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Patient Clinical Data Integration in Integrated Electronic Medical Record System using System Development Life Cycle (SDLC)

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Abstract—Clinic is a health service facility that provides individual services, both providing basic and/or specialized medical services. The processing of medical record documents for outpatient services at the Al-Ikhlal Clinic, Sragen, is still carried out conventionally, starting from registration to storing documents. Often there is duplication, inaccuracy in recording, and presentation of reports that are not in accordance with the services at the service. The purpose of this study was to create medical records for inter-clinic patient data interventions with the development life cycle system development (SDLC) method so that it could provide benefits for officers in processing clinical patient data. This type of research is qualitative in nature using the SDLC system development method carried out by selecting projects, initiating and planning projects, analysis, design, Implementation, and maintenance. The subjects in this study were medical record officers and doctors, while the object under study included recording and processing patient medical record data. The development of the SDLC system is the main instrument to replace the old system as a whole or to improve the existing system, and the data sources used are primary data and secondary data. Electronic Medical Records built using the PHP programming language and MySQL database, where this system has the advantage of being able to speed up the registration process and data processing of computerized patient medical records as well as the ease of staff in making reports to clinic leaders. Electronic Medical Records of Al-Ikhlal Sragen Clinic can produce information in the form of patient data reports, diagnosis reports, action data reports, drug data reports, officer data reports, doctor data reports, polyclinic data reports, examination data reports, and patient registration data reports.

Keywords—electronic medical record, SDLC, outpatient, website based

I. INTRODUCTION

Clinic is a health service facility that provides individual health services that provide basic and/or specialized medical services, organized by more than one type of health worker-led by a medical staff. Clinics with quality services need to be supported by good medical records. According to Permenkes RI No. 269 / Menkes / PER / III / 2008 Medical Record is a file containing notes and documents about patient identity, examination, treatment, actions, and other services to patients. Medical record management is carried out by the medical records department, which is in charge of managing medical

record documents. Medical records must be written, complete and clear as well as electronically. According to Sudra (2013), Electronic medical records are medical records that are stored electronically whose contents include personal data, demographic data, social data, clinical/medical data, and various clinical events during the service process from various data sources (multimedia) and have an active function. to provide support for decision-making. Electronic medical records allow sharing of information from various sources in various forms to be stored, processed, communicated, and retrieved easily in the original or processed form, things like this can be used to manage general practitioner-patient data obtained from general practitioner-patient medical records.

Al-Ikhlal Clinic in Sragen is one of the main clinics in Ngrampal District, Sragen, Indonesia. Implementation of medical records at the Al-Ikhlal Clinic in Sragen was done manually which resulted in less effective and efficient data processing, such as: (1) duplication of documents, (2) inaccuracy of records, and (3) presentation of reports that were not as needed.

Based on this case, it is necessary to conduct a system or software development, namely the use of electronic medical records with the development method of systems development life cycle (SDLC). According to Prof. Dr. Sri Mulyani, AK., CA. (2017) SDLC is a logical process used by a systems analyst to develop an information system that involves requirements, validation, training, and system owners. SDLC has many functions, including as a means of communication between the development team and stakeholders. SDLC also serves to divide clear roles and responsibilities between developers, designers, business analysts, and project managers. Researchers will develop this solution, initially the medical records are carried out manually into a computerized system, the development of the system is expected to be able to process data quickly, accurately, and relevant so that it can provide optimal health services.

II. METHOD

This type of research is intended to create a web-based outpatient electronic medical record information system. The research used is qualitative in nature with the SDLC system development method which is carried out by means of project identification and selection, project initiation and planning,

5 analysis, design, implementation, and maintenance. The subjects in this study were medical record officers and doctors, while the object under study included recording and processing patient medical record data. The development of the SDLC system is the main instrument to replace the old system as a whole or to improve the existing system, and the data sources used are primary data and secondary data.

