

## Electronic Medical Records Management of Top 10 Outpatient Diseases Using the Waterfall Method

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### Abstract

This study aims to describe several problems related to data processing of the top 10 outpatient diseases. The research method used is a qualitative research method with a descriptive approach and a waterfall software development method, while the data collection techniques used are observation and interviews with medical record staff. In the research, problems were found such as diagnoses that were difficult to read by poly officers, the existence of duplicate tasks for medical record officers and recording still using manuals filled in by poly officers which were then inputted into the Microsoft Office Excel program and only made worksheets to then be processed back into the top 10 outpatient disease reports. The suggestions given for problem solving are the coordination between officers and doctors regarding the writing of diagnoses, the addition of medical record officers to reduce the workload and the design of a software that can facilitate the process of processing data on the top 10 outpatient diseases using Visual Studio 2012. So that the final report on the top 10 diseases can be accurate and can improve the quality of service in the hospital.

Keywords: Design; Top 10 Diseases; Electronic Medical Records; management

### 1. Introduction

Hospital is one of the public service institutions in the health sector that requires the existence of an information system that is reliable and accurate and also sufficient to improve service to patients and other related environments. Health services in hospitals require support, one of which is the provision of medical records according to existing and applicable standards.

A medical record is required for all health services, including those provided in hospitals. According to Health Ministry Regulation No. 24/MENKES/PER/2022, medical record is "A file that contains various kinds of documents and notes regarding the patient's identity, examination results, service actions, treatment, and other matters that have been given to the patient"(Regulation of the Minister of Health of the Republic of Indonesia regarding Medical Records, 2022)

This medical record is a service system that is much more effective and efficient and also allows users to feel the benefits of the services provided by the hospital. Medical records are responsible in the process of processing patient data starting from the assembling process, analysis, assigning disease codes, to creating indexes and hospital reporting.(Adiyanti et al., 2021). Medical record activities that have an influence on the quality of medical services in hospitals are data processing, especially in providing disease codes, creating indexes and actions(Angela et al., 2022). The hospital is used as one of the facilities that has the function of being a health service center for people who are supposed to provide medical services.

The Hospital Management Information System is used to manage services and aims to help develop the management of medical services in hospitals (Muryanti et al, 2018)(Rahmawati et al., 2023)Visual Basic is a program to create or

create an application program based on Microsoft Windows in an easy and fast method. Visual Basic provides tools to create a simple application program to very complex or complex application programs, both for an organization or company or agency that uses a much larger system (T.N. Putri et al., 2022).

Muhammadiyah Bandung Hospital is one of the hospitals that provides health services for inpatients, outpatients, or emergency departments. The medical record data processing system at the Muhammadiyah Bandung Hospital already uses a computerized system both in the registration section and other data processing. The data processed into computerization was previously processed data from files completed by officers then after completion of manual processing it will be inputted back into the computer including patient data, visits, actions and final diagnoses. Bandung Muhammadiyah Hospital has several problems that occur, the information system processing for the top 10 outpatient diseases is what I'm interested in researching since in Muhammadiyah Bandung Hospital it's still intermingled with disease codes that aren't directly associated with the disease or action, leading to inaccurate disease categorization. As a result, the author plans to develop a design or information system program that helps data processing officers recognize and assist 10 major outpatient diseases.. It is hoped that this program will be more efficient and effective and make it easier for officers to categorize the top 10 outpatient diseases at Muhammadiyah Bandung Hospital.

## 2. Methodology

In this study the author will use a qualitative method that uses a descriptive approach that represents the situation and conditions that occur in the field, especially regarding the information system for the top 10 outpatient diseases and accuracies with the existing theory then designed to be an electronic-based medical record management for the top 10 outpatient diseases using the waterfall method. In an effort to collect data as complete as possible during the preparation of this journal, the authors use several methods:

### a. Observation

A form of report from the results of observations and observations carried out

by researchers during observation activities(A.L. Putri et al., 2021).Observations were made in the casemix section to find out the flow of outpatient admissions in each poly, then the authors conducted an analysis to find out the data processing of the top 10 outpatient diseases in each poly.

