International Journal of Psychosocial Rehabilitation, Vol.24, Issue 01, 2020
ISSN: 1475-7192

# Analysis of Usability Using Heuristic Evaluation Method in The Raycare Hemodialisis Clinic Application

Alivia Yulfitri[1], Ayunda Indarwulan, Riya Widayanti,,Muhammad Benny Chaniago[4]

***Abstract**: Hemodialysis clinic application the raycare hemodialysis clinic medical record application is web-based and can be accessed by medical personnel namely doctors and nurses. Over the past 9 months there have been 4 changes of nurses that have led to the emergence of new nurses which takes about 2 months for features in the application. This time is considered to be less than optimal because the application of patient medical records is important and important in the company's business processes. This research was conducted with a heuristic evaluation method to find the use of problems in interface design. There are ten heuristic aspects that are used, namely: visibility of system status, match between system and the real world, user control and freedom, standards and consistency, help and user recognize, diagnose and recover from errors, error prevention, recognition rather than call flexibility and efficiency of use, aesthetic and minimalist design, and help and documentation. Data collection techniques used were questionnaires, observations and interviews sourced from the heuristic evaluation checklist given to 8 respondents. Evaluation results consist of improved feedback, error messages, help features, letter order, tasks and important items, handling the number of words in the data entry column.*

***Keywords:** Usability, heuristic evaluation, website application.*

## I. PRELIMINARY

Usability is an important aspect in making an application. Based on ISO 9241- 11, usability is a term that indicates the ease of humans to use a tool or other man-made object to achieve certain goals and how easy the use of the application interface can produce the value of user satisfaction in using the product.

Raycare hemodialysis clinic is one of the therapeutic clinics for patients with kidney failure or called dialysis clinics. The Raycare hemodialysis clinic utilizes website-based information technology to store patient medical record data such as body weight, patient's blood pressure, and medicines stored in a database. With the application of the patient's medical record, it is expected that users, doctors and nurses, will be able to obtain ease in inputting patient data while undergoing therapy at Raycare hemodialysis clinic.

The main problem in the application of Raycare hemodialysis clinical medical records is the user interface (UI). The error rate in using an application will be greater when an application has a bad user interface. The application of Raycare hemodialysis clinic patient medical record is an important and crucial thing in the operational business processes because the application is used for more than 8 hours in 1 day and the data inputted is the patient's development data during therapy. This makes medical personnel feel comfortable when using the application.

Based on observations, there have been 4 changes of nurses or application users in the past 9 months. This causes the new

[1] (alivia@esaunggul.ac.id)
(ayunda.indarwulan@esaunggul.ac.id)
(riya.widayanti@esaunggul.ac.id)
Universitas Esa Unggul, Jakarta 1,2,3 Widyatama University 4

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

nurses need about 2 months to study the appearance

and features contained in the medical record application for Raycare hemodialysis patients. This raises the initial hypothesis that users have difficulty when studying the application interface design.

To measure the usability of the interface design and measure the convenience of the application user, it is necessary to evaluate the appearance of the application interface. To evaluate the application interface, heuristic evaluation method is performed. This method was introduced by Jakob Nielsen and Rolf Molich who discussed usability checking techniques using a number of heuristic principles. The purpose of the inspection is to evaluate the user interface (UI) of a product. Heuristics have aspects including, visibility of the system status, compatibility between the system and the real world, user control and freedom, standards and consistency, help users recognize, diagnose and solve problems, prevent errors, the introduction, flexibility and efficiency, aesthetics and minimalist design, and help and documentation features. Evaluation of the application interface aims to measure the level of user usability and comfort when using the application as well as for business needs in assessing system excellence. The results of the evaluation in the form of recommendations as a reference for application improvement and for further research.

## II. LITERATURE REVIEW

### 1. Usability

Usability is a factor that affects an application can be said to be good or not. According to Jakob Nielsen (2012) usability as an attribute of assessing how easily the

application can be used. A good interface design will have an impact on the ease of interaction. Moreover, it can increase value in terms of user satisfaction. The basis of usability assessment is the experience felt by users when using the application. The following are some of the quality components according to Nielsen (2012):

1. Leanability (learnability)

Measuring ease that can be learned even by novice users in using a product for the first time.

