ELECTRONIC MEDICAL RECORD FOR FAMILY PHYSICIAN CLINIC IN INDONESIA

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Abstract - Most of the family physician clinic in Indonesia still use paper-based medical records. There are many problems that often occur in paper-based medical records such as documents are not managed properly, prone to breakage, incomplete records, and data redundancy. Electronic medical records for family physician clinic in Indonesia is needed. This study identified the user requirement by conducting an in-depth interview with family physicians and medical record practitioners as well as study the paper-based documentation in 25 family physician clinics in Yogyakarta Province. A Web based electronic medical record prototype for family physician clinic has been developed based on the assessment. Electronic medical record of family physician clinic should be able to store and display the previous patient visit history, immunizatiwn history, behavioral risk factors such as smoking, alcohol consumption, exercise, diet, allergy notes, and the patient's family medical history. Integration with BPJS database become one of the key factors to be considered when developing the system.

Index Terms - Electronic medical record, prototype, family physician clinic.

I. INTRODUCTION

Information technology has become the important role for improving the quality of healthcare facilities[1]. Health information system implementation potentially improves the healthcare quality, saving the cost, and increase patient satisfaction[2]. Therefore, healthcare facilities should use information technology to support their daily operation. The implementation of information technology in healthcare facilities consist of many activities such as creating algorithms for management process, controlling the process, decision support and medical analysis[3]. Medical record handling is part of the activities that better being integrated with the information technology. In Indonesia, health care facilities mostly used paper-based medical record. There are many problems arise from the use of paper-based medical records. The only solution is done by implementing the electronic medical records[4]. Electronic Medical Record (EMR) is a computerized health information system which provides record detailed information such as patient demographics, patient summaries, medical history, allergies, laboratory test histories, and some decision support [5]. Electronic medical records offer the ability for health care providers and organizations to share and store patient health information without the reliance on paper records [6]. The use of an EMR in ambulatory care has been widely recommended as a method for reducing errors, improving the quality of healthcare, and reducing costs [7][8]. In family medicine, EMR has grown recently. Family physician resident in American Academy of Family Physicians gets many benefit from the implementation of electronic medical records. EMR has increased the documentation accuracy, reduce clinical error, reduced times needed to review past patient medical history, reduce data redundancy, and made faster access to patient data[9]. Family physician clinics in Indonesia are part of Indonesian Health Insurance called Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS Kesehatan). They use a software called P-Care to record the data of BPJS Kesehatan patient. P-Care can not be used as an electronic medical record because of its limitation. P-Care records only the BPJS Kesehatan patient data. P-Care can not show more than 10 patient medical histories. The ideal electronic medical record should able to show all patient medical histories. Because of its limitation, family physician clinics have to use paper-based medical records. The family physician needs a more powerful and complete EMR.

II. METHODS

This study was a research and development study. This study was held in Yogyakarta by collaborating with 25 family physician clinics. This study identified the user's requirement of EMR by conducting an in-depth interview with family physicians and medical record practitioners as well as study the paper-based documentation. The results of this study then used to develop an EMR prototype.

III. RESULT AND DISCUSSION

A. Need Assessment

Patient flow in family physician clinic starts in registration counter. Medical record practitioner writes down the patient data in the patient visit registry book. For the BPJS Kesehatan patient, the data will also be inputted into P-Care. Then, medical record practitioner searches the paper-based medical record in the document rack. The medical record practitioner brings it in the physician room. Patients will be examined according to their problems and then the physician writes down the data in the medical records

document. The physician writes a prescription and the patient takes the drug at the pharmacy. At last, the patient completes the payment administration. The detailed flow of the patient services is shown in Figure 1. EMR of family physician clinic should able to store and display the previous patient visit histories, immunization histories, behavioral risk factors such as smoking, alcohol consumption, exercise, diet, allergy notes, as well as the patient's family medical histories. Regulation of the Ministry of Republic of Indonesia No. 269/MENKES/PER/III/2008 about Medical Records states that the content of medical records for outpatient services at least contains:

a. Patient identity;
b. Date and time visit;
c. Anamnesis, include at least the patient complaints and the history of disease;
d. The results of physical examination and medical support;
e. Diagnosis;
f. Plan;
g. Medication and treatment;
h. Other services;
i. For dental clinic, patient medical record also include an odontogram;
j. Informed consent if needed.