### b. Interview

Interviews are one of the data collection techniques that are often used for research or in-depth research and overall observation of a phenomenon that is an object of research. (Hofisi et al, 2014) (Hansen, 2020).

## 2.1. System Development Methods

This research uses a software development method using the waterfall method, where the software development model is often used. This method will not run if the previous stages do not run (Wahid, 2020). The waterfall method represents the development of a model that presents the stages of software life rules with an influential system that can be mentioned sequentially by preceding the stages of analysis, design, coding, testing and supporting parts (Nurseptaji et al., 2021).

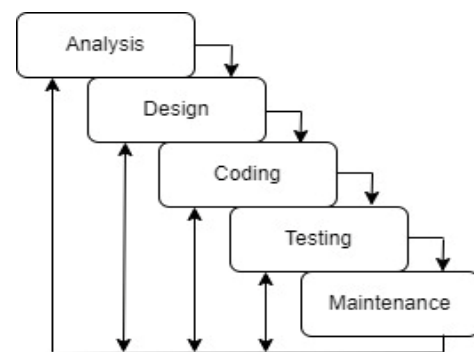


Figure 1. Waterfall Method Model

The steps for the software development method using the waterfall method include:

### 2.1.1. Analysis

The step where all the requirements needed to carry out software development are checked. This stage can be carried out through interviews or observations in order to obtain the necessary information.

### 2.1.2. Design

Design is a stage in creating specifications regarding program architecture, appearance, style, and also the need for materials for the program (Afrianti & Musril, 2020). The previous specifications can be applied to help the system as a whole.

### 2.1.3. Coding

Coding is writing a set of code according to the syntax and certain writing rules of the programming language used in a computer programming language that has determined the specifications to be made or done (Ramadhan et al., 2020).

### 2.1.4. Testing

Software testing stage that is carried out to find problems and ensure that the input is in accordance with the desired results.

### 2.1.5. Maintenance

Comprehensive implementation accompanied by maintenance if there are changes to the structure in terms of hardware or software.

## 3. Results and Discussion

### 3.1. Results

The author's observation at the Muhammadiyah Bandung Hospital in the process

of processing the top 10 outpatient diseases still uses writing from the polyclinic register book which is then entered into a Microsoft Office Excel worksheet and processed again to then make a report

Top 10 outpatient diseases. The flow of procedures for reporting the top 10 outpatient diseases at Muhammadiyah Hospital in Bandung includes several stages, including:

- 1) Patients register at the registration section,
- 2) The patient enters the polyclinic room to be given procedures and treatment
- 3) The doctor makes a diagnosis,
- 4) The police officer writes the diagnosis and action,
- 5) Medical records officers input patient data,
- 6) Officers process the top 10 outpatient illnesses.

### 3.2. Discussion

The description of the results of the research and tests carried out by the researchers discussed the information system flows needed by making processing features for the top 10 outpatient diseases as explained below:

#### 3.2.1. Flow chart

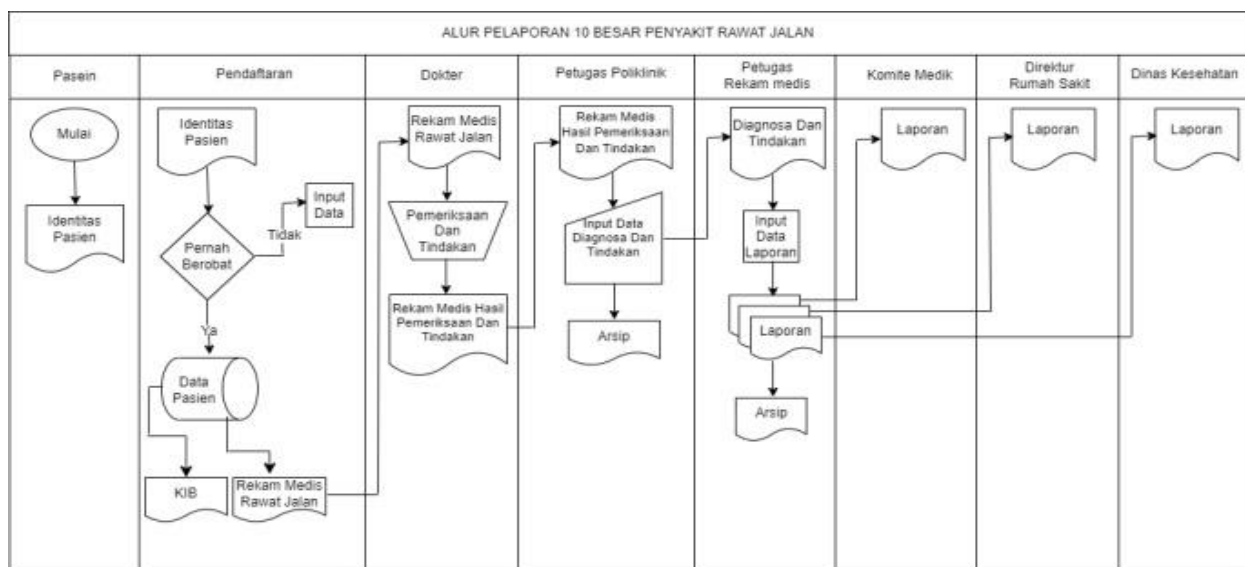


Figure 2. Designed system Flowchart

The submission flow starts from the patient admin input in the identity in the registration section in the form of an ID card (Resident Identity Card) and BPJS (Social Security Administrative Agent). After that, the patient has been treated or not, if yes, then the patient data is entered into the outpatient medical record and gets a KIB (Treatment Master Card). Then an examination and action is carried out by the doctor and the diagnosis and action are entered by the polyclinic staff and then archived. Then the medical record officer inputs the report data for the report to be submitted to the medical committee, the director of the hospital and the health service. Complete data is then stored in Hospital Management Information System.

### 3.2.2. Diagram Context

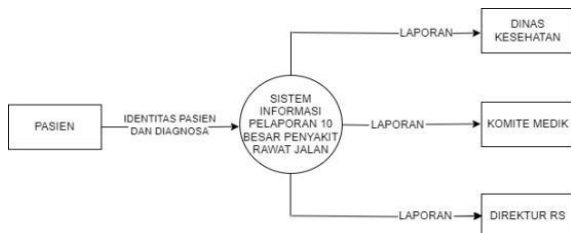


Figure 3. Designed Context Diagram

The Information System for the top 10 outpatient diseases designed to represent a context diagram that includes processes and also describes the scope of a system.

### 3.2.3. Data Flow Diagram (DFD)

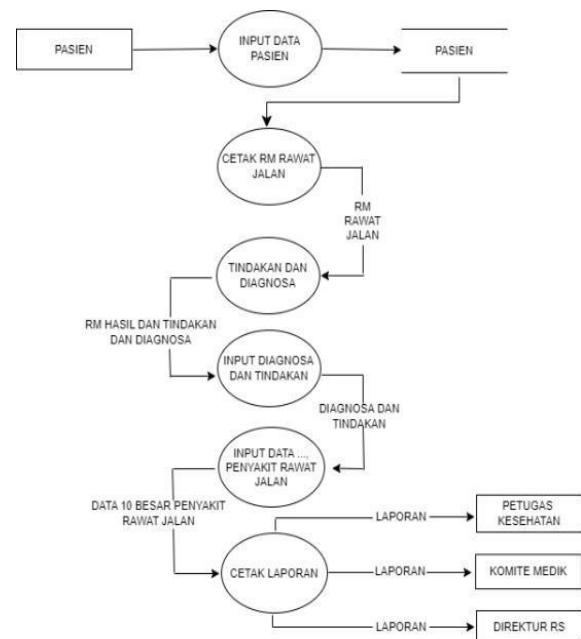


Figure 4. DFD design

In DFD there is a patient entity where the patient's identity data is inputted into the patient datastore, then prints the outpatient medical record, where the patient takes action and is diagnosed by a doctor. The results of the diagnostic action are inputted again for further processing into a report which will be reported to the Health Service, the Medical Committee and the Director of the Hospital. From the data processing system for the top 10 outpatient diseases that are running, there are several problems that exist. For this reason, the authors have designed a system that can streamline time and improve the quality of reporting. And by adding features related to data processing of the top 10 outpatient diseases.