2. Efficiency (efficiency)

Measure how quickly the user can do his job after learning the interface.

3. Memorability (memorability)

Whether an application that has not been used for a long time or a new application used once can be remembered by the user.

4. Errors

The smaller the error rate, the better the application. The application can be seen from how many errors that occur when the user uses the application, the extent of the consequences of these errors and how easily a user to overcome the mistakes he made.

5. Satisfaction (satisfaction)

Satisfaction is subjective for each user which includes feelings when using the application, his opinion about the application and others.

### 2. Heuristic evaluation

Heuristic evaluation is one of the most widely used types of usability evaluation. The popularity of heuristic evaluations is that they are fast, easy and inexpensive to implement. This evaluation was stated by Jakob Neilsen and Rolf Molich. The main

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

purpose of heuristic evaluation is to identify problems related to interface design. The evaluator evaluates through the performance of a series of tasks by design and adapted to the criteria of each level. If an error is detected it can be reviewed to be fixed before the implementation phase. The following are ten rules for evaluating heuristics:

1. Visiblity of System Status
2. Match Between System and The Real World
3. User Control and Freedom
4. Consistency and Standards
5. Help and User Recognize, Diagnose, and Recover from Errors
6. Error Prevention
7. Recognition Rather Than Recall
8. Flexibility and Efficiency of Use
9. Aesthetic and Minimalist Design
10. Help and Documentation

## III. RESEARCH METHODOLOGY

### 1. Framework for thinking

Thinking framework is a formula made based on the process of deductive thinking to produce new concepts in order to facilitate a researcher to formulate his research hypothesis. The following is a circular framework in the usability analysis process using the heuristic evaluation method for the clinical application of Raycare hemodialysis.

