



DESIGNING A DIAGNOSE CODE PREDICTION SYSTEM IN ORDER TO SUPPORT MEDICAL RECORD ELECTRONIC GOVERNANCE USING AGILE METHOD

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Abstract : Build an electronic medical record system that can support health services for the community in the Primary Health Center work region is the goal of this study. The goal of this system is to replace the existing one, which is still largely manual and naturally requires a lot of resources in terms of time, money, and energy. This study's system development methodology techniques employ the AGILE methodology. According to research findings, there are many different types of issues, including 1). Health service activities are not integrated into any system, and medical record activities are manually installed. 2). There is no medical record reporting because the medical record unit is thought to be restricted to simply documenting the health services that patients received also The utilization of medical records and maintaining the quality of medical records cannot be maximized because KLPCM were not carried out. 3). Morbidity Codification and classification are only for referral patients and BPJS users.

IndexTerms - Medical Record Electronic, Information System, AGILE, Primary Health Center, Morbidity Codification and Classification.

I. INTRODUCTION

According to Health Services of the Ministry of Health of the Republic of Indonesia (2009) are "any efforts organized alone or jointly in an organization to maintain and improve health, prevent and cure diseases and restore the health of individuals, families, groups and or communities"

In this case, hospitals are an important part of the health system. The hospital provides complex curative services, emergency services, knowledge transfer centers, and technology.

According to WHO (World Health Organization) permanently staffed by at least one physician, can offer inpatient accommodation, and can provide active medical and nursing care

In supporting excellent hospital services, it has become a mandatory part to be supported good medical record management. For its management, Medical Records are divided into several work activity units, namely: Patient Registration, Medical Record File Assembling, Medical Record Distribution, Medical Record Return, Medical Record Filling, Daily Census, Qualitative Analysis and Quantitative Analysis of Medical Records, Disease Codification, V claims insurance, any indexing report using medical record, Reporting to Medical Record File Retention.

In its implementation, Medical Recorders often have obstacles, one of which is the discrepancy in the disease code in Hospital reporting and V Claim Insurance as well as in the Medical Record File. Disease codification itself has rules that are permanently determined, for its implementation some disease codifications can be not the same or appropriate because the coding process follows the rules in sequence. This is a big obstacle where medical recorders are faced with the choice to match the rules or according to the actual disease. It is also a matter of time to get the right code, usually, if you follow the rules of codification it will take quite a long time and if the coding is done by not following the rules in sequence it will be more able to cut time.

According "Accuracy of Clinical Codification based-on ICD-10 in Primary Health Center and Hospitals in Indonesia: A Literature Review" by Angga Eko Pramono¹ Nuryati² Dian Budi Santoso³ Marko Ferdian Salim⁴ from Departemen Layanan dan Informasi Kesehatan, Sekolah Vokasi, Universitas Gadjah Mada, "The coding application must comply with ICD-10 to get the correct code so that it reflects the actual health condition." Their research sought to determine the level of clinical categorization accuracy and the factors that influence it in Indonesian primary health care and referral health care institutions (hospitals). A systematic literature review was applied to a number of published research articles from 2009 to 2019. Three online databases, 19 journals, Google Scholar, and online proceedings were used to gather literature. The total number of papers received was 458, with 45 publications meeting the research criteria. According to the majority of the papers, the accuracy rate of diagnosis code at primary

health centers is 26 - 45% and in hospitals is 21 - 81%. Previous research has also found that the availability of suitable standard operating procedures and facilities, as well as the coding audit, are determinants of code accuracy. To support a high-quality health-reporting system, the diagnosis code must be improved. Efforts to improve should not be limited to a few factors, but should be carried out extensively in all areas.

After that, the researcher discovered "KETEPATAN KODE DIAGNOSIS PENYAKIT UNTUK KLAIM BIAYA DITINJAU DARI BERBAGAI LITERATUR" by Indah Kristina, Fenita Purnama Sari Indah, and Vicy Varia Detyas. According to their findings, the correctness of diagnosis codes in medical records is critical for claiming fees and assuring high validation. A specific main diagnosis simplifies coding and reporting, making it easier for officers to analyze and report on disease recapitulation reports. A literature study found that the accuracy of disease diagnosis codes for cost claims is not perfect, with factors such as coder competence, lack of participation in coding seminars, and less readable diagnoses contributing to inaccuracies. Factors influencing inaccuracies include unclear diagnoses, lack of training, experience, and errors in coding for the main code." This demonstrates how critical Morbidity Codification correctness is. Using ICD X is sufficient to become a justification for this research.

Designing a Diagnose Code Prediction System in Order to Support Medical Record Electronic Governance Using AGILE Method was the title chosen by the researcher. The outcomes of codification directly conflict with the results of codification based on illness codification principles, according to observations of issues that are frequently a barrier to disease codification. There are some instances where the codification that does not adhere to the guidelines is more appropriate for treating the condition than the codification that does. Large hospitals also need a lot of coders because the codification process seems to take a while. With this program, it is anticipated that work effectiveness will enhance by reducing workload.

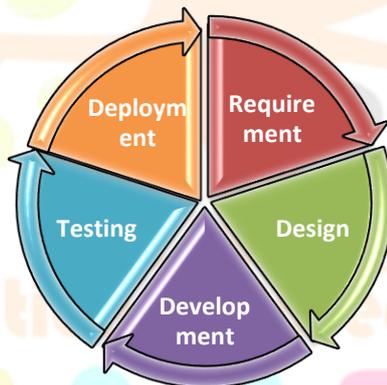
II. RESEARCH METHODOLOGY

This study system development methodology techniques employ the AGILE methodology

2.1 Design Method

The researcher's purpose in this study is to create a new system that will make the work of a medical recorder easier; for system development methodologies, the AGILE methodology is used. Agile Methodology is a people-centered, results-oriented approach to software development that takes into account our continuously changing world. It is based on adaptive planning, self-organization, and rapid delivery. It is adaptable and quick, and it strives for continual quality improvement through the use of technologies such as Scrum and Extreme Programming.

Figure 1 Agile WorkFlow



2.1.1 Requirement

The requirement process is the first stage of designing a system using the Agile Method. It involves identifying problems and analyzing the process to determine what is truly required to create in the new system and what can be repaired in the existing system. The requirement process could be an observation procedure, an interview process, a literature study, or anything else. At this stage, the Researcher conducts a Medical Record Management problem analysis at the Primary Health Center in order to discover what needs and systems must be designed or built.

2.1.2 Design

The second phase is design, which involves creating a general perspective of the new system that will be developed, as well as planning the major process and the main purpose of the new system that will be built. This step typically employs diagrams to describe the system's details.

At this stage, the previous analysis results are used as a benchmark to determine what type of system is formed, and the system is designed using a model-based visual design using the tools flow map diagrams, context diagrams, data flow diagrams (DFD), and entity relationship diagrams (ERD).