### 3.2.4. DFD Diagram (User)

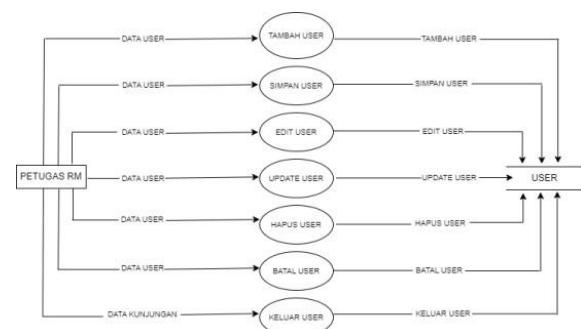


Figure 5. User Process

In the DFD User Diagram, the medical record officer inputs user data in the form of adding users and then saving them, editing if the user data is not appropriate and updating the user data, then if there is an error in the user data, then it is deleted, canceled, and exited.

### 3.2.5. Process Patient Data DFD

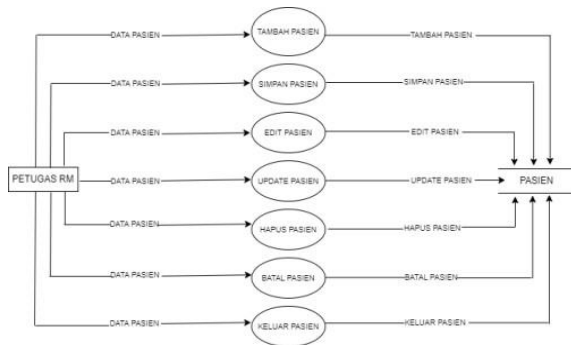


Figure 6. Patient Data Process

In DFD Patient Data Processing, the medical record clerk inputs patient data then saves it and edits if there is an error and updates the patient data, then deletes or cancels and exits if patient data is found that does not match the data.

### 3.2.6. Doctor Data Processing DFD

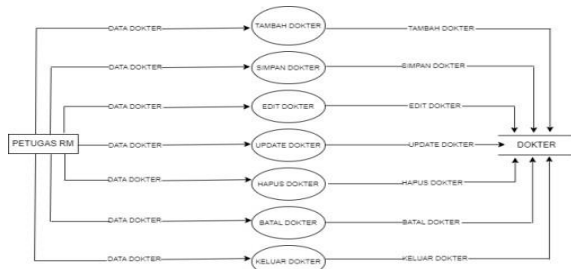


Figure 7. Doctor Data Process

In the Doctor Data Processing DFD, the medical record officer inputs user data in the form of adding doctor data and then storing it, editing if the doctor's data is not appropriate and updating the doctor's data, then if there is an error in the doctor's data, it is deleted, canceled, and exited.

### 3.2.7. Poly Data Process DFD

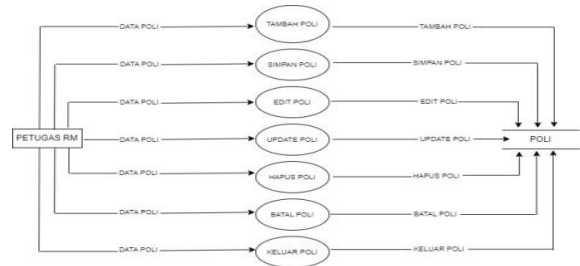


Figure 8. Poly Data Process

In DFD Poly Data Processing, the medical record clerk inputs poly data then saves it and edits if there is an error and updates the poly data, then deletes or cancels and exits if poly data is found that does not match.