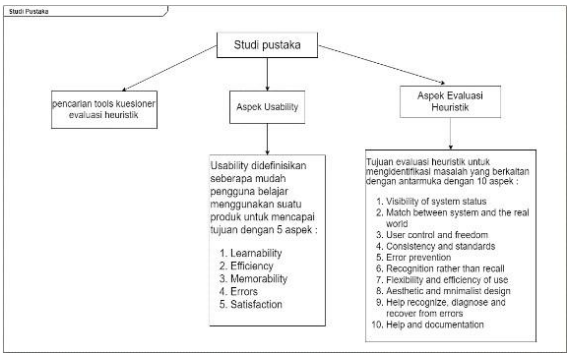



**Figure 1** Literature study

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

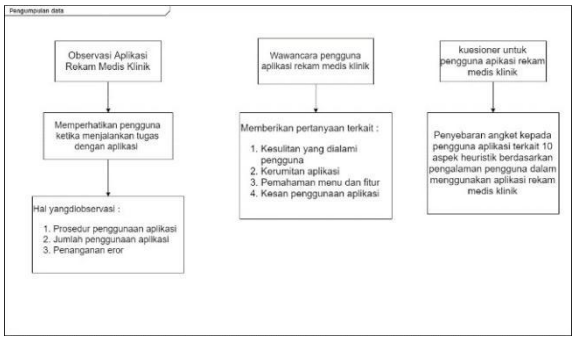



**Figure 2** Data collection

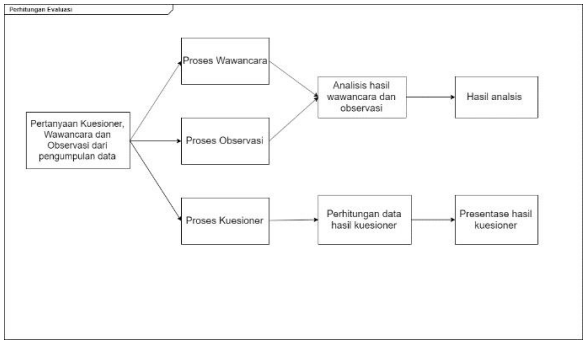



**Figure 3** Calculation of evaluation

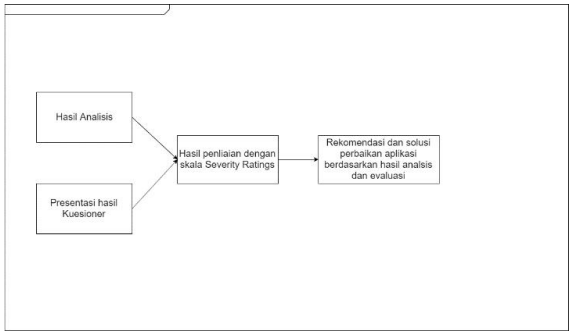



**Figure 4** The recommendation process

## 2. Data collection

Data collection was carried out sourced from a heuristic evaluation-checklist system consisting of 10 aspects of heuristics and 253 question points. To simplify the research process, researchers provide a set of written questions (questionnaires), verbal questions (interviews), and observations (observations) that refer to the heuristic evaluation-checklist system. This was done to make it easier for respondents to provide answers and make all points of the question effective.Furthermore,

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

the data will be converted again into a heuristic evaluation-checklist system questionnaire to facilitate data processing.

### 3. Characteristics of respondents

Information on the characteristics of respondents is used to simplify the analysis process. Information on the characteristics of respondents described is related to gender, age, sub-occupation, length of service and last education. Based on the results of collecting data obtained using questionnaires, the description of the characteristics of respondents can be seen as follows:

**Table 1** Characteristics of respondents

| | | | |
|---|---|---|---|
| Gender | Male | 3 | 37,5% |
| | Female | 5 | 62,5% |
| Length of service | 0 – 5 months | 1 | 12,5% |
| | 6 – 12 months | 3 | 37,5% |
| | 1 – 5 years | 3 | 37,5% |
| | 5 – 10 years | 1 | 12,5% |
| Education | SMA – D3 | 5 | 62,5% |
| | S1 – S3 | 3 | 37,5% |
| Age | 18 – 25 years old | 2 | 25% |
| | 26 – 30 years old | 3 | 37,5% |
| | 31 – 40 years old | 3 | 37,5% |

### 4. Linkages between usability, heuristics and questionnaires

To make it easier at the stage of usability aspect evaluation, a table was made first explaining the relationship between the usability component, heuristic evaluation aspects and indicator number aspects on the questionnaire.

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

**Table 2** links the heuristic usability and questionnaire

| Component of Usability | Heuristic aspect | Aspect questionnaire |
|---|---|---|
| Easy to Learn | • Visibility of System Status<br>• Match Between System and The Real World<br>• Standard and Consistency<br>• Recognition Rather Than Recall | 1<br>2<br>4<br>7 |
| Eficiency | • Visibility of System Status<br>• User Control and Freedom<br>• Flexibility and Efficiency of Use | 1<br>3<br>8 |
| Memorability | • Flexibility and Efficiency of Use | 8 |
| Error Prevention | • Error Prevention<br>• Help and User Recognize, Diagnose, and Recover from Errors | 6<br>5 |
| Satisfying | • Aesthetic and Minimalist Design<br>• Help and Doumentation | 9<br>10 |

## IV. ANALYSIS OF RESULTS

In this study, the results of the interview and in the form of exposure to the results of the author's analysis. The results of the questionnaire in the form of calculating the

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

percentage of 10 aspects of heuristics. The results of the interview presentation are used as evaluation material for the company or further research. The percentage results are used as a guideline for describing the usability aspects of the Raycare Karawaci Hemodialysis Clinic medical record application. After obtaining the percentage of respondents' answers then given an interpretation or assessment of the results of research using the scale of severity ratings.

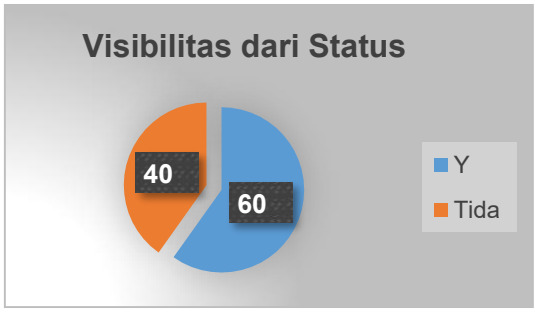
This study uses 3 data collection techniques, namely questionnaire, interview and observation but still refers to 1 source, namely Heuristic Evaluation-Checklist System. The purpose of doing this is because the number of questions at the source is 253 questions, which makes it impossible for researchers to give a number of these questions in full to respondents. The study was conducted for 2 weeks with 8 respondents.