Besides the individual patient medical histories as mentioned above, the patient family medical histories are also important part of the basis of patients treatment. Family medical histories can be used to predict the risk of various health problems such as heart disease, breast cancer, ovarian cancer, osteoporosis, asthma, type 2 diabetes, and suicidal behavior[10]. Family medical histories can also be used to motivate patients to adopt a healthy lifestyle[11]. One of the users expectations related to EMR of family physician clinic are the integration system such that no double data entry needed when users input the BPJS Kesehatan patients data. A common problem in the primary care facilities in the era of national health coverage is double entry data that increase the workload of the officers[12]. Another users expectation of EMR is the ability of EMR to generate the required report automatically such that the users do not need any manual process. The best EMR should able to generate the required report automatically[13]. The patient flow can be shortened after EMR implementation. Many processes can be omitted, such as filling the register book, fulfillment the paper-based medical record, and P-Care data input. The use of EMR could reduce the physician workload and patient waiting times. Figure 2 shows the flow of patient in the family physician clinic after EMR implementation.

B. System Design

Based on needs assessment phase result, the EMR prototype of family physician clinic has been designed. The design cover process design, database design, and user interface design. Table 1 shows the specification of EMR. Figure 3 shows the screenshot of EMR. Figure 4 shows the screenshot of the patient medical histories. EMR of family physician clinic was developed by using prototyping method. This method adopts the software development approach based on experiments and experiences. Prototyping produces an early version of a software which is an overview of the whole software that will be developed in the future. This method lets software developers communicate with prospective users to obtain suggestions for the improvement of software development in the future [14]. Effective communication with potential users is the key to prototype development. Based on effective communication with prospective users, prototypes continue to be improved and perfected. Improvements continue until the prototype ready to be implemented[15]. The user interface has been made as the interpretation of software developers from the result of need assessment phase. The software developer perception may differ from the user's perception. [16]. Web-based EMR system for family physician clinic that has been developed. By the increasing widespread distribution of internet usage, the need to access the web-based information system is getting higher [17]. There is a difference between web-based information systems with traditional corporate information systems[18]. The web-based information system can be accessed anytime and anywhere using a web browser and internet networks without having installed on each user's computer. This is an advantage of web-based information systems than desktop-based information systems that should be installed first on each user's computer. The web-based information system has ease system updates and maintenance because it can be done at the source code that resides on the server computer, not needed to update on each user's computer. One of user expectations on the needs assessment phase is that the EMR system can be integrated with P-Care. The integration of EMR with P-Care is facilitated by using web service technology. The basic concept of web services technology implementation is the interaction between the service provider and the service requester[19]. In this case, the service provider is BPJS while the service requester is family physician clinics. The interaction among them is be facilitated through an EMR system that has been developed. By using web service technology, the data entered in the EMR system will also be added automatically to the P-Care database. The critical point of web service technology is security aspects[20]. BPJS Kesehatan applies a fairly strict procedure for a primary health care which wants to integrate with BPJS database. A primary health care needs an official account from BPJS that will be used with web service technology to access the database.

CONCLUSION

Based on the results of needs assessment phase, it is known that an EMR of family physician clinic should

be able to store and display the patient identity, visit history, record of allergies, lifestyle, immunizations, surgical history, diseases history, and patient's family medical history, and should be able to automatically generate the required report in primary health care. The EMR of family physician clinics should also be integrated with P-Care such that users do not have to do double data entry of BPJS patients into P-Care. The prototype of web-based electronic medical records has been developed and ready to be implemented in family physician clinics.