### 3.2.8. Process Diagnostic Data DFD

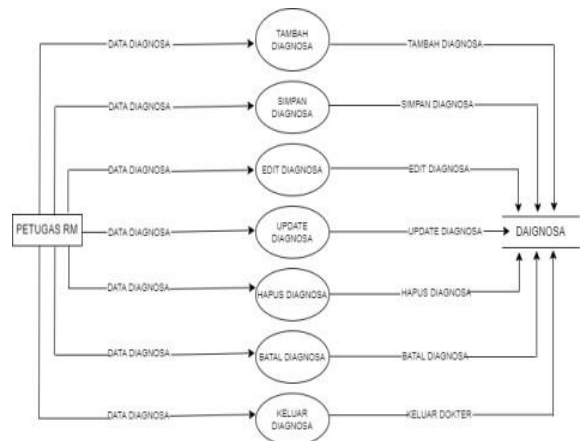


Figure 9. Diagnostic Data Process

In the DFD Diagnostic Data Process, the medical record clerk inputs diagnostic data in the form of adding diagnostic data and then saving it, editing if the diagnostic data is not appropriate and updating the diagnostic data, then if there is an error in the diagnostic data it is deleted, cancelled, and exited.





In the main menu of the information system for the top 10 outpatient diseases, there are several data menus, the authentication menu, login, logout and exit, then there is a master menu, user, poly, doctor, patient and disease input data, then there is a visit input menu, input menu. visits and reports.

### 3.3.2. Login Form

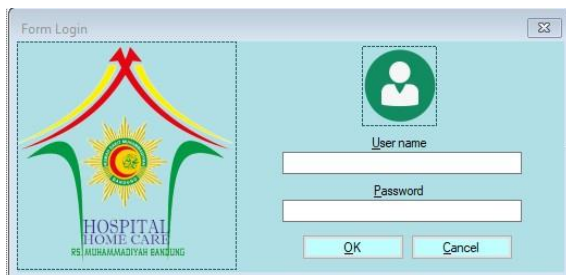


Figure 14. Login Form

Before accessing the information system for the top 10 outpatient diseases, the author designed a login form which aims to manage the users of the information system for the top 10 diseases so that it can be used by registered users.

### 3.3.3. User Input Menu



Figure 15. User Input Menu Form

The user data form menu contains the name of the user who can access the information system for the top 10 outpatient diseases which aims to find out the user name and security of user data by using a password. And with authentication, only the admin login can access user data input, otherwise everyone can add user data.

### 3.3.4. Poly Input Menu Forms

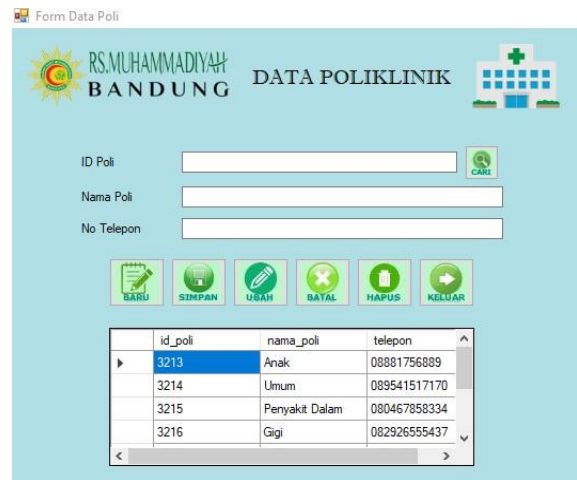


Figure 16. Poly Input Menu Form

The poly data form aims to input poly data including the name of the existing poly and the poly contact to provide information on the existing poly. To make it easy for officers to ask for the information they need.

### 3.3.5. Doctor Input Menu Forms



Figure 17. Doctor Input Menu Form

Doctor data Forms is intended to collect doctor data including the identity of the doctor in charge of health services at the outpatient clinic at Muhammadiyah Hospital Bandung.