## 1. Wetting research results

Following are the results of the accumulation of research results based on the Heuristic Evaluation-Checklist System source which will be explained in diagram form, based on the diagram drawings, the blue part states "Yes" and the orange part states "No". The answer choices "Yes" to indicate the question item has fulfilled the heuristic aspect while the answer choice "No" has the meaning of not fulfilling the heuristic aspect. The percentage of each aspect is obtained from the calculation formula as follows:

$$\frac{Number\ of\ "Yes"}{Questions \times Respondets} \times 100\%$$

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**



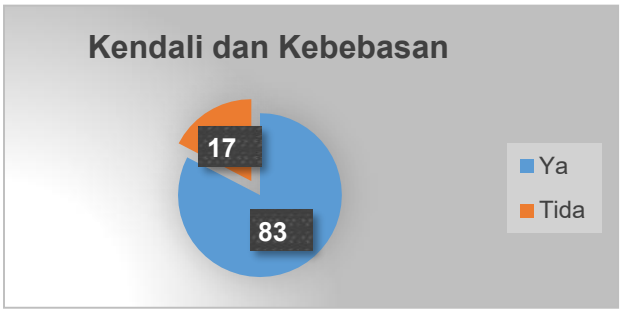




**Figure 5 PIE diagram aspect 1** Based on Figure 5, aspect 1 discusses the appearance and distance of the user's view of the screen content such as icon schemes, menus, feedback, and data entry. Based on the picture above, it can be concluded that from 8 respondents and 29 questions, the medical record application of Raycare hemodialysis clinic patients fulfilled 60% of the visibility aspects of the system status and 40% did not meet the aspects

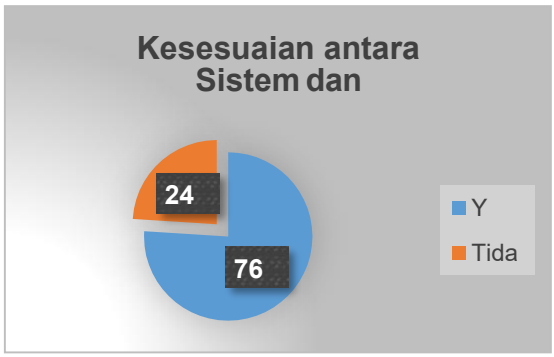
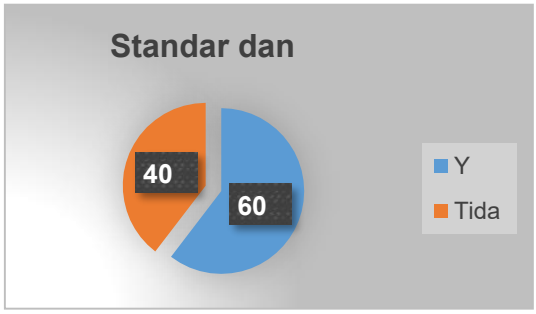



**Figure 6 PIE diagram aspect 2** Based on Figure 6, aspect 2 discusses the system design in such a way that the usercan understand the appearance of the system such as familiar icons, colors that match the color code and clear and simple language so that the user can remember the workflow of the system. Based on the picture above, the application already 76% meets the suitability of the system with the real world in the heuristic aspect and 24% does not meet the aspect.

**Figure 7 PIE diagram aspect 3**

From Figure 7, aspects of user control and freedom, discussing user control in inputting, modifying / editing and canceling ongoing tasks and user freedom to set the work window page to return to the previous menu (undo) or move forward to the next page. Based on the picture above, 83% of the aspects of user control and freedom have fulfilled the aspects and 17% have not fulfilled the aspects

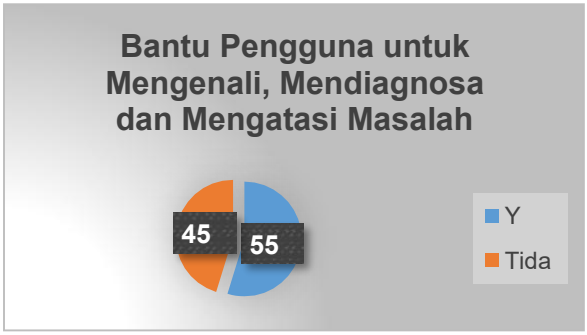
**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**




