Information System For Receiving Inpatients For Covid-19 Cases

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Abstract—Coronavirus (Covid-19) cases are increasing now and it makes the hospital should be ready to receive patients. The problems faced made the queues of patients mixed up, between general patients and Covid-19 cases, which overwhelmed the officers in serving. So it should be a must for the hospital to upgrade the system of inpatient administration, especially for Covid-19 patients. The information system of inpatient administration for Covid-19 cases has become a very important thing to simplify the performance of officers, make reports easier to be more computerized, and simplify the administrative process to be easier and more efficient. The research method of this research is done by interview and observation, where the information system development is using the design uses data flow diagrams with the implementation of visual studio 2010 programming language and the database is using Microsoft Access. based on the results obtained from Covid-19 inpatient admission system, the system input consists of log-in form, new patient data entry form, inpatient registration form, and doctor form. Testing using the Black box, which results in a successful test for each form. The test results in the input that generates an as-expected output. The design has created an information system for receiving inpatients for COVID-19 cases according to needs which are obtained from the interview with the IGD registration officer at the hospital "X" in Bandung. This information system is very helpful for hospital management and improves the quality of service of the hospital.

Keywords; Information system, Covid-19, DFD, Hospitalization

I. INTRODUCTION

Corona Virus (COVID-19), is one of the diseases that infect the respiratory tract caused by a new type of coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV-2) was first discovered in Wuhan China in December 2019. At the end of January 2020, the World Health Organization (WHO) declared that the state of emergency caused by the virus has almost spread throughout the world, including Indonesia[1]. When people infected with coronavirus will experience tightness, including in breathing and causing tightness light to medium and or require special care. But older people, and have a history of diseases such as heart disease (CVD), diabetes, breathing chronic, and cancer is more likely to develop serious diseases when infected with this virus [1].

In Indonesia, the spread of Covid-19 has spread to almost all provinces of Indonesia. That requires health workers to fight at the forefront of handling Covid-19 cases. According to, the establishment of referral hospitals to combat certain emerging infectious diseases, informing hospitals should be ready in the treatment of patients in cases of Covid-19. Hospitals in dealing with pandemics must maintain the quality of services, where the information system must still be implemented.

At this time, the role of technology, especially information and communication systems, is needed to help several processes in the field of health. Especially the admissions section of inpatients. From the results of research conducted at one of the "X" Hospitals in Bandung, hospital officials experienced difficulties in the acceptance of incoming patients, including general patients and Covid-19 patients. Limited information systems hampered hospital services. While the information system has the function of saving time, effort, and cost. To improve the service health by the quality of service, it is necessary to be changed to the system used to be more effective and effective[2].

By [3] researching the inpatient registration system with the results of the system runs according to the needs and can manage the data precisely and accurately. Research on inpatient information systems has generally been conducted [4] [5] and can create circumstances that ease the work of health workers so that their performance becomes optimal. However, previous research is

still limited to information systems for inpatients, but in this paper specifically for the analysis of admission information systems for inpatient cases of Covid-19 that have never been made. The update of the research is that the information system is specifically intended for Covid-19 cases. It is believed that there needs to be an update because it is urgent so it must have a separate integrated information system.

II. THEORETICAL FOUNDATION

A. Medical Records

According [6], [7] to medical records are files contains notes and documents about patients contain patient identity, examination, treatment, and also medical measures managed by government and private health care facilities. Medical Record is a file that contains records and documents regarding identity, examination, diagnosis of treatment, actions, and other services provided to patients during hospitalization, whether carried out in outpatient units, inpatients, and emergency units[8][9].

B. Information Systems

Information systems, many experts have opinions on what is an information system. According to [10][11]system information is a system that can collect information from all sources and use media to display information. While according to [12] information system is a system that exists in an organization that has the function of uniting daily transactions and also supports information that provides the necessary reports.

C. Database (Microsoft Access)

According to [13] a database is a system that has several data files and is integrated and has a primary key that aims to repeat data. Databases not only store information about people, but can store products, orders, or other data.

D. Visual Basic 2010 Applications

In today's technological developments, information is needed for example for science, science, and insight. Then the information system is getting more advanced and growing, one of which is Microsoft Visual Studio, according to [14] Microsoft Visual Studio is Complete software with a programming language that gets used to performing development applications on the computer. Microsoft Visual Basic can be used to create business applications, personal applications, or application components. Then the designer took advantage of the development of the times by designing an information system for admission of inpatient cases of covid-19 following what is needed by hospital "X".