2.1.3 Development

The following process is the development build process of the new system, such as a computerized program, WEB, and so on. At this point, the process will employ third-party applications and programming languages to create a new one, such as Visual Studio, PHP, Python, XML, and so on. After the system modeling is completed, the Researchers put it into action by creating an information system.

2.1.4 Testing

The testing process is carried out to determine whether the system is functioning properly, to identify the system's advantages and disadvantages, and to determine whether there are any issues that need to be addressed in the system.

The testing process is carried out to evaluate whether the system is functioning properly, to identify the system's benefits and drawbacks, and to determine whether any faults with the system need to be addressed.

2.1.5 Deployment

The final procedure is the deployment of a completed system that has been designated fit for use by the relevant departments and requires the system to work.

At this stage, the outcomes of the previously created system are implemented, which can then become an information system that can subsequently be used to produce information and related data needed by managers.

III. RESULTS AND DISCUSSION

3.1 REQUIREMENT

In this phase, the researcher analyzes the activities related to the researcher's scientific work at the Primary Health Center, beginning with the running system, problems with the running system, typical solutions for running system problems, and what causes problems in the running system.

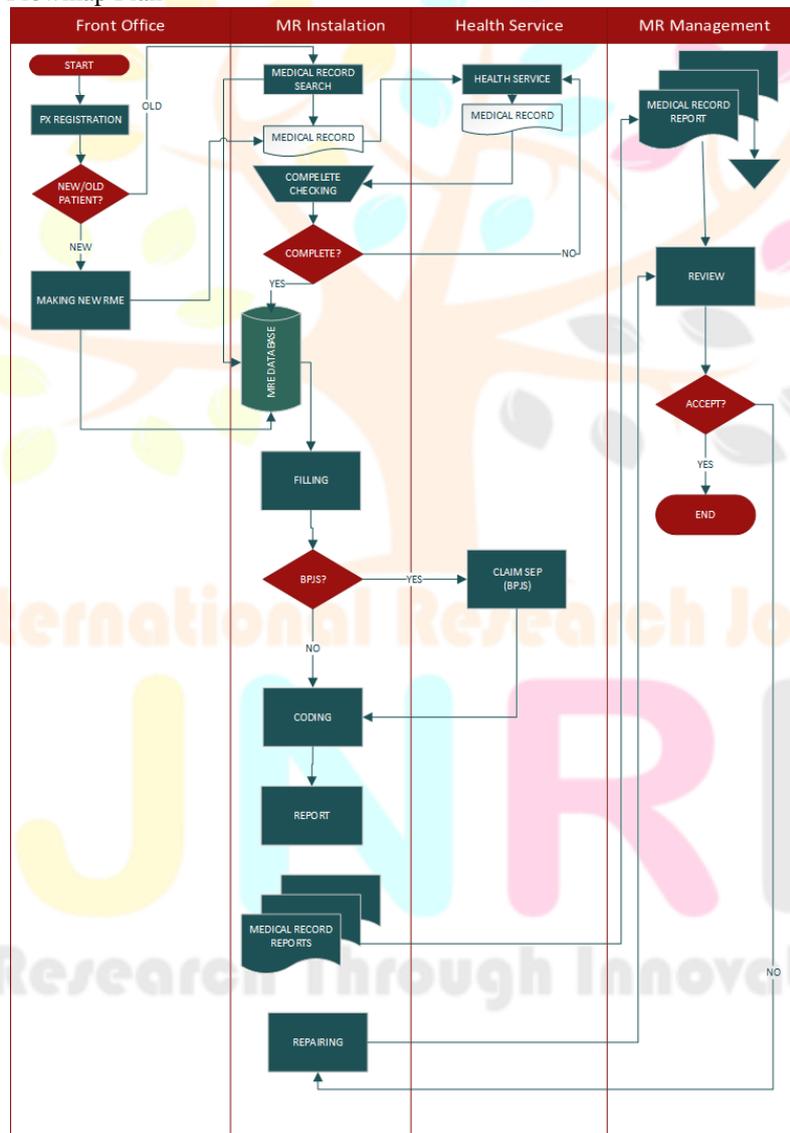
The following findings can be derived based on the analysis of the medical service system at the Primary Health Center:

- a. The patient registration process is still done manually using a register book
- b. The registration program can only be used to check up patient medical record numbers and not to register patient visits.
- c. Due to double data (double names/double numbers), the medical record search procedure is hampered.
- d. There are no registration data findings to report.
- e. Medical records are entirely on paper.
- f. Disease coding is only available for referral patients and BPJS Kesehatan users.

3.2 DESIGN

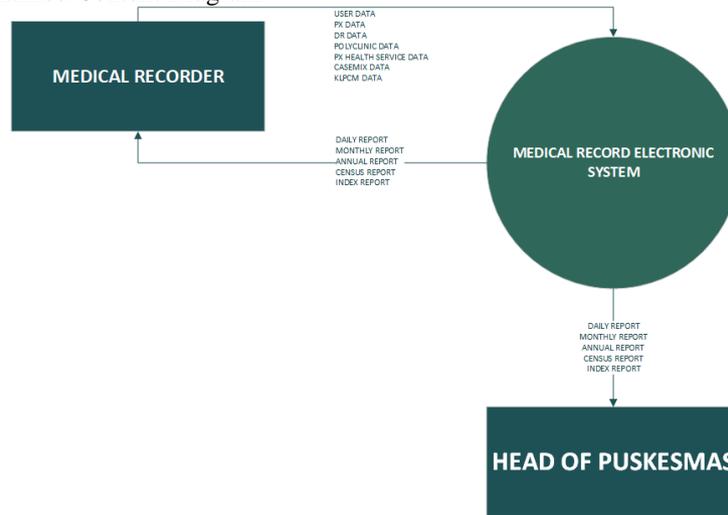
The system that researchers propose can be described as follows:

- a. Proposed Flowmap Plan

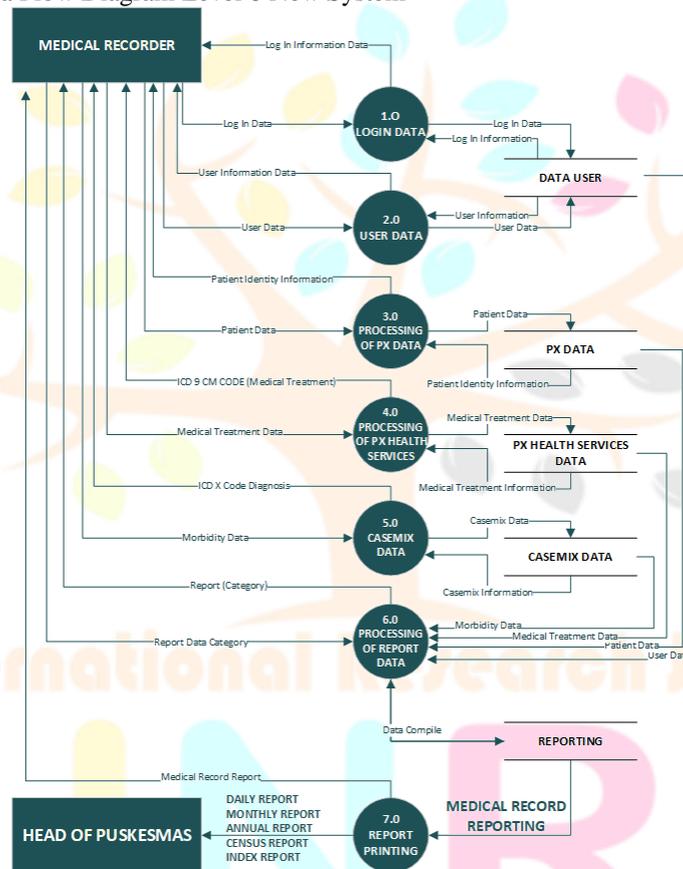


b. Proposed DFD Plan

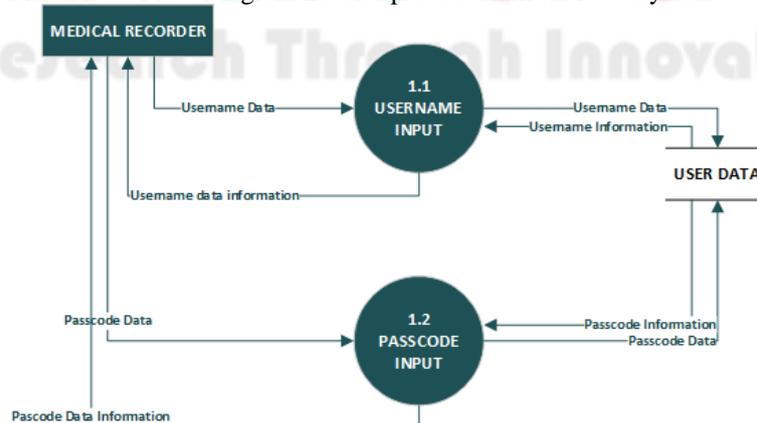
1) Planned Context Diagram



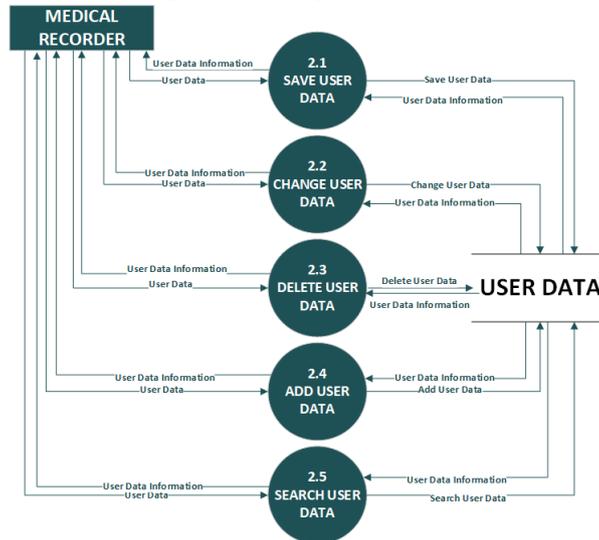
2) Data Flow Diagram Level 0 New System



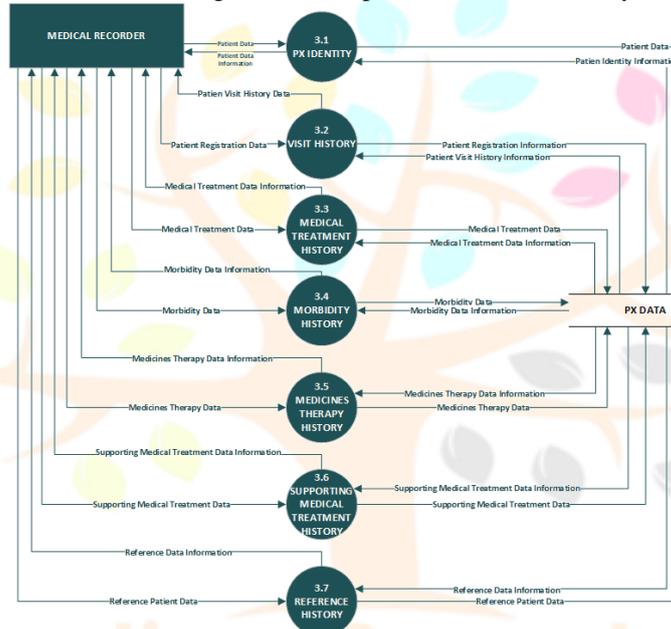
3) Planned Data Flow Diagram Level 1 process 1.0 from New System



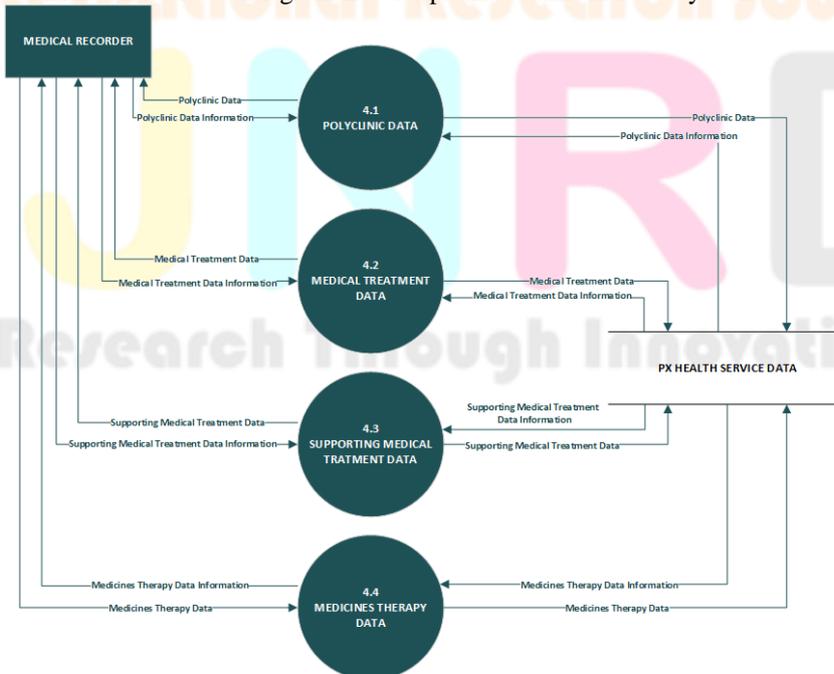
4) Planned Data Flow Diagram Level 1 process 2.0 from New System