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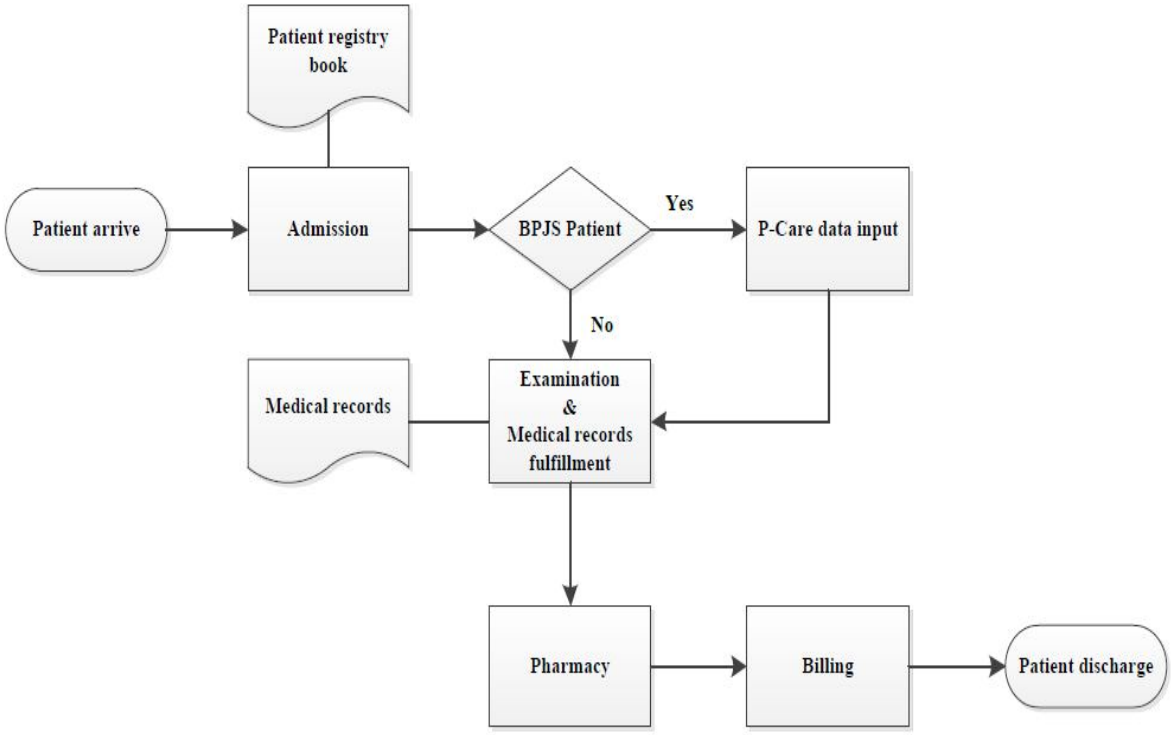


Figure 1. Patient flow in the family physician clinic

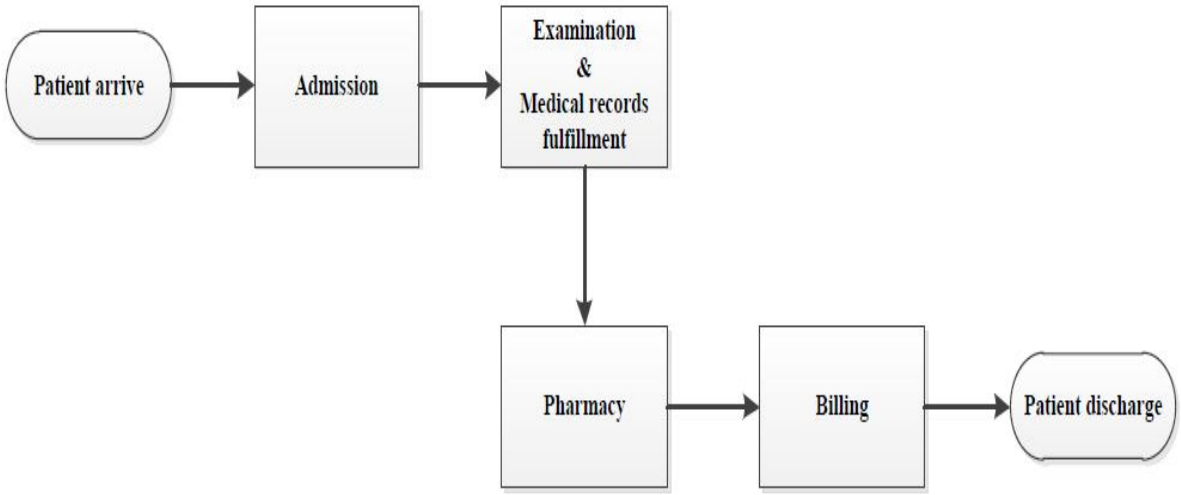


Figure 2. Patient flow of family physician clinic after EMR implementation.

Specification	Description
Programming language	PHP 5.5
Database management system	MySQL 5.6
Programming framework	Laravel 5.0
Web browser	Mozilla Firefox 42, Google Chrome 46
Web server	Apache (XAMPP)