III. RESULT

A. Clinical Overview

12 Based on the Law of the Republic of Indonesia number 36 of 2009. Health service facilities are tools and/or places used to carry out promotional, preventive, curative, and rehabilitative health service efforts carried out by the government, local governments, and/or the community. Clinic is a health service facility that provides individual health services that provide basic and/or specialized medical services, organized by more than one type of health worker-led by a medical staff.

Al-Ikhlal Clinic in Sragen is one of the clinics in Ngrampal District, Sragen, Indonesia. Al-Ikhlal Clinic in Sragen provides outpatient services, inpatient services, emergency services, immunization, family planning, and laboratories. The average number of patients at Al-Ikhlal Clinic Sragen is around 45 patients. In supporting medical services to patients, Al-Ikhlal Clinic in Sragen is supported by medical professionals who are professionals in their fields. The medical personnel owned by the Al-Ikhlal Clinic in Sragen include one general practitioner, two midwives, one nurse, two nursing assistants, one laboratory technical staff, and one pharmaceutical technical staff. one person, medical records staff, amounting to one person

B. SDLC System Development

7 The systems development process is divided into a number of different sequences. But all of them will refer to standard processes namely analysis, design, implementation and maintenance. In its development, these standard processes are outlined in a method known as the System Development Life Cycle (SDLC) which is a general methodology in system development that marks the progress of analysis and design efforts. The system development process has a number of sequences. The system development process has a number of sequences. Based on the sequence of these processes, it is poured into a System Development Life Cycle (SDLC) method. SDLC includes the following phases:

1) Project Identification and Selection

9 At this stage several things must be done, including identifying potential projects, classifying and ranking projects, selecting projects to develop. At this stage, the researcher identified the flow of the patient's examination at the Al-Ikhlal Sragen Clinic and the problems at the Al-Ikhlal Sragen Clinic. Al-Ikhlal Clinic in Sragen provides outpatient health services. At this time, the outpatient registration unit at the Al-Ikhlal Clinic, Sragen, is still carried out conventionally even though there is already a computer, namely by using Microsoft Excel, so there are various obstacles and weaknesses in presenting information, including:

- a) Duplication of medical record documents and medical record numbers is often difficult to find if the patient forgets to bring his medical identification card.
- b) Inaccuracy of recording patient identity data because it is only recorded on the patient's medical record form.
- c) Cannot present reports as needed immediately.

Besides, in outpatient services, there is also an outpatient examination unit. The process of recording outpatient examinations at the Al-Ikhlal Clinic, Sragen is still done manually, namely by recording on medical record documents. Medical record documents after going from the next examination unit to the payment unit, here the medical record documents are used for financing patient treatment. After the payment process is complete, the medical record documents to the pharmacy installation are used for drug use for patients. After the patient goes home, the officer will carry out the conventional patient visit reporting process by recording it in a clinical report book. This process is felt to be less effective because it requires a long and repetitive time for recording.

2) Project Initiation and Planning

At this stage, a potential information system project is described and arguments for proceeding with the project are presented. A well-prepared work plan is also drawn up to carry out the other stages. At this stage, the researcher determines in detail the work plan that must be done, the duration required for each stage, human resources, software, hardware, and financial estimation..

3) System Initiation

Starting from the patient coming to the Al-Ikhlal clinic, whether the patient made a new visit or not, if not then asked whether to bring the KIB, if not bringing the KIB then look for the RM number in the database, if the patient is a new visit then input the patient data then make the KIB. After carrying out the registration process, then continue to take the DRM on the shelf to be submitted to the police for further examination at the pharmacy, a report is made, the patient goes home.