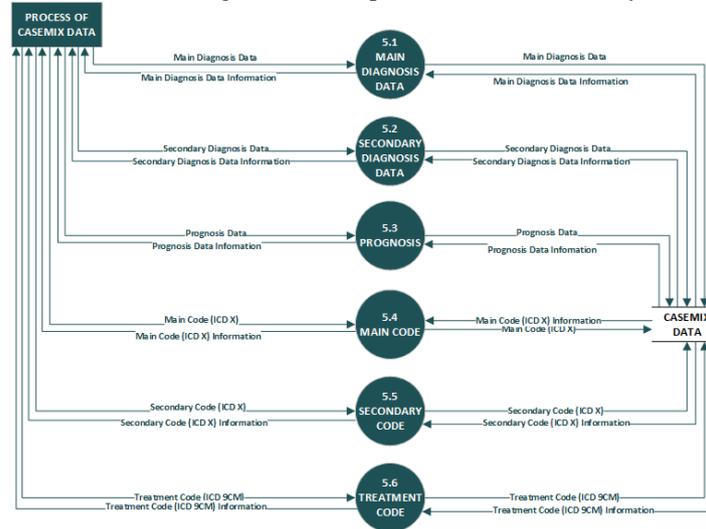
5) Planned Data Flow Diagram Level 1 process 3.0 from New System



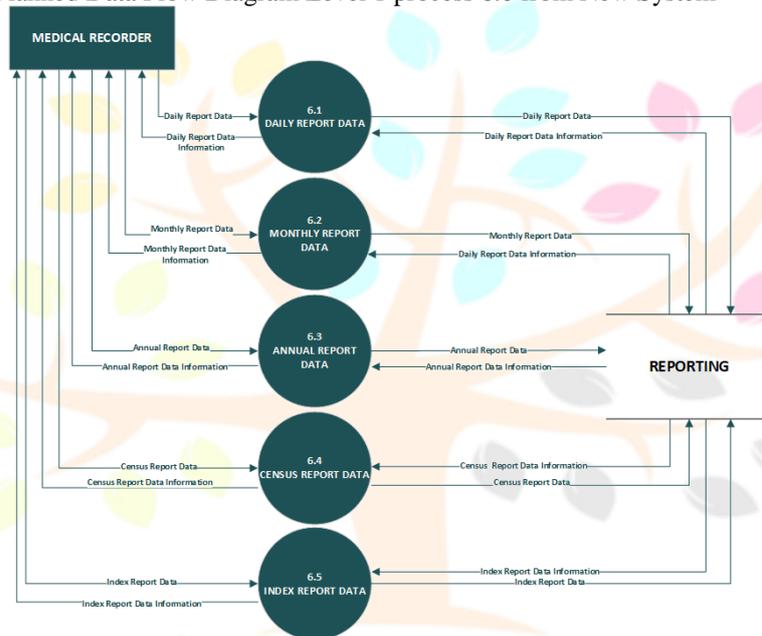
6) Planned Data Flow Diagram Level 1 process 4.0 from New System



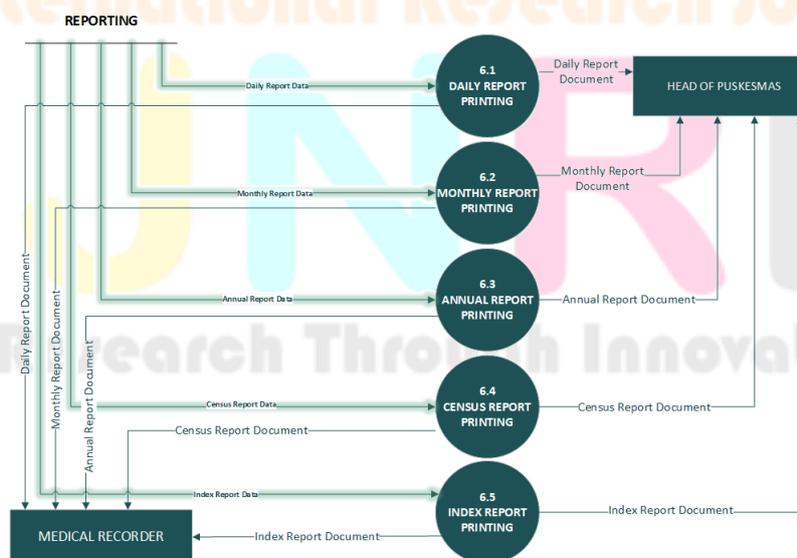
7) Planned Data Flow Diagram Level 1 process 5.0 from New System



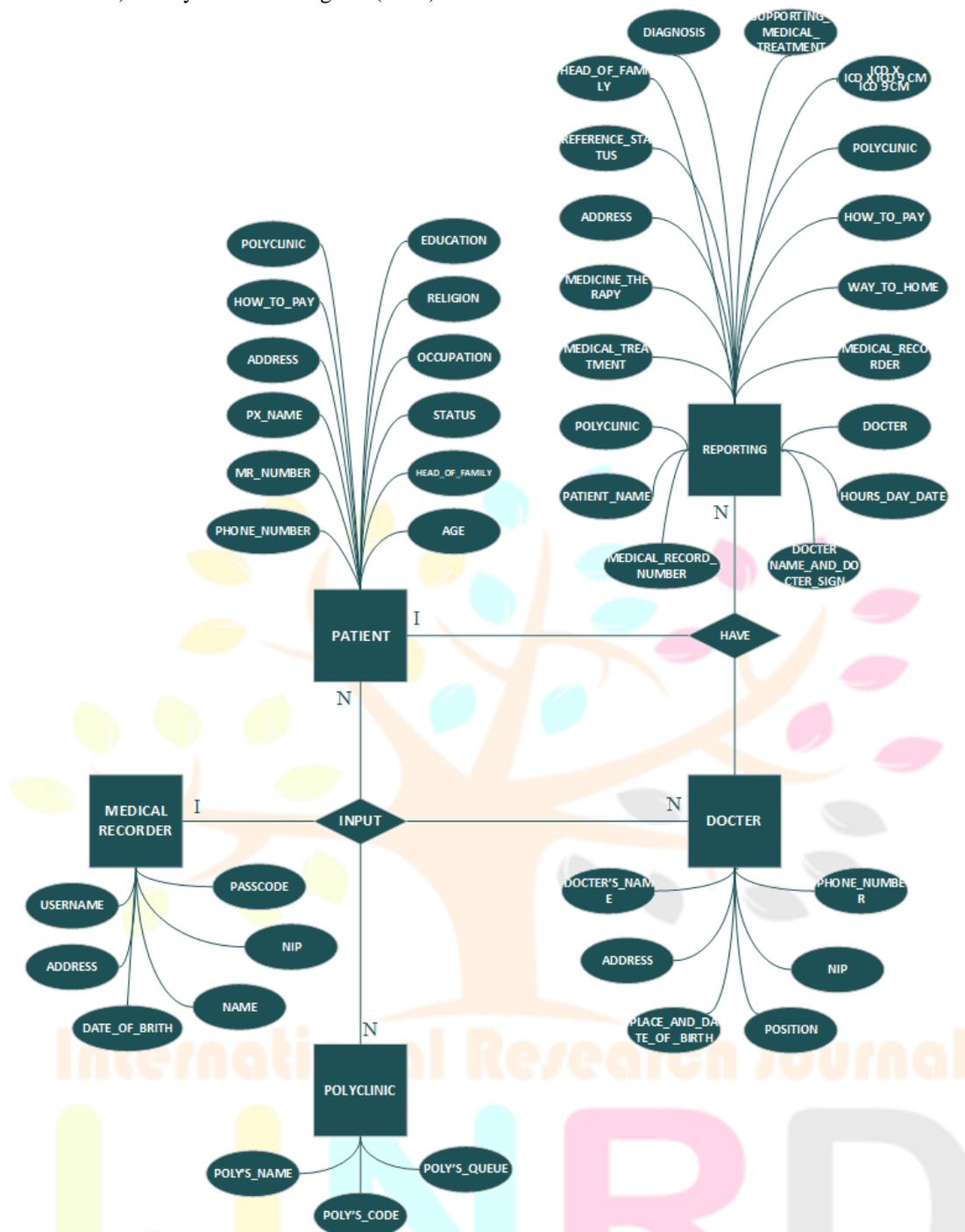
8) Planned Data Flow Diagram Level 1 process 6.0 from New System