Table 1. EMR specification

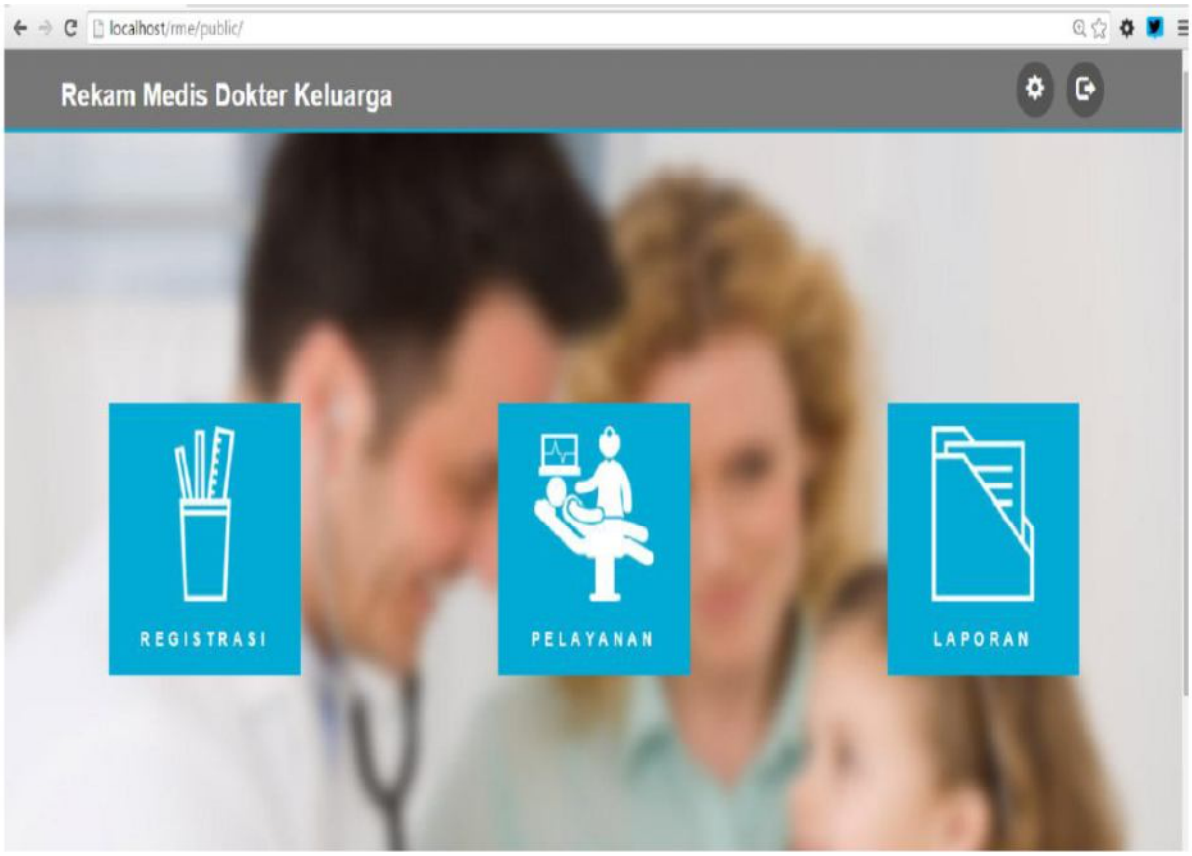


Figure 3. Screenshot of the main page of the EMR

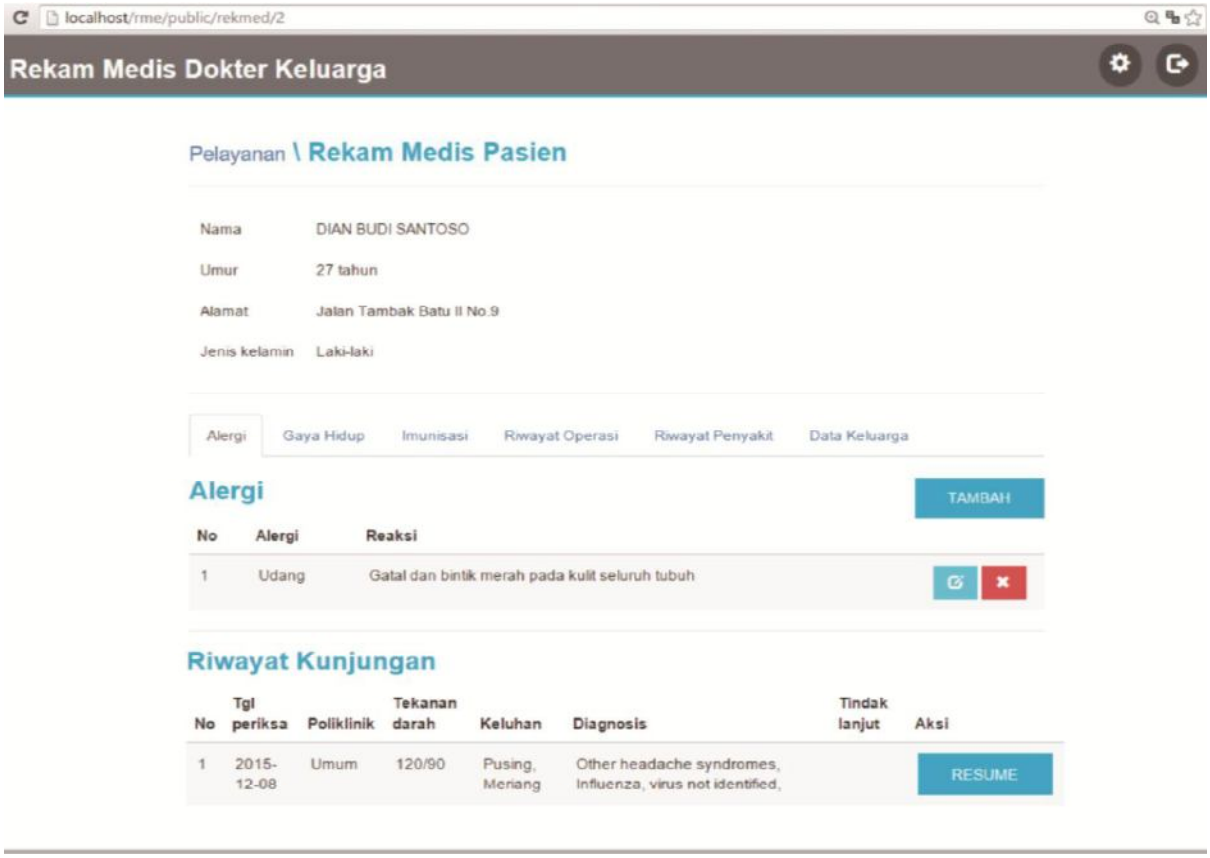


Figure 4. Screenshot of patient medical history in EMR.