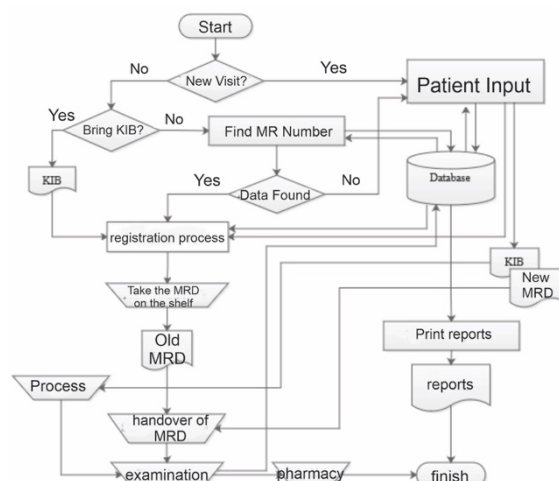


Figure 1. The System Built in the Al-Ikhlal Clinic, Sragen

4) System Design

System design is the planning of the entire system design consisting of Date Flow Diagrams (DFD), database design, input design, output design, operation, and screens. The top-level in the tiered diagram above is the outpatient electronic

medical record. Level 0 on the tiered diagram includes master data processing, data processing, and report processing. Level 1 in the tiered diagram has three parts, namely in the processing of master data, there are patient master data, officer master data, diagnosis master data, action data master, drug master data, polyclinic master data, doctor master data. In data

processing, there is registration data processing and inspection data processing. In the processing of reports, there are patient data reports, doctor data reports, officer data reports, registration data reports, examination data reports, diagnosis data reports, action data reports, drug data reports, polyclinic data reports.