9) Planned Data Flow Diagram Level 1 process 7.0 from New System



10) Entity Relation Diagram (ERD)



3.3 DEVELOPMENT

3.3.1 Input Design

Medical Record Electronic Input Design system researcher can describe as:

Table 1 Table Input Design of New System

No	Input Name	Function	Attribute
1	Sign In Data	To Log In And Operate The Program	User Nama, Passcode
2	User Data	To Change, Add, Save, Delete, And Search User	Username, Passcode, Email, Telephone Number, Name, Address, Job Title, NIK, NIP, Limit Access.
3	Patient Data	To Show Patient Identity, Visit History, Morbidity History, Medical Treatment Medicine Therapy History, Supporting Medical Treatment History, Reference	Medical Record Number, Name, Address, Phone Number, How To Pay, Polyclinic, Education, Religion, Occupation, Head Of Family, Age, Last Date Visit, Morbidity History, Treatment, Medicine, Support Treatment, Reference.

		History, And Patient Registration.	
4	Patient Health Service Data	To Show Polyclinic Data, Medical Treatment Data, Supporting Medical Treatment Data, and Medicine Therapy Data.	Polyclinic Name, Polyclinic Code, Polyclinic Queue, Medical Treatment, Supporting Medical Treatment And Examination, Medicine Therapy.
5	Casemix Data	To Show Main Diagnosis Data, Secondary Diagnosis Data, Prognosis Data, Main Code Data, Secondary Code Data, Treatment Code Data.	Main Diagnosis, Secondary Diagnosis, Prognosis, ICD 10 Code For Main Diagnosis, ICD 10 Code For Secondary Diagnosis, ICD 9 CM Code For Treatment Code, Prognosis Or Second Option Of Therapy
6	Reporting Data	To Show Daily Report Data, Monthly Report Data, Annual Report Data, Census Report Data, Index Report Data	Daily Report Data Monthly Report Data Annual Report Data Census Report Data Index Report Data

3.3.2 Output Design

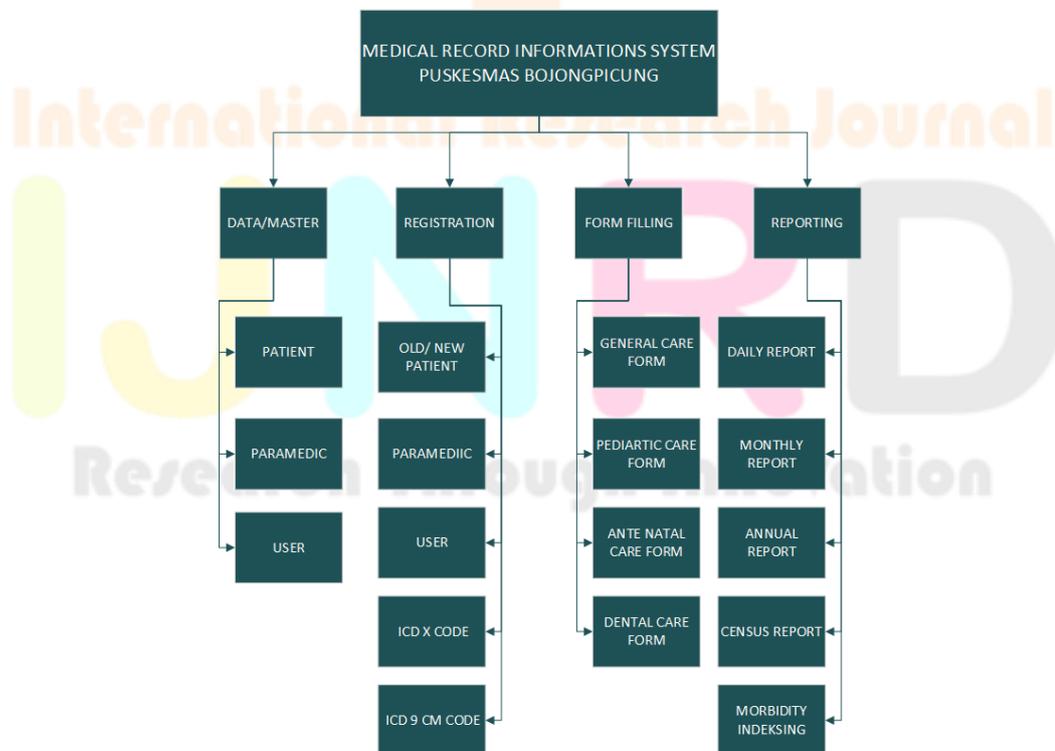
Medical Record Electronic Output Design system researcher can describe as:

Table 3 Table Output Design of New System

No	Output Name	Function	Attribute
1	Daily Report	To print the Daily report	Daily report data
2	Monthly report	To print Monthly report	Monthly report data
3	Annual report	To print the Annual report	Annual report data
4	Census report	To print the Census report	Census report data
5	Index report	To print the Index report	Index report data

3.3.3 Screen Dialog Plan

Medical Record Electronic Input Design system researcher can describe as :