**Gambar 8 Diagram PIE aspek 4** Berdasarkan gambar 8, aspek standar dan konsistensi secara garis besar membahas mengenai konsistensi sebuah aplikasi yang akan dievaluasi seperti besar huruf, tanda baca, jumlah dan jenis item serta nama objek sistem yang harus konsisten disemua proses dalam sistem. Sebuah aplikasi juga harus mengikuti standar format industri secara konsisen disemua tampilan dan proses pada sistem. Berdasarkan gambar diatas, dari jumlah 51 butir pertanyaan dan 8 orang responden, aplikasi yang diteliti sudah memenuhi 60% aspek konsistensi dan

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

standar. Sedangkan 40% belum memenuhi aspek.



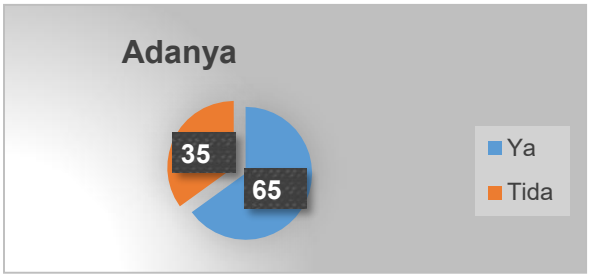
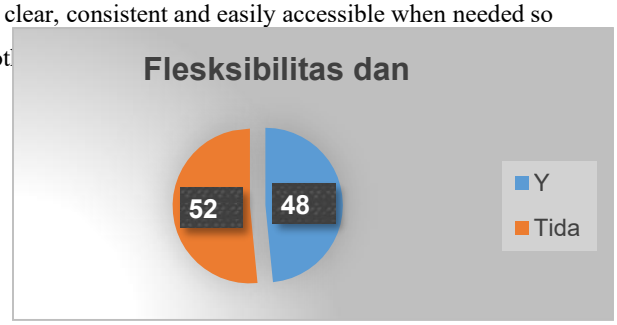




**Figure 9 PIE diagram aspect 5** Based on Figure 9, Aspect 5 discusses the types of error messages and command language in the form of feedback for the user and how the system simplifies the form of error messages so that the user can find out how severe the error is and how the user overcomes the fatigue based on error messages that appear on the system. Based on the picture above, the application fulfills 55%

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

**Figure 11 PIE diagram aspect 7** Based on Figure 11, the 7th aspect of heuristics, namely recognition rather than recall, has items that discuss the system must make objects, actions and choices clear, consistent and easily accessible when needed so that users do not have to memorize information from one page to anot




questions have met this aspect and 35% have not.

of these aspects and 45% has not fulfilled these aspects

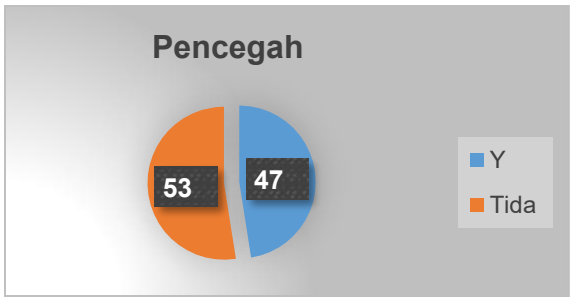



**Figure 10 PIE diagram aspect 6** Based on Figure 10, the error prevention aspect discusses the system design which must prevent users from making mistakes by paying attention to the process of the workflow system starting from which has the most serious consequences and the lowest consequences. The application must also be able to prevent and warn users if they make a mistake. In the picture above, the application meets 54% of the aspects of error prevention and 46% has not met.

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

**Figure 12 PIE diagram aspect 8** Based on Figure 12, the aspects of flexibility and efficiency have 16 questions that discuss the system that must be able toaccommodate users who are experts and users who are beginners. The system must also provide alternative shortcuts such as "find next" and "find previous" and keyboard shortcuts to make it easier for users so that users can work optimally and efficiently. Based on the picture above, the medical record application of Raycare hemodialysis clinic patients has not fulfilled the aspects of flexibility and efficiency, it can be seen from 52% of the questions with answers "No" filled in by respondents. Whereas only 48% of the questions met the flexibility and efficiency aspects.