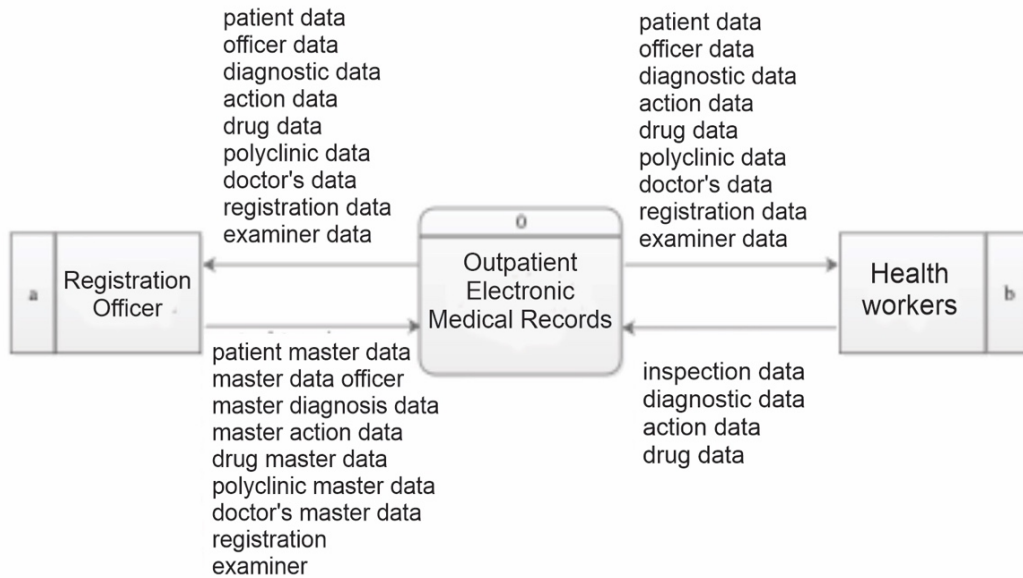


Figure 2. DFD Outpatient Electronic Medical Record Context

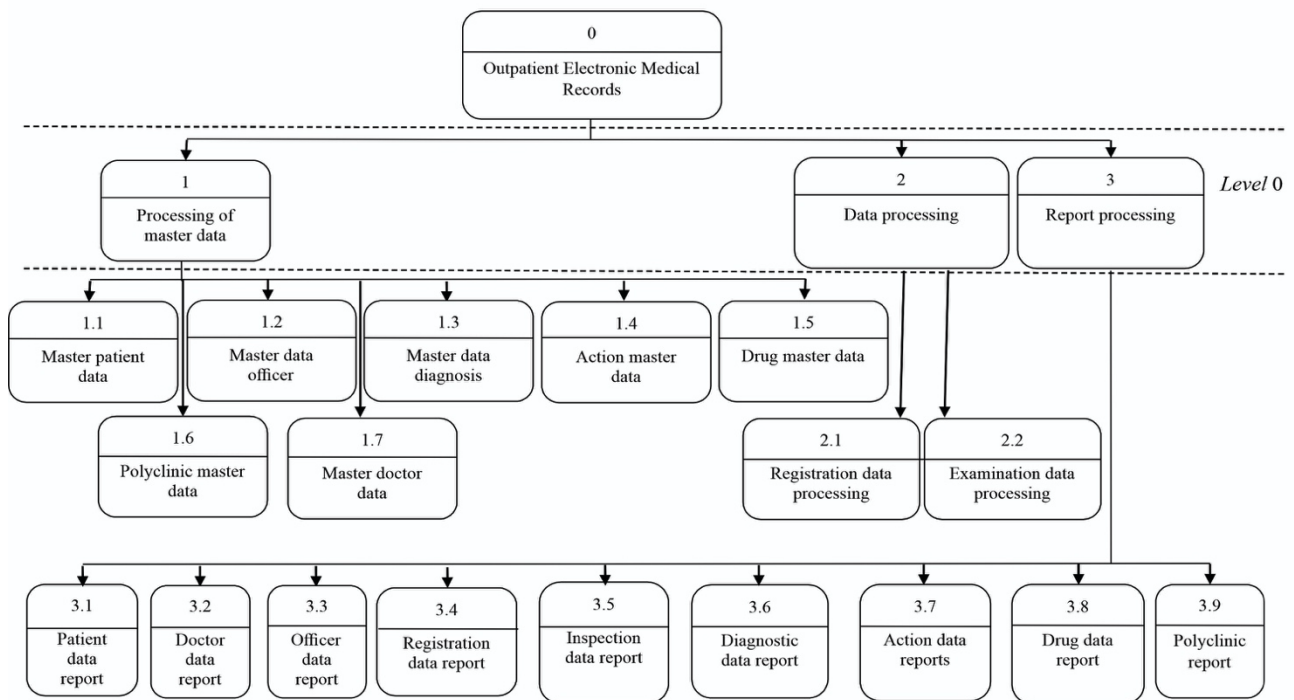


Figure 3. Outpatient Electronic Medical Record Tiered Diagram

5) Analysis

This stage describes the running system, problems, defined opportunities, and general recommendations for how to fix, improve, or general recommendations for how to repair, enhance or replace the system that is currently running are proposed. The main objective of the analysis phase is to understand and document the business needs and process

requirements of the new system. The analysis carried out at the Al-Ikhlas Sragen Clinic is about the problem of conventional medical records, then looking for solutions to solve the problems of conventional medical records that are easily lost and damaged by replacing them using electronic medical records.