3.3.4 Interface Design
 3.3.4.1 Log In interface Design



Figure 2. Log In Form Interface

3.3.4.2 Help Desk (Home) Interface Design



Figure 3. Interface Help Desk

3.3.4.3 Patient Identity Interface Design

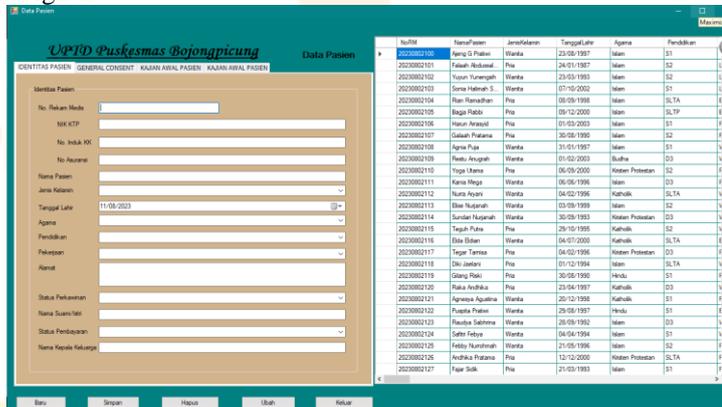


Figure 4. Patient Identity Form Interface

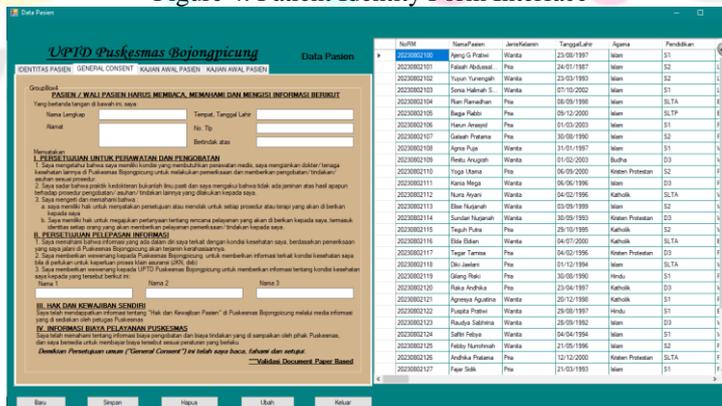


Figure 5. General Consent Form Interface

Figure 6. First Come Patient Observation Form Interface

Figure 7. First Come Patient Observation Form Interface

3.3.4.4 Patient Visit History Interface Design

No. Rekam Medis	Nama	Tanggal Kunjungan	JenisKelamin	NamaPasien	Poliklinik
U01		11/08/2023	Wanita	Ayeng G Pratiwi	Umum
U02		11/08/2023	Pria	Falahah Abdussal	Umum
U03		11/08/2023	Wanita	Yuyun Yunengah	Umum
U04		11/08/2023	Pria	Bagga Rabbi	Umum
U05		11/08/2023	Pria	Yoga Ukama	Umum
U06		11/08/2023	Pria	Andi Gilang	Umum
U07		11/08/2023	Wanita	Puspita Pratiwi	Umum
U08		11/08/2023	Wanita	Nunsa Ariyani	Umum
U09		11/08/2023	Pria	Togor Tamisa	Umum
U10		11/08/2023	Wanita	Amanah Rahma	Umum
U11		11/08/2023	Wanita	Farah Azzahra	Umum
U12		11/08/2023	Pria	Galash Pratama	Umum
U13		11/08/2023	Wanita	Restu Anugrah	Umum
U14		11/08/2023	Pria	Diki Jaelani	Umum
U15		11/08/2023	Pria	Andhika Pratama	Umum

Figure 8. Patient Visit History Form Interface

3.3.4.5 Paramedic Data Interface Design

NIP	Nama	Tanggal Lahir	Jenis Kelamin	Alamat	Agama
234567890	Ayeng Pratiwi	23/08/1997	Wanita	Canjur	Islam
234567891	Gustani Pratiwi	23/08/1997	Wanita	Depok	Islam
234567892	Yayan Suhaya	17/07/1989	Pria	Bandung	Islam
234567893	Nining Sumari	18/10/1989	Wanita	Cmah	Islam
234567894	Tatang Sutada	17/08/1987	Pria	Cilin	Islam
234567895	Soniaa Koswara	07/10/2002	Wanita	Garut	Islam
234567896	Asep Sutiana	18/12/1987	Pria	Taskmalaya	Islam
234567897	Halmah Saidah	12/12/2000	Wanita	Jakarta	Islam
234567898	Udin Bahrudin	01/01/1991	Pria	Sumedang	Islam
234567899	Andri Andani	02/09/1986	Wanita	Garut	Islam

Figure 9. Paramedic Data Form Interface

3.3.4.6 User Data Interface Design

NIP	Nama_User	Username	Passcode	Profesi
234567890	Ayeng Pratiwi	Pragustiayeng23	23Bintang	Rekam Medis
234567891	Gustiani Pratiwi	gusti	12345	Perawat
234567892	Yayan Suhaya	yayan	23456	Dokter Umum
234567893	Nining Sumarni	ninging	34567	Rekam Medis
234567894	Tatang Sutada	tatang	45678	Dokter Sp
234567895	Sonaa Koswara	sonaa	56789	Rekam Medis
234567896	Asep Sutiana	asep	67891	Staff
234567897	Halmah Saidah	halmah	78912	Bidan
234567898	Udin Bahudn	udin	89123	Dokter Gigi
234567899	Andri Andiani	andri	91234	Staff

Figure 10. User Data Form Interface

3.3.4.7 New Patient Registration Interface Design

Kode_Antrian	Tanggal	NoRM	JenisKelamin	NamaPasien	Poliklinik
U01	02/08/2023	20230802100	Wanita	Ayeng G Pratiwi	Umum
U02	02/08/2023	20230802101	Pria	Falah Abdussal...	Umum
U03	02/08/2023	20230802102	Wanita	Yuyun Yunengah	Umum
U04	11/08/2023	20230802105	Pria	Bagia Rabbi	Umum
U05	11/08/2023	20230802110	Pria	Yoga Utama	Umum
U06	11/08/2023	20230802129	Pria	Andi Gilang	Umum
U07	11/08/2023	20230802122	Wanita	Puspita Pratiwi	Umum
U08	11/08/2023	20230802112	Wanita	Nurra Aayani	Umum
U09	11/08/2023	20230802117	Pria	Tegar Tamisa	Umum
U10	11/08/2023	20230802132	Wanita	Amani Rahma	Umum
U11	11/08/2023	20230802130	Wanita	Farah Azahra	Umum
U12	11/08/2023	20230802107	Pria	Galaah Pratama	Umum
U13	11/08/2023	20230802109	Wanita	Restu Anugrah	Umum