E. Software Research Methodology

In this study development file using 1100 waterfall. A waterfall is often also with a Linear Sequential model. System development may be old, but simple.
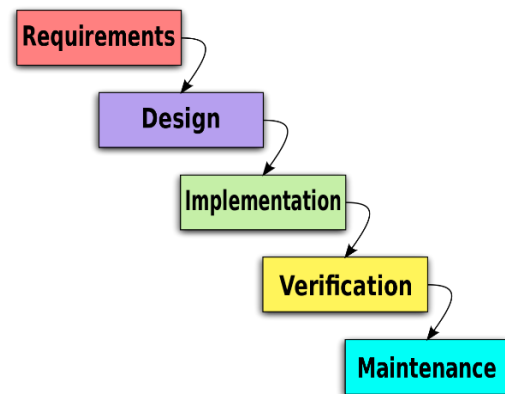

Figure 1. Waterfall Development Methodology [15][16]

According to [17] the stages of the waterfall cycle in figure 1 are :

1) System Analysis
   This modeling has a stage of finding the needs according to the applied. Hospital "X" analyzes the information system of admissions of inpatients. Analyzing the workings such as inputs, processes, outputs, and their shortcomings so that improvements can be made.

2) Requirements Analysis
   Contains the analysis of software in the hospital. This analysis serves to determine the fugsi needed so that the program can be used by hospitals.

3) Planning
   The process that contains the above needs into a form of blueprint or design before coding. The design contains an overview of inputs and outputs that have not been synced.

4) Coding (program writing)
   To facilitate the machine, coding programs are created using the programming language. This stage is an implementation of the interface to the coding so that the system can run.

5) Testing
   In this design, we are conducting tests using... black-box method. The black box test is a software-centered test without looking at program structure internally.

6) Maintenance
   At this stage, it is expected to always back up data periodically and make developments as needed.

F. Data Collection Techniques

The data collection techniques are as follows:

1. Observation
   Observations were conducted at "X" Hospital in Bandung from April to June 2021, during the observation and careful review of the conditions that occurred in

the field, especially in the admissions system.

2. Interview

It is a data collection by way of Q&A to obtain accurate data. Interviews are submitted to field supervisors and hospital IGD officers.

III. RESULT AND DISCUSSION

A. System Analysis

The information system technology is growing. Almost all health installations already use computerized. The results of interviews and observations in the field produce information for the development of the system. When the pandemic began, there was a lack of efficiency in the admission of patients to be treated at home. therefore, the development of the system is very much needed. So that the place of admission of general inpatients and cases of Covid-19 can be distinguished. Here is the flow of admission of inpatients in Covid-19 cases at "X" Hospital.
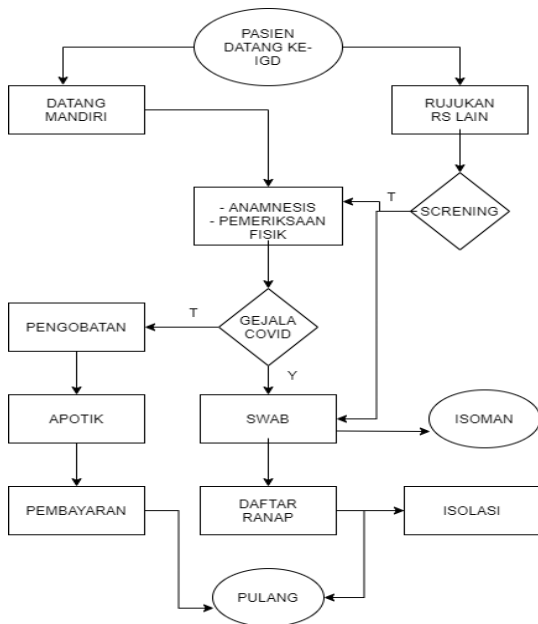

Figure 2. The flow of admission of inpatients in Covid-19 cases

Judging from figure 2, patients come to IGD or outpatient polyclinics of their voles or there is a referral from the first health care facilities, patients who have symptoms of covid-19 will be instructed to do a SWAB test or other covid-19 test. If the patient is declared negative will perform the treatment, as usual, then if the patient is declared positive covid-19 will be given a choice between self-isolation or conducting treatment in the hospital according to the existing procedure.