### 3.3.6. Patient Input Menu Forms

nomor_rm	nama_pasien	tanggal_lahir	umur	jenis_kelamin	alamat	pr
321561	Marchelo Sefa R...	2/9/2018	5	Laki-laki	jalan cimuncang ...	Pe
321562	Astri Septina	7/10/2010	12	Perempuan	jalan padasuka n...	Pe
321563	Andini Maharani	1/18/2003	20	Perempuan	jalan pahlawan n...	Mz
321564	Muhammad Fade...	9/23/2000	22	Laki-laki	jalan cikutra no. 45	Mz

Figure 18. Patient Input Menu Form

The patients Forms have been adjusted to the variable and metadata guidelines in administering electronic medical records. These guidelines must become a reference for health facilities, providers of electronic health systems, health workers, all parties interested in managing electronic medical records, as well as becoming standard data elements to facilitate compatibility and interoperability of data in the electronic systems they develop. (Guidelines for Variables and Meta Data in the Implementation of Electronic Medical Records, 2022). The patient data form aims to input patient data including the identity of patients visiting the outpatient unit.

### 3.3.7. Disease Input Menu Forms

id_penyakit	kode_icd	nama_penyakit
321600	H02.1	Ectropion of eye
321601	K06.9	Disorder of gingi
321602	J20.9	Acute bronchitis
321603	I63.9	Cerebral infarctio

Figure 19. Disease Input Menu Form

In the disease input form there is a collection of disease tabulations based on ICD 10 codes.

### 3.3.8. Visit Input Menu Forms

tgl_kunjungan	no_rm	nama_pasien	jenis_kelamin	diagnosa	kode_icd	cr
1/3/2023	321563	Andini Maharani	Perempuan	Ectropion of eyelid	H02.1	Uh
1/8/2023	321564	Fauzan Muham...	Laki-laki	Asthma, unspecifi...	J45.9	BF
2/15/2023	321565	Daffa Ramadhan	Laki-laki	Migraine with aura	G43.0	Uh
2/19/2023	321566	Amelia Khalisa	Perempuan	Cataract, unspeci...	H26.9	Uh

Figure 20. Visit Input Menu Form

The visit menu forms is the main source of data required by the top 10 outpatient disease information system, which aims to input outpatient visit data including the identity of patients who have previously been entered in the patient input data or who already exist. And patient diagnosis data that has been determined by doctors from each outpatient clinic. Which can then be processed into a report that can be printed out for hospital needs.

### 3.3.9. Quarterly Period Report Output Forms

LAPORAN KUNJUNGAN PASIEN  
 RUMAH SAKIT MUHAMMADIYAH BANDUNG  
 Jl. K. H. Ahmad Dahlan No. 53 Kota Bandung

7/28/2023

tgl_kunjungan	no_rm	diagnosa	dokter_penanggung_jawab
1/3/2023 12:00:00AM	321563	Ectropion of eyelid	Vinan Keysa, Sp.M
1/8/2023 12:00:00AM	321564	Asthma, unspecified	Asyifa Miasan, Sp.PD-KP
2/15/2023 12:00:00AM	321565	Migraine with aura	Asyifa Miasan, Sp.PD-KP
2/19/2023 12:00:00AM	321566	Cataract, unspecified	Rina Dwi Saisabla, Sp.M
2/28/2023 12:00:00AM	321567	Disorder of gingiva and eden	Chika Lia Anggreani, Sp.BM
3/11/2023 12:00:00AM	321568	Otitis	Bara Hasyid, Sp.IHI
3/10/2023 12:00:00AM	321569	Endocervix	Sinta Lauran, Sp.UG (K)(Onk)
3/23/2023 12:00:00AM	321570	Cerebral infarction	Rizky Januar, SpS(K)
3/25/2023 12:00:00AM	321571	Fracture of tooth	Chika Lia Anggreani, Sp.BM
3/26/2023 12:00:00AM	321572	Delayed Milestone	Juna Ananda Putra, Sp.A(N)
4/17/2023 12:00:00AM	321573	Acute bronchitis, unspecified	Abdul Hadi, Sp.A(K)
4/29/2023 12:00:00AM	321574	Acute sinusitis, unspecified	Raihan Zakiah, Sp.IHI
5/11/2023 12:00:00AM	321575	Febrie convulsions	Rasendira Safna, Sp.S
5/22/2023 12:00:00AM	321576	Specific spelling disorder	Abdul Hadi, Sp.A(K)
5/3/2023 12:00:00AM	321577	Acute gingivitis	Muhammad Reyhan, Sp.Rad
5/5/2023 12:00:00AM	321578	Corneal scar and opacity, uns	Rina Dwi Saisabla, Sp.M
5/13/2023 12:00:00AM	321579	Acute laryngitis	Bara Hasyid, Sp.IHI
5/14/2023 12:00:00AM	321580	Urinary tract infection, site no	Siska Fauzia, Sp.O(K)
5/28/2023 12:00:00AM	321581	Diabetes mellitus with ketoac	Yenna Chelsya, Sp.PD-KEM
6/22/2023 12:00:00AM	321582	Hypertensive renal disease w	Rizky Januar, SpS(K)
5/16/2023 12:00:00AM	321577	Acute gingivitis	Muhammad Reyhan, Sp.Rad
5/23/2023 12:00:00AM	321577	Acute gingivitis	Muhammad Reyhan, Sp.Rad
5/30/2023 12:00:00AM	321577	Acute gingivitis	Muhammad Reyhan, Sp.Rad
6/6/2023 12:00:00AM	321577	Acute gingivitis	Muhammad Reyhan, Sp.Rad