Figure 11. New Patient Registration Form Interface

3.3.4.8 Old Patient Registration Interface Design

Kode_Antrian	Tanggal	NoRM	JenisKelamin	NamaPasien	Poliklinik
U01	02/08/2023	20230802100	Wanita	Ayeng G Pratiwi	Umum
U02	02/08/2023	20230802101	Pria	Falah Abdussal...	Umum
U03	02/08/2023	20230802102	Wanita	Yuyun Yunengah	Umum
U04	11/08/2023	20230802105	Pria	Bagia Rabbi	Umum
U05	11/08/2023	20230802110	Pria	Yoga Utama	Umum
U06	11/08/2023	20230802129	Pria	Andi Gilang	Umum
U07	11/08/2023	20230802122	Wanita	Puspita Pratiwi	Umum
U08	11/08/2023	20230802112	Wanita	Nurra Aayani	Umum
U09	11/08/2023	20230802117	Pria	Tegar Tamisa	Umum
U10	11/08/2023	20230802132	Wanita	Amani Rahma	Umum
U11	11/08/2023	20230802130	Wanita	Farah Azahra	Umum
U12	11/08/2023	20230802107	Pria	Galaah Pratama	Umum
U13	11/08/2023	20230802109	Wanita	Restu Anugrah	Umum
U14	11/08/2023	20230802118	Pria	Diki Jaelani	Umum
U15	11/08/2023	20230802126	Pria	Andhika Pratama	Umum