Then the stage needed after conducting interviews and observations in the hospital is that

the admission system of covid-19 cases will greatly facilitate the division of duties for medical record officers. The admission system for covid-19 cases includes patient identity, laboratory test results, screening.
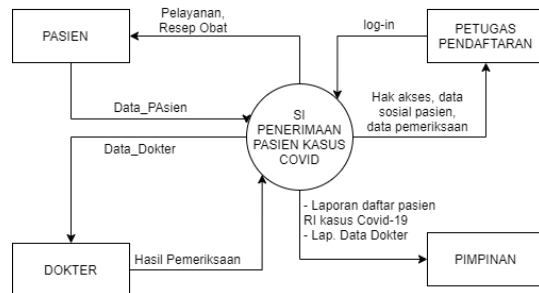
a. Diagram Contex

Figure 3. Diagram Context

In figure 2 of the Context Diagram process, the system is built to include a system containing admins that provide data about patients, data on the doctor who handles, a list of inpatient data, and a system that will inform the hospital leaders in detail and relevant information that facilitates the management of hospital administration.

b. Diagram Flow Diagram Level-0

Furthermore, the flow of the system to be created is created Flow Diagram Diagram Level-0 flow where the task is to explain the flow of data from input to output. Where the level 0 diagram only describes the basics of the system alone without explaining it more broadly. Here's what level 0 diagrams look like.
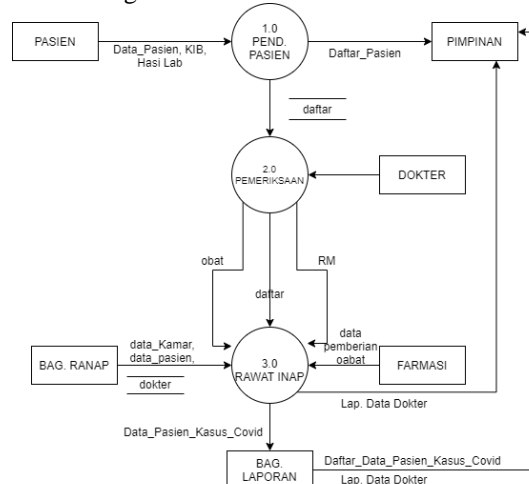

Figure 4. DFD Lev-0

A Level 0 Flow Diagram (DFD) is describing how the first flow or process of each process is created. Figure 3 has the main processes namely the registration process (1.0), the examination process (2.0), the inpatient process (3.0) and there is a reporting process. However, the design only discusses the registration process and does not

discuss how the officer conducts the reporting process.

c.   Data Flow Diagram Level 1 process 1.0 dan level 1 process 2.0

After you finish creating DFD level 0, the next step is to create a level 1 DFD with process 1.0 where the process is detailed in more detail. DFD level 1 aims. Give an idea of. overall system. depth than DFD level 0. Guidelines for creating DFD level 1 are similar to DFD level 0, among others:

- Input, where is the process. this should be able to produce output.
- The output here is generated by inputs that have previously gone through the process.
- An output generated from the resulting process must have a relationship with the input provided.

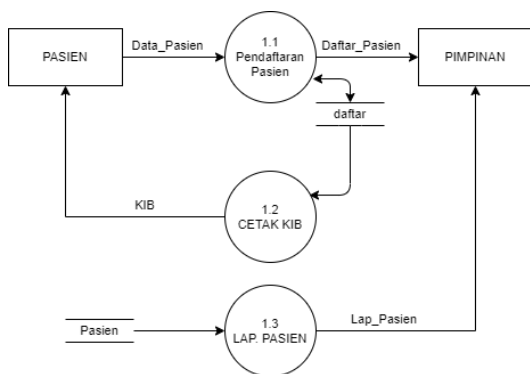Here's an image depicting DFD level 1 process1.0