Figure 21. Quarterly Period Report Form



The report output forms is the result of processing visit data that has been entered previously. Where there is information on the ranking of the top 10 diseases in the outpatient unit for three months. It can then be printed out for reporting to the relevant agencies, but previously reported to the medical committee and hospital director for review.

### 3.3.10. Top 10 Diseases Report Output Forms



No	Kode ICD	Diagnosa	Jumlah
1	E10.Y	Diabetes mellitus with ketoacidosis	25
2	I12.Y	Hypertensive renal disease withoi	20
3	H26.Y	Cataract, unspecified	18
4	J45.Y	Asthma, unspecified	17
5	I63.Y	Cerebral infarction	15
6	J20.Y	Acute bronchitis, unspecified	13
7	H92.U	Otitalgia	10
8	R56.U	Febriile convulsions	8
9	N59.U	Urinary tract infection, site not spc	7
10	G43.U	Migraine with aura	6

Figure 22. Top 10 Disease Report Forms

The output form for the top 10 diseases report contains information about patient visits who come for treatment at the hospital, where this data can be accessed through various filters including by date period, quarterly, yearly, as well as medical record number, diagnosis, doctor, and patient name. Can be printed out and used for reporting patient visit activities.

### 4. Conclusion

Based on the results of research conducted at the Muhammadiyah Hospital in Bandung, the author's review concluded that the processing system for the Top 10 Outpatient Diseases at the Muhammadiyah Hospital in Bandung still uses writing from the polyclinic register book which is then input into a Microsoft Office Excel worksheet and processed. back for a report. This processing system can display reports on the top 10 outpatient illnesses based on a certain period. The problem that often occurs is that police officers have difficulty reading the doctor's diagnosis results in outpatient medical records which results in the input process in the register book being hampered, medical records officers who do the reporting experience double duty because they are not only inputting data for the report. Thus, it is necessary to design and create a computerized information system that can speed up and simplify data

processing. By designing a computerized information system for the top 10 outpatient diseases using the Microsoft Visual Studio 2012 programming language that the author has designed, it can reduce the workload of medical record officers and optimize the available time to make it effective and efficient.

### 5. Suggestion

Based on the results of the research, there are some suggestions or input regarding the implementation of recapitulation activities for the top 10 outpatient disease reports at the Muhammadiyah Hospital in Bandung. It would be better for the Medical Records Unit to provide a sheet to agree on the doctors' writing rules, so that errors do not occur when coding diagnoses. To optimize the reporting process for the top 10 outpatient diseases, it is necessary to design an integrated computerized information system to make it easier for officers to process data input and data processing, so that the time required is efficient and the report results are quality.

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