Figure 12. Old Patient Registration Form Interface

3.3.4.9 Paramedic Registration Interface Design

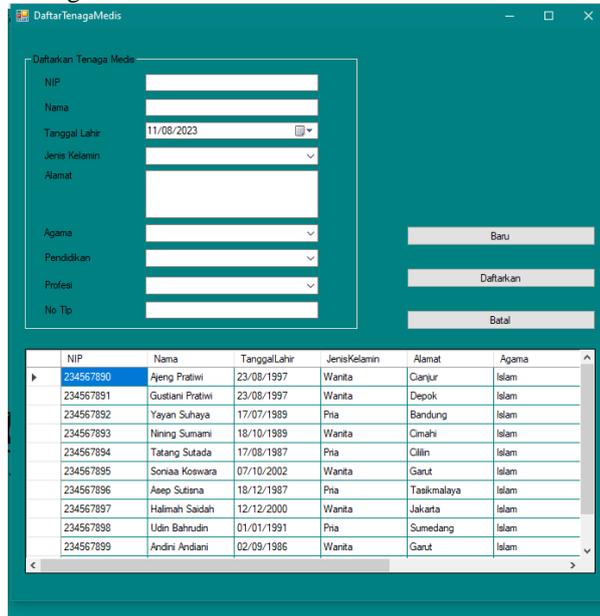


Figure 13. Paramedic Registration Form Interface

3.3.4.10 User Registration Interface Design

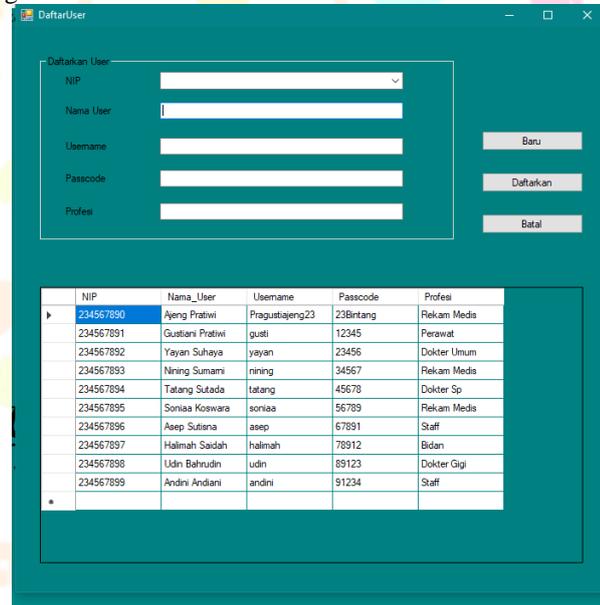


Figure 14. User Registration Form Interface

3.3.4.11 Code ICD X Record Interface Design

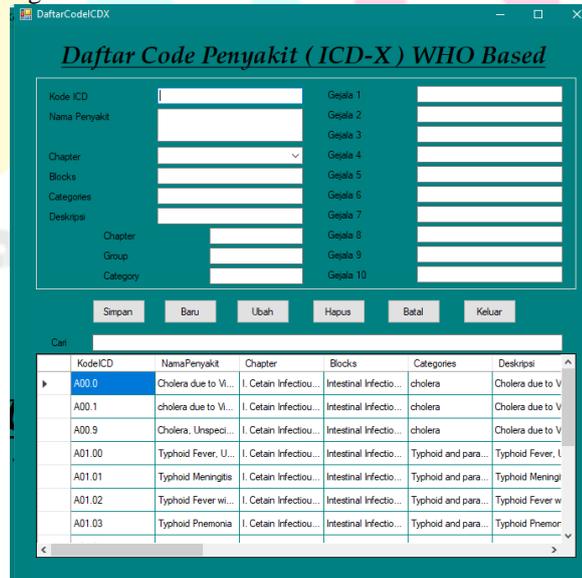


Figure 15. ICD X Code Record

3.3.4.12 Code ICD 9 CM Registration Interface Design

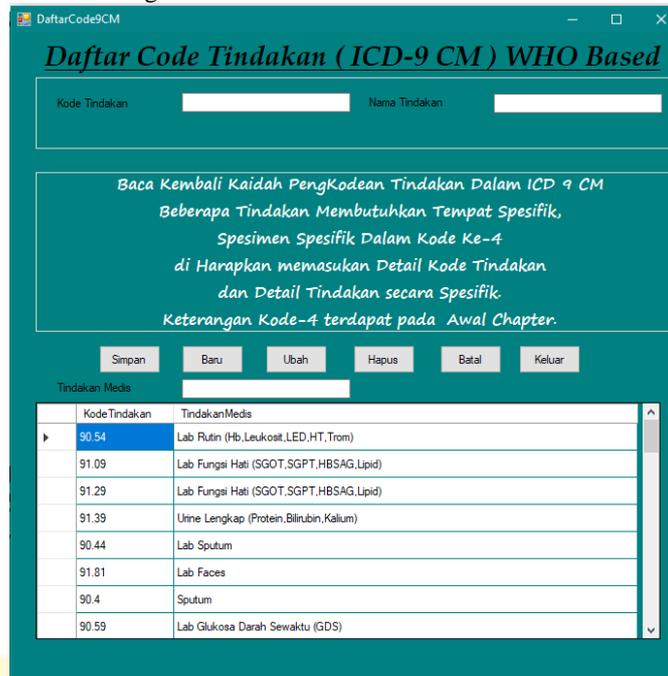


Figure 16. ICD 9-CM Code Record

3.3.4.13 General Care Form Interface Design

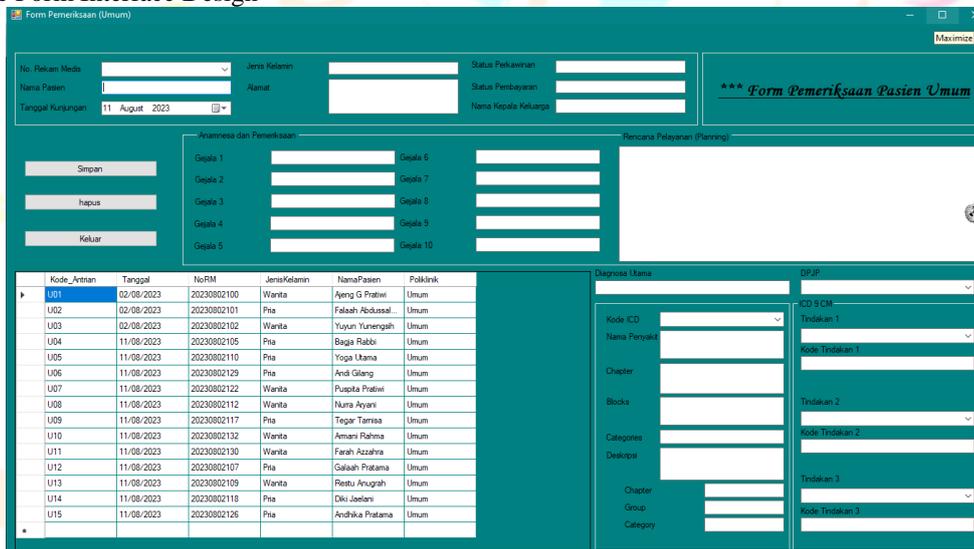


Figure 17. General Care Form Interface

3.3.4.14 Daily Report Interface Design

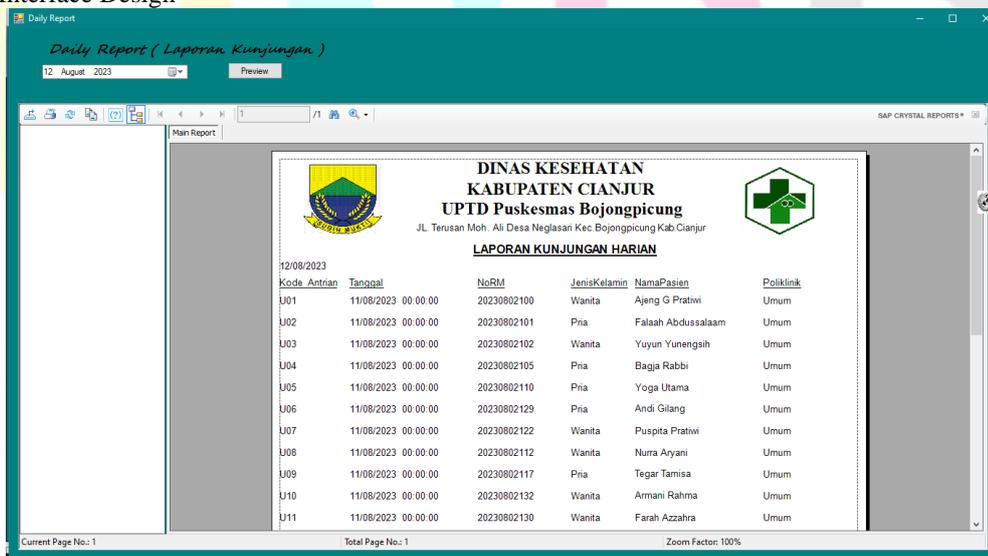


Figure 18. Daily Report Interface

3.4 TESTING

The Researchers utilize the Black Box Testing method to evaluate the Information Systems of the Medical Record Electronic system with the goal of testing system functionalities, whether they are running or not, and analyzing any shortcomings that may be remedied.

During testing, the researcher can be described as:

Table 3 Table Testing of New System

No	Testing Class	Testing Scenario	Result	Information
1	Log In	The user is automatically brought to HelpDesk Programs after entering the Username and Passcode and clicking the Log In button.	If the user correctly enters their username and password, the helpdesk will appear. However, if the username, passcode, or both are incorrect, the log in procedure will fail and the conversation screen will remain unchanged.	Done
2	Patient Registration	The user must enter the medical record number to access patient data; if the patient is new, the user must first identify the patient in order to obtain the medical record number; and finally, the patient can register to receive health services.	After entering a medical record number, the user can register anything such as a patient, data identity patient, antenatal patient, anc, form general care, form pediatrics, and dental care.	Done
3	Paramedic Registration	This function's objective is to collect all paramedics in the Primary Health Center and know who is on duty, as well as to allow paramedics to access data after becoming users.	After filling out the paramedic registration form. If the paramedic is a registered user, he or she can access data to obtain information.	Done
4	User Registration	This module's function is to access data and perform program commands such as patient registration, report generation, and so on.	After becoming a user, the user can utilize the application and issue commands.	Done
5	ICD X Code Registration	To gather morbidity codes, determine which ICD x codes will be used to code patient morbidity.	After the morbidity code is obtained, it may automatically fill the icd x code field by just inputting the code, and the morbidity (and vice versa) will be described on the patient form.	Done
6	ICD 9 CM Code Registration	To gather medical treatment codes by which ICD 9 CM code to code medical treatment codes that the patient received	After collecting the medical treatment code, it may automatically fill the icd 9 cm code column by simply inputting the code, and the medical treatment (vice versa) will be	Done

			described on the patient form.	
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3.5 DEPLOYMENT

The researcher's designed Data Processing Information System for Medical Record Electronic is then socialized to the Medical Record Management section from beginning to end, beginning with Master data of Patient Identity, Master data of Paramedic, Master data of User programs, and so on. Then there's registration for old/new patients, registration for paramedics, registration for users, registration for ICD x and ICD 9 CM codes, general care form filling, paediatric care form filling, antenatal care form filling, dental care form filling, and end with daily, monthly, annual, census, and morbidity indexing.

IV. CONCLUSION

Based on observations at the Bojongpicung Primary Health Center, researchers concluded that the health service process still relies on manual and traditional methods, which wastes time, resources, and health workers and is inefficient. Based on the magnitude of the problem, researchers decided to update the process with new programs that will save time, materials, and, of course, health personnel, undoubtedly the new programs will also reduce workload. "Sistem Informasi Rekam Puskesmas BojongPicung" is the name of the program. the program designed for patient registration (new/old (general care, antenatal care, dental care, and Paediatrics care)), paramedic registration, user registration, ICD X code registration, ICD 9CM code registration, recording health service results in digital forms (general care, antenatal care, dental care, and Paediatrics care), indexing morbidity, and report printing (daily, monthly, annual, census, and index).

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