Figure 5. DFD Level 1 Process 1.0

Furthermore, the DFD level 1 process 2.0 on patient examination.
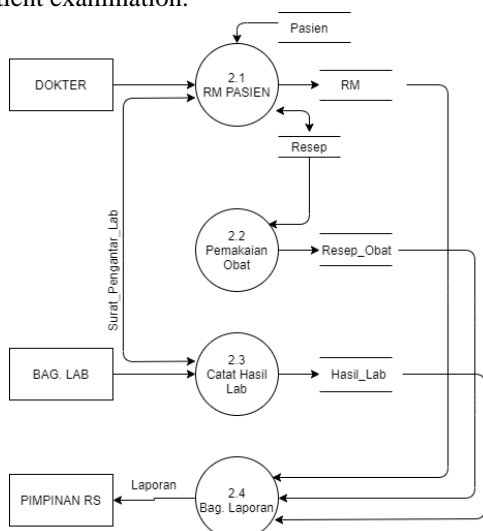

Figure 6. DFD Level 1 Process 2.0

Figure 6 has the first process in (2.1) the patient's medical record will be given room to see the previous history of the disease, after which the doctor will prescribe the drug if the patient has a history of other diseases from the diagnosis of covid-19. If the patient needs a laboratory check to see if they still have symptoms of covid-19 or not. All of that will be recorded in the patient's medical records. After the examination process is complete, the medical record officer will capture the data of incoming and outgoing patients to be made a report to the hospital leader.

When carrying out their duties, officers should always apply health protocols that are always using masks and recommended to use medical masks, hands-on, and hand sanitizers are available. In the admissions system of coved cases, the registration officer must always focus on filling in the data and registering patients. So that no misinformation is biased to harm officers and hospitals.

B.   Database Design

Data table of new patients hospitalized cases of covid-19 at Hospital "X" in Bandung. The inpatient data table is a collection of data generated from data input in the registration section. The keyword in the new patient data table is no rm.

Next, create the Entity Relational Diagram (ERD) design. According to (Budi et al., 2017) ERD is a database model whose modeling is used to generate conceptual data models. ERD has a rational database, and the conditions are good-down or top and down.
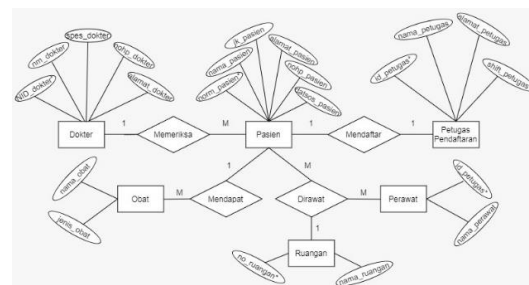

Figure 7. *Entity Relationship Diagram (ERD)*

C.   System Planning

The results of the design of the program or inputs made in the admission information system of inpatient cases of covid-19 made using Visual Studio 2010 are as follows

a.   Log-in View

Figure 8. Program Log-in View

The view in figure 8 is a log-in view by first entering the user name and password so that not everyone can access the information system.

b.   *New Patient Data Entry View*

Figure 9. New Patient Data Entry View

Figure 9 explains about each patient who.. it's the first time. come or seek treatment at Hospital "X" will be registered in advance to get a medical record number, even if it is a patient case of covid-19.

The officer will ask the patient before he has been treated or not, if the patient comes is the first time then the officer will tell the patient or the patient's family to fill out a new patient form at a special table. And after passing several stages of the process, the patient will be directed to perform treatment according to the procedure. In the admissions section, the information system will be automatically filled in about the identity of the patient who has registered.

c.   *Inpatient Registration Form Display*

Figure 10. Inpatient Registers Form Display

Figure 10 describes the names of new patients listed in the hospital database, the officer will be easy when updating patient data. When covid-19 case-patients enter do not forget to enter the registration date, room name, and doctor who handles covid-19 case-patients in the hospital. The next process will be to take the patient to the isolation room according to the procedure.

d.   *Doctor Data Form View*

Figure 11. Doctor Data Form View

Figure 11 describes the registration officer queuing up the data of the doctor who performs the task every day. The doctor's data form will be useful in reporting to be given to hospital leaders as well as reports to the center.

e.   *Officer Data Form View*

Figure 12. Officer Data Form View

Figure 12 contains the data form of the officer who cares and guards in the isolation room (nurse). Not only doctor data input into the system but the data of nurses who care and the guard must also still be included in the system for reports.

