distinguish” (P1)

"I like the design, images, layout content on the dashboard, it is efficient and informative for me as a nurse. The color is soft, calm green" (P2)

“The design of this monitoring feature caught my attention to monitor the patient's condition and help me as a doctor for further action. (can be an answer option for doctors, miss)” (P3)

“Regarding the warning feature, it makes it easier for us to determine patients. I remember the warning feature the most because it is very important in monitoring patient conditions continuously, I find it easy to find and understand the features, images, and icons of this design. The layout is neatly arranged. Starting from the main page, dashboard to final monitoring. I am very impressed with the design of the trend graph displayed. It helps me analyze data quickly and effectively. (can be for doctors or nurses, sis” (Dr).

Efficiency

In terms of efficiency, according to statements from informants, the designed system is efficient enough to use, the output in the system is according to needs, the completeness of the features, layout and design are also attractive. Here are some statements from informants:

"This design is quite efficient and understandable and of course the hope is that it can produce the desired output, for example, daily reports of patient monitoring actions" (P1)

"I think this design is very helpful in getting the data I need in detail quickly, accurately. The output of the warning design produced is very much in accordance with my needs, namely HD monitoring" (P2)

"The completeness of these features is satisfactory, the layout of the display suits my specific needs, especially for a nurse like me" (P3)

"This feature is custom so it has helped me to make the monitoring process more efficient with a well-placed feature layout, starting from warnings to HD action reports. In general, the dashboard layout is neatly and logically organized, making the monitoring process more efficient. Clear features and attractive colors for monitoring designs can be used to see trends and make decisions based on data, of course it can help in monitoring patients and patient follow-up actions, helping to get information (Dr)

Satisfaction

This stage is the final stage in the usability testing design which explains how to assess the usefulness and satisfaction of users in the overall monitoring design that is designed, based on the interview results it can be concluded that the majority of informants said they were satisfied with the proposed system, this is evidenced by the following statement:

"Quite satisfied with the efficiency of this monitoring system, with the simplest possible design it can help our performance as health workers. No longer taking small notes because sometimes we forget or lose them. It certainly benefits, because it is made to ease the burden on users or health workers on duty. Helps monitor patient health trends" (P1)

"Satisfied because it is in accordance with the custom design of this monitoring. The features provided help give us an overview before in the form of an application. Yes,

"Apart from the good design and increasing monitoring efficiency based on specific needs, it is hoped that in the future it can be realized by clinics" (P2)

"This design is quite adequate and attractive starting from the dashboard and the HD monitoring menu, the display is easy to understand. I hope that as a nurse, this design can improve communication between medical personnel and add clinical information to make it more efficient" (P3)

"I hope this design can simplify the monitoring and recording process so that we can spend more time with patients and provide better, more focused care because it can be more efficient, helping me access complete patient medical history monitoring, helping in better and faster decision making. So I (the Doctor) can see the HD history and clinical records of patients in one platform" (Dr)

DISCUSSION

Based on the research results obtained through evaluationsystem design using Usability Testing, it is known that the existing system is only to record the results of patient examination reports such as electronic medical records in general to store patient data, but not to specifically monitor patients with hemodialysis. Electronic medical records at the Lestari Semarang Kidney and Hypertension Clinic can be accessed every day for every patient arrival and can be screened at the same time. In addition to electronic medical records, Lestari Semarang Kidney and Hypertension Clinic officers also often use paper notes to record patient examination results. What is feared is that using notes that are still stored in regular medical records will be lost. The hemodialysis patient monitoring information system as a solution for reporting and recording hemodialysis patient monitoring.

All results of recording and reporting of hemodialysis patients are recorded in the electronic medical record system and manual medical records. The officers responsible for medical records are the doctor in charge and the officers or nurses on duty in the hemodialysis polyclinic and who can also access the health workers on duty in the room. It is known that health workers including doctors need output in the form of a hemodialysis patient monitoring system in recording and reporting and collecting data for follow-up actions and for decision making in monitoring hemodialysis patients at the Lestari Kidney and Hypertension Clinic Semarang. The Hemodialysis Patient Monitoring System as a solution to provide the required output, output in the form of a Hemodialysis Patient Monitoring System that can be used for recording and reporting and decision making by doctors.

CONCLUSION

Based on the research results and discussion, it can be concluded thatLestari Kidney and Hypertension Clinic Semarang requires an update of the hemodialysis patient monitoring system, it is known that health workers experience several problems that often occur such as limited technology and infrastructure, errors by health workers in recording, limited time and resources and difficulties in coordinating the team. These problems can be overcome by using a hemodialysis patient monitoring system, where users no longer need to record manually, because in the recommended information system there are already sections for recording and reporting each. So there is a need for an evidence-based monitoring system specifically for hemodialysis patients to make it easier for health workers to monitor patients and in decision making. The hemodialysis patient monitoring information system can also store data and guarantee its security because it can only be accessed by responsible health workers and doctors.

SUGGESTION

Stillconduct further research to find out more about the evaluation of the design of a hemodialysis patient monitoring system by examining the input, process and output in more detailLestari Kidney and Hypertension Clinic Semarang.

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