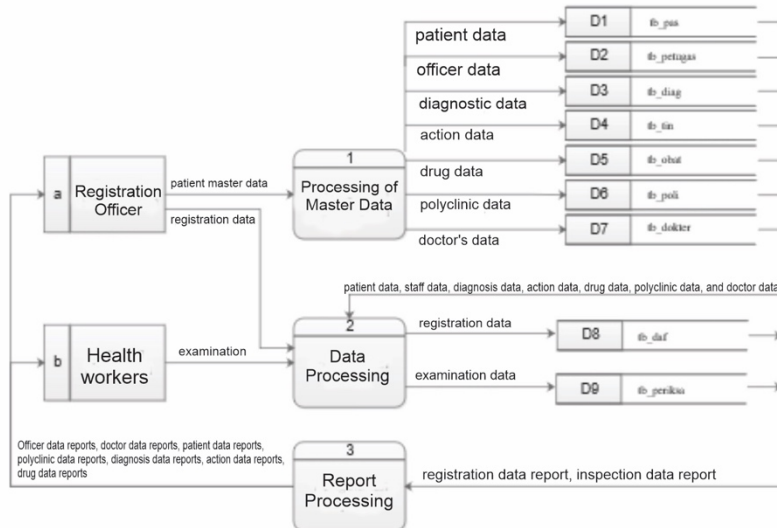


Figure 4. DFD Level 0 Outpatient Electronic Medical Records at the Clinic

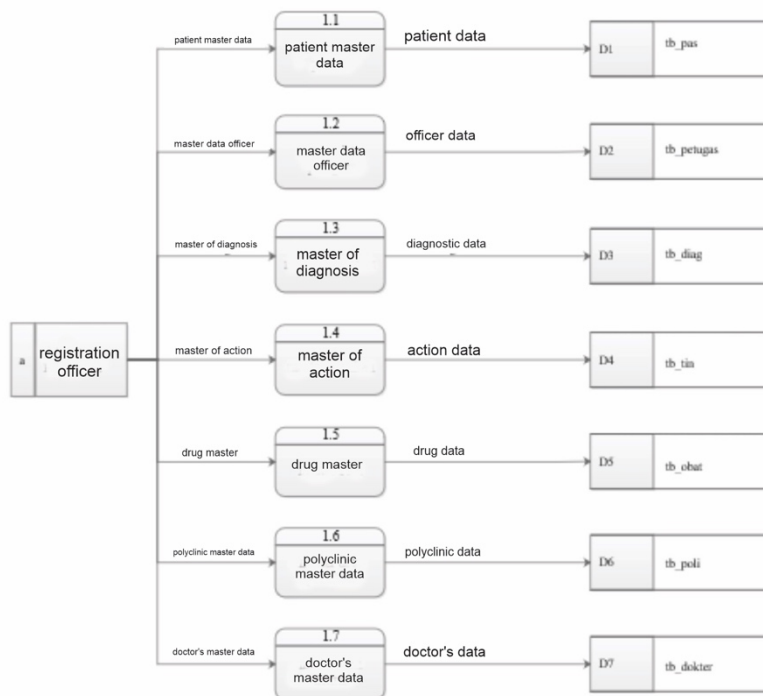


Figure 5. DFD Level 1 Master Data Management

6) Design

The design stage is the stage of changing a conceptual requirement into a real specification. The system design stage can be divided into 2 stages, namely the logical design (logical design) and the physical design stage (physical design). The differences between the two can be explained as follows:

a) Logical Design

Logical design is part of the design phase in SDLC where all the functional features of the system are selected from the analysis phase and are described separately from the computer platform that will be used later.

b) Physical Design

In this section, the logical specifications are transformed into technological details by which programming and system development can be accomplished.

At this stage, the researcher produces a logical design designing inputs such as patient data, health worker data, action data, diagnostic data, incoming patient assessment data, patient examination data, and registration data. Design a process using an electronic medical record process. Designing the outputs that are generated such as patient data reports, health worker data reports, registration data reports, incoming assessment data reports, patient examination data reports, diagnostic data reports, and action data reports. While the physical design consists of the software used is Adobe Dreamweaver, XAMPP, MySQL, and PHP. The hardware used is a laptop.

Figure 6. Id-Password Input Form Design

Figure 7. Electronic Medical Record Menu Form Design

7) Implementation

System implementation is the system implementation stage that will be carried out if the system is approved, including for operation. In the fifth stage of SDLC, several things need to be done, namely:

- a) Testing, which is testing the results of the program code that has been generated from the physical design stage.
- b) Installation, after the program passes the trial, the software and hardware will be installed at the client organization or company and officially put into use to replace the old system.