D. *System Testing*

System testing has the meaning of the most important part of the stage of information system development. System testing aims to show that the information systems built are of good quality and worth using. Testing this information system using the black box testing method. Black box testing tends to be applied during the final stages of testing conducted to find errors in the category: the functions are not true or missing, interface error, error in a data structure or access database.

a.   *System Testing*

Testing the information system using inputted data as already created, here is a test plan that has been built.

Table 1. Testing Plan

Test Item	Description	Test Type

Log-In	Logging into the system	*Black Box*
Form Data Patient	Add new patient data	*Black Box*
Form Registration	Add patient data to a room	*Black Box*
Form Doctor	Add doctor data	*Black Box*
Form Officer	Add officer data	*Black Box*

Table 2. Testing Log-in

Test Cases and Results (Normal Data)	
Input Data	User: Admin1 Password: RanapCovid
Expected	Log-in successfully goes to the next page
Observation	Log-in successfully < to form menu
Conclusion	[X] Successful [ ] Fail
Test Cases and Results (Incorrect Data)	
Input Data	Incorrect Log-in data
Expected	Incorrect log-in data and display messages
Observation	Users cannot log in if data does not match data in the database
Conclusion	[X] Successful [ ] Fail

Table 3. Patient Data Form Testing

Test Cases and Results (Normal Data)	
Input Data	Input patient data such as No RM, Patient Name, etc.
Expected	Patient data was successfully saved to the database
Observation	Patient data was successfully saved to the database
Conclusion	[X] Successful [ ] Fail
Test Cases and Results (Incorrect Data)	
Input Data	No RM Blank
Expected	Display a "data not found" dialog message
Observation	Data will not be saved if the medical record number is not inputted
Conclusion	[X] Successful [ ] Fail

Table 4. Testing Form Registration

Test Cases and Results (Normal Data)	
Input Data	Input patient data such as No RM, Insurance, patient name, etc.
Expected	Patient data was successfully saved to the database
Observation	Patient data was successfully saved to the database
Conclusion	[X] Successful [ ] Fail
Test Cases and Results (Incorrect Data)	
Input Data	No RM blank
Expected	Displays the "No RM required" dialog message
Observation	Data will not be saved if the medical record number is not inputted
Conclusion	[X] Successful [ ] Fail

Table 5. Testing Doctor Form

Test Cases and Results (Normal Data)	
Input Data	Input NID Doctor
Expected	Doctor data was successfully saved to the database
Observation	Doctor data was successfully saved to the database
Conclusion	[X] Successful [ ] Fail
Test Cases and Results (Incorrect Data)	
Input Data	NID Doctor blank
Expected	Display the "NID Doctor must be filled in" dialog message
Observation	Data will not be saved if the Doctor's NID is not inputted
Conclusion	[X] Successful [ ] Fail

Table 6. Testing Officer Form

Test Cases and Results (Normal Data)	
Input Data	Input ID Officer
Expected	Officer data is successfully saved to the database
Observation	Officer data is successfully saved to the database
Conclusion	[X] Successful [ ] Fail
Test Cases and Results (Incorrect Data)	
Input Data	ID Officer blank
Expected	Display the "Officer ID required" dialog message

Observation	Data will not be saved if the Officer ID is not inputted
Conclusion	[X] Successful [ ] Fail

From the testing conducted using black-box testing in table 2 when the user and password are entered by the data then the process is successfully run and when deliberately doing not correspond to the system data on the program encountered a bug (error). In tables 3, 4, 5, and 6 when entering data according to the type of data the system is running well, and the data can be saved, changed, search and delete according to the button commands that have been designed. If the data input does not match the type of data that has been set, then the system encounters a bug (error). All of this gives you an idea as expected.

IV. CONCLUSIONS

From the results of research that has been done on the system running in Hospital X in Bandung and has adjusted the data to the system designed according to the needs and desired in the field, whether the system is by the description of the material that has been discussed earlier, it is concluded that. With the information system of an admission of inpatient cases of covid-19 that has been developed from the existing system, it is by the original goal that the information system will make it easier for officers in the management of inpatient data of covid-19 cases with general patient inpatient data. So the report. needed will be. faster and more efficient. The designed application can manage patient data well, where the system can input, edit, search, save, delete, and update data. Visual Basic is an easy program to apply and learn. With the advantages of Microsoft Access database is one of the data processing managers that are easy to learn.

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