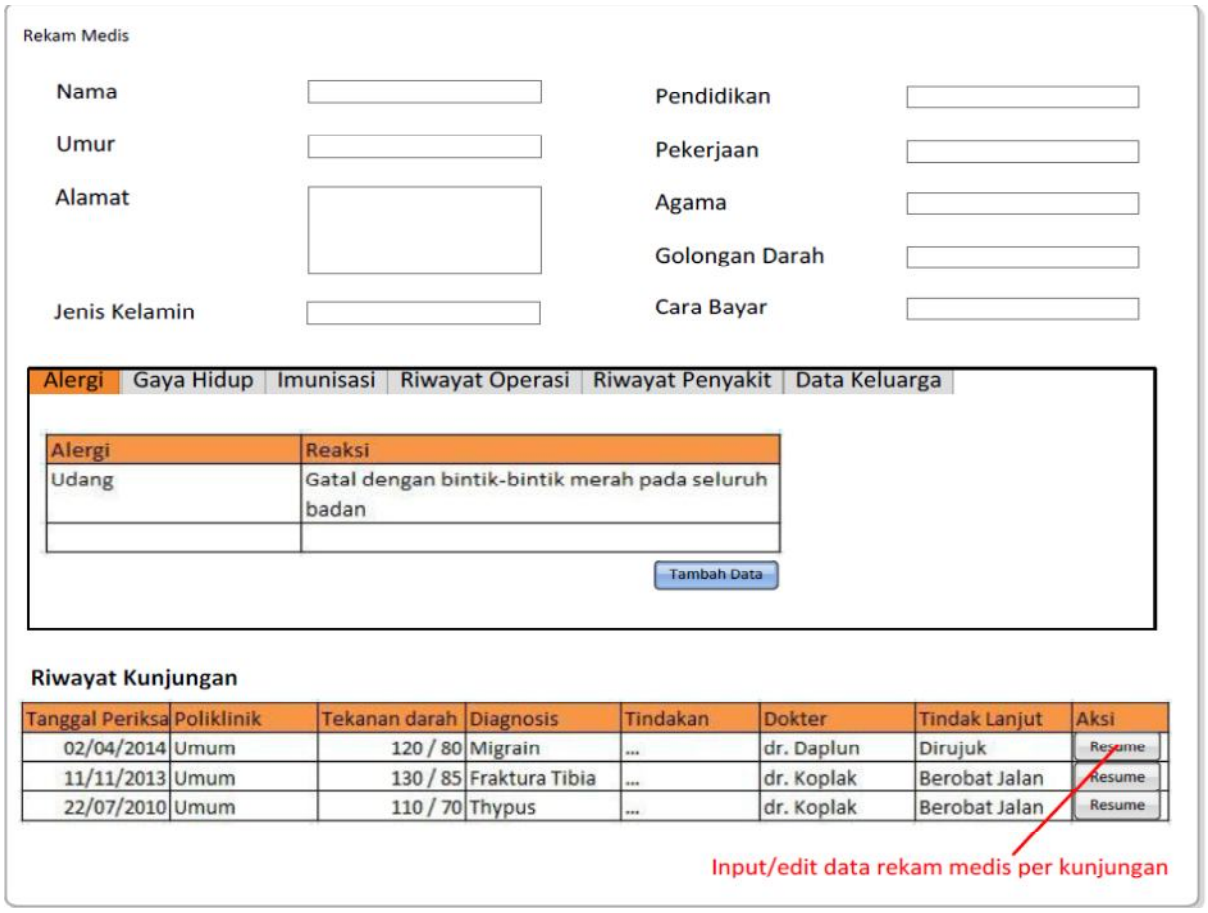


Figure 5. User interface design of EMR

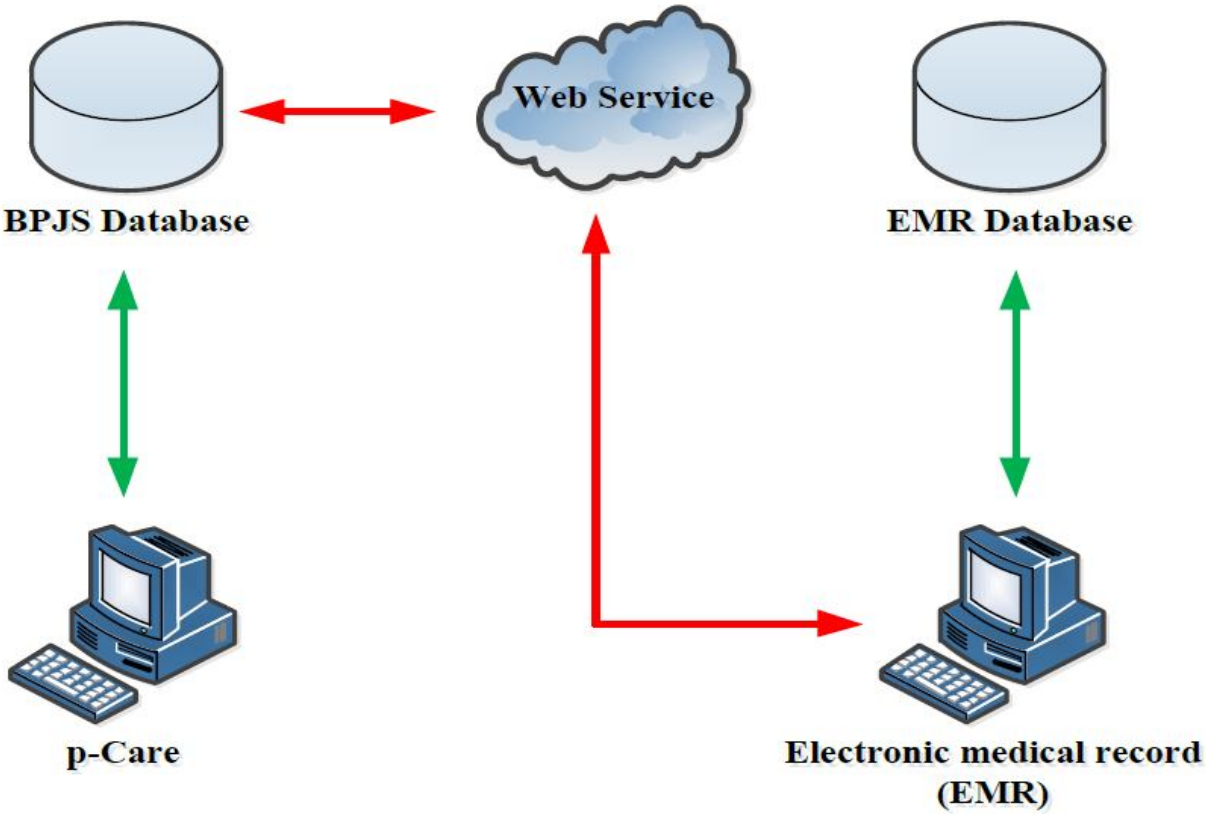


Figure 6. Integration between EMR and P-Care

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