Figure 8. Patient Data Menu Form Design

The results of the implementation of Web-Based Outpatient Electronic Medical Records at the Al-Ikhlus Clinic in Sragen are as follows:

a) Implementation of Program Activation

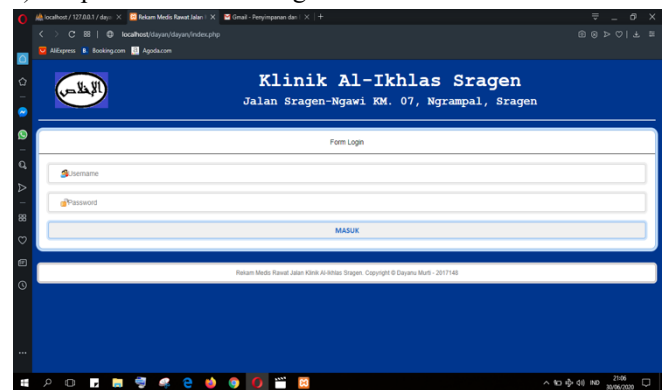


Figure 9. Login Form

Program activation begins by opening a browser application available on the computer. After that, type the link [http://localhost/dayanu/index, php](http://localhost/dayanu/index.php) in the http column available in the browser and wait a few moments until the login field is available and enter the Id-Password as follows:

b) Menu Master Implementation

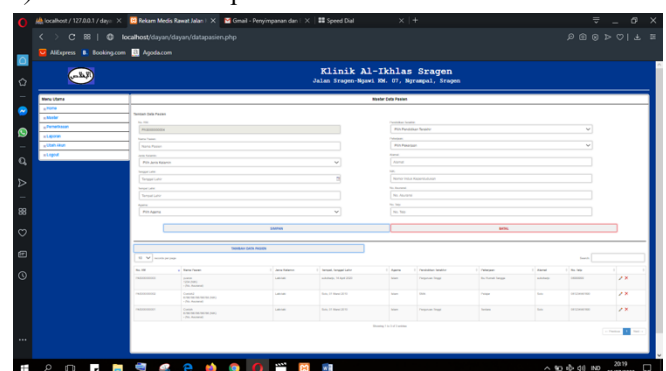


Figure 10. Main Menu Form

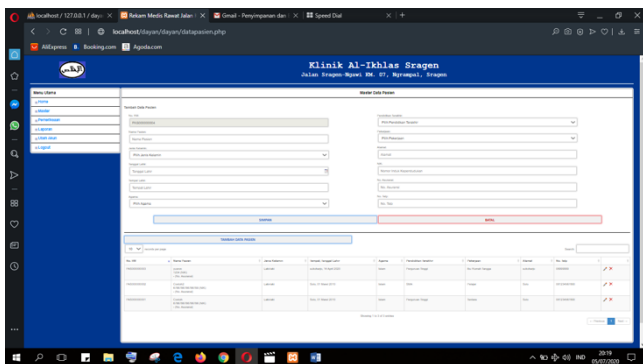


Figure 11. Master Data Input Form for Patients at the Clinic

8) Maintenance

The final step of SDLC is at this stage the system is systematically repaired and upgraded. The result of this stage is a new version of the software that has been created. The improvements that are carried out can vary widely, from fixing a crashed program to functioning again to adding new program modules in response to changing needs.

IV. CONCLUSION

Clinic is a health service facility that provides individual services, both providing basic and/or specialized medical services. The processing of medical record documents for outpatient services at the Al-Ikhlās Clinic, Sragen, is still carried out conventionally, starting from registration to storing documents. The development of electronic medical records with a development life cycle (SDLC) system can provide benefits for officers in processing clinical patient data.

SDLC is a logical process used by a systems analyst to develop an information system that involves requirements, validation, training, and system owners. SDLC has many functions, including as a means of communication between the development team and stakeholders. SDLC also serves to

divide clear roles and responsibilities between developers, designers, business analysts, and project managers. The SDLC system development is carried out using project identification and selection, project initiation and planning, analysis, design, and maintenance.

Electronic Medical Records built using the PHP programming language and MySQL database, where this system has the advantage of being able to speed up the registration process and data processing of computerized patient medical records and make it easier for officers to make reports to clinic leaders.

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