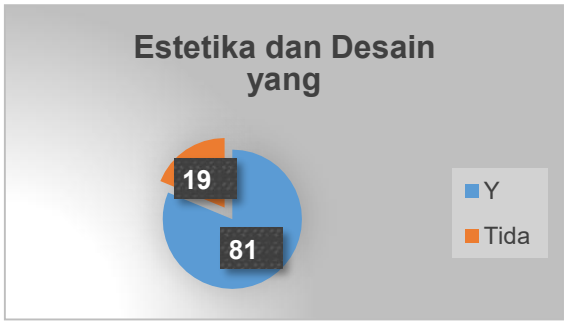
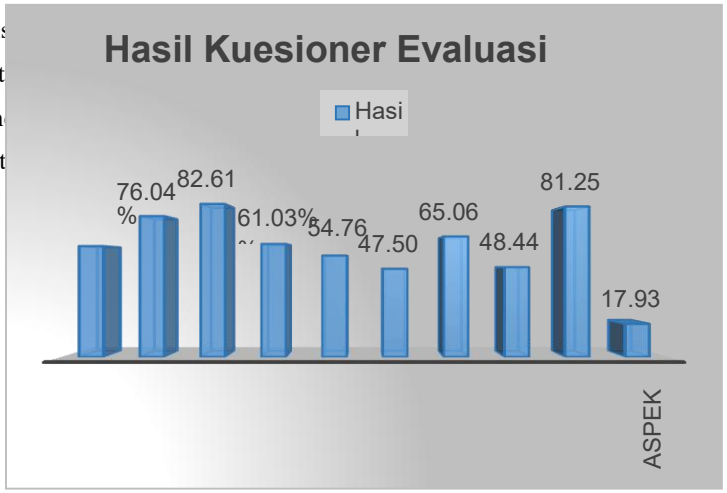
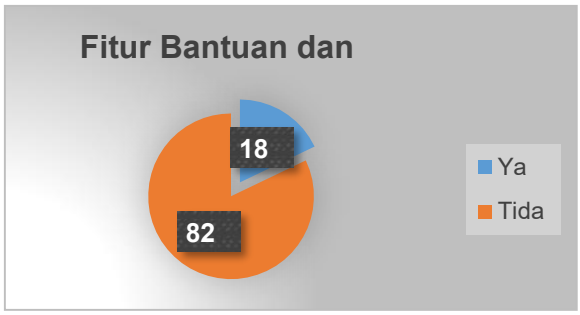



**Figure 13 PIE diagram aspect 9** Based on Figure 13, the minimalis must be comfortable to look at using good color contrast, suitable posit with the appropriate whitespace (spacing between elements) so that th relevant information. Based on the picture above, the application meet 19% of the 12 questions did not meet the aspects.




**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

**Figure 14 PIE diagram aspect 10** Based on Figure 14, aspects of the help and documentation feature discusses the system that must have help and documentation features to be able to solve the problem and its work so that the user can learn everything related to the system. Based on the diagram above, only 18% fulfill the assistance and documentation aspects. And 82% of the 23 questions have not been fulfilled, so it can be concluded that the medical record application of Raycare hemodialysis clinic patients does not meet aspects of the help and documentation features.

Based on the pie chart above that assesses the percentage of the choice of answers in each aspect, the authors simplify the percentage form into graphical form of each aspect of the heuristic evaluation checklist in the medical record application of Raycare hemodysalysis clinic patients. In this study, the percentage value is said to meet the heuristic aspect if it gets a percentage of> 50% and the term does not meet the heuristic aspect if it gets a percentage value <50% referring to the total percentage that is100%.

ASPEK ASPEK ASPEK ASPEK ASPEK ASPEK ASPEK ASPEK ASPEK

**Figure 15 results of the evaluation questionnaire**

## 2. Recommended Research Results

The results of this discussion show the results of the usability analysis using heuristic evaluation methods used to identify problems related to interface design and to assess the usability of the interface design and measure user comfort.

The next step is to analyze the data obtained so that it becomes information in order to describe the problem to be solved. Problem solving in the form of severity

ratings and interface improvement recommendations. Here is a table of results of analysis with severity ratings scale.

**Table 3 severity ratings table**

| Aspect | Many Problems | *Severity ratings* |
|---|---|---|
| 1 | 5 | 2 (Minor) |
| 2 | 1 | 1 (Cosmetic) |
| 3 | 1 | 1 (Cosmetic) |
| 4 | 10 | 3 (Major) |
| 5 | 2 | 1 (Cosmetic) |
| 6 | 3 | 2 (Minor) |
| 7 | 7 | 3 (Major) |
| 8 | 3 | 2 (Minor) |
| 9 | 0 | 0 (Don’t agree) |
| 10 | 11 | 4 (Catastrophic) |

**Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019**

Discussion of the conclusions of the usability analysis results in the application of Raycare hemodialysis clinical medical records as a whole application has fulfilled the heuristic aspects of the system visibility aspects of the system has been informing the user about what is happening. From the second aspect, the application has adjusted the appearance that is commonly used and familiar to users. Aspects of user control and freedom, the application has provided features that free the user in operating tasks on the application, one of which is the undo, redo and edit features. The application already uses a system and display that refers to consistent company standards so that users easily understand the situation and the action on the application. The next aspect, the application has helped users find out the error message using good grammar, but the current system is not optimal in fixing problems. The error prevention aspect only needs to maximize the design of the system which prevents errors from occurring. The introduction aspect of this application can be seen from the presence of whitespace on choices and actions that make instructions and information clearly visible when needed. Flexibility and efficiency in the application still has shortcomings that new users have difficulty and require a long time to operate the application, but the application becomes flexible because of the features "find next" and "find previous". Appearance design of the application is very fulfilling heuristic aspects. Display the title, menu and data entry column is consistent, simple and clear. The aspects of the help and documentation features of the Hemcare Medical Hemodialysis Clinic medical record application need to create a help feature to help users learn everything that is on the system.

**CONCLUSION**

Based on the descriptions that have been stated in the previous chapters, as well as the final project plan to be designed, the conclusions that the author gets are as follows:

1. The study was conducted on the medical record application of Raycare hemodialysis clinic patients, with 8 respondents who were application users.
2. Research uses a heuristic evaluation method to assess the usability of the interface, and measure user comfort, and to meet business needs in assessing system excellence.
3. The study used 3 data collection methods, namely questionnaires, interviews and observations sourced from heuristic evaluation checklists consisting of 10 aspects with a total of 253 questions.
4. The research results show the percentage of each aspect. 7 out of 10 aspects have fulfilled the heuristic aspects in the medical record application of Raycare hemodialysis clinic patients, while the 3 aspects have not met the aspects and need to be maximized again for user convenience.
5. There are 8 aspects that have problems and are given recommendations for improvement from severity ratings to improve system appearance. As well as 2 aspects that have met the heuristic aspects, namely aspects 3 and 9
6. Recommendations from aspects that have not been fulfilled namely discussing feedback, error messages, using letter order for menu listings, limiting the number of characters in the data input column, identifying tasks and important items with color and implementing the help feature for users.
7. Draft recommendations are made by Mockup with Balsamiq Mockup software.

**REFERENCE LIST**

(Toyama & others, 2010)Bertot, J. C., Snead, J. T., Jaeger, P. T., & McClure,

C. R. (2006). Functionality, usability, and accessibility. *Performance Measurement and Metrics*.

Dumas, J. S. (n.d.). *Janice (“Ginny”) Redish A Practical Guide to Usability Testing. Intellectbooks, 1999.*

Nielsen, J. (1995a). How to conduct a heuristic evaluation. *Nielsen Norman Group*, *1*, 1–8.

Nielsen, J. (1995b). Severity ratings for usability problems. *Papers and Essays*,

*54*, 1–2.

Nielsen, J., & Landauer, T. K. (1993). A mathematical model of the finding of usability problems. *Proceedings of the INTERACT'93 and CHI'93 Conference on Human Factors in Computing Systems*, 206–213.

Toyama, K., & others. (2010). Human-- computer interaction and global development. *Foundations and Trends®in Human--Computer Interaction*, *4*(1), 1–79.

(Nielsen, 1995a)(Nielsen, 1995b)(Bertot et al., 2006)(Dumas, n.d.)(Nielsen & Landauer, 1993)