



# Design of EMR (Electronic Medical Record) Applications Using RFID Cards to Record Patient Medical Record Data at The Sukajadi Bandung Health Center

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**Abstract.** One of the supports for health services is required to be better, one of which is by making EMR (electronic medical record) applications using RFID cards as a substitute for patient medical record cards. In this case this RFID card can function as patient history data, when the patient taps the RFID card, then all the history data appears entirely. Problem Identification at this stage the author identifies the problems that occur and looks for solutions needed at the Sukajadi Community Health Center in Bandung which requires a medical record application system to assist in processing patient data, medical record data and drug data at the Sukajadi Community Health Center. This research resulted in the design of a Medical Record application at the Sukajadi Health Center, Bandung City using an RFID card. b. With the record application can help activities in managing data both patients and drug data and more efficient and safer so that doctors can add or view the patient's medical record history.

**Keywords:** Application, Medical, Record, RFID.

## 1. Introduction

Medical records are written and recorded information about identity, history taking, physical determination, laboratory, diagnosis of all medical services and actions provided to patients [1]. Medical records have a very broad understanding, not just recording activities, but have an understanding as a system for organizing medical records starting from recording while the patient is receiving medical services, followed by organizing, storing and removing medical record files from storage to serve requests / borrowing by patients or for other purposes [2].

In addition to the implementation of medical records starting from patient admission to retrieval of medical record files. One part that is very instrumental is the storage of medical record files that are good and free from access to information for people who do not have an interest in health services [3], [4]. A good medical record is to have continuous data from the beginning to the end of treatment, so if medical record documents are not available, it will interfere with various aspects ranging from patient treatment to the payment process. Keshta and Odeh [5] in addition, the quality of medical records is an indicator of the quality of hospital services that can be seen from the completeness of filling out medical records. One of the parameters for determining the quality of health services in hospitals is data or information from good and complete medical records [6].

There are several factors that can cause errors in recording medical records. One of them is that patient recording still uses manual methods, so that if it is searched again, the recorded data will be lost. In addition, another factor in recording health history is human error. Users (especially doctors) also contribute to patient errors. The most common causes are poor clinical judgment and inaccurate data entry [7]. As with

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traditional medical records, long working hours, lack of experience, and fatigue are factors that encourage human error.

In addition, patients usually have a medical record card, When seeking treatment at a doctor or clinic, patients must bring their traditional patient card [8], [9]. The nurse or receptionist will also ask for the patient card to verify patient information and match eligibility with the medical record [10]. However, it is not uncommon for patients to lose their treatment card or forget to bring it. The admission department issues a new patient card, searches for the medical record, and records the medical record number. The impact will make it difficult for patients and health facilities.

A health card is just a card, so it may seem meaningless. However, it plays an important role as the first point of access for the admission department to retrieve and verify the patient's data along with the necessary related documentation, the patient card indirectly increases the patient's trust and sense of security in the health institution's services [10], [11]. The patient card contains the provider's name, medical record number, patient's name, date of birth, and age. These components are important as they relate to the patient's medical history, medication, treatment, allergies, and attending physician recorded in the medical record [12], [13], [14], [15].

One of the supports for health services is required to be better, one of which is by making EMR (electronic medical record) applications using RFID cards as a substitute for patient medical record cards. In this case this RFID card can function as patient history data, when the patient taps the RFID card, then all the history data appears entirely. This research aims to design EMR (Electronic Medical Record) Applications Using RFID Cards to Record Patient Medical Record Data at The Sukajadi Bandung Health Center.

## 2. Method

### 2.1 Research Method

At this stage, the authors carry out data collection techniques, namely:

- a. Problem Identification At this stage the author identifies the problems that occur and looks for solutions needed at the Sukajadi Community Health Center in Bandung, which requires a medical record application system to assist in processing patient data, medical record data and drug data at the Sukajadi Community Health Center.
- b. Literature Study At this stage the author studies the theories or journals regarding medical records that underlie this research, the author uses scientific book guidelines and other papers as a basis for knowledge in conducting research and a theoretical basis for research to design a medical record application system at the Sukajadi Community Health Center.
- c. System Development After studying what is needed and collecting data to solve problems that occur at the Sukajadi Community Health Center and making system development using usecase diagrams and creating a new system
- d. Conclusion From the research that has been done, it can be concluded that the existence of a record application can help activities in managing both patient data and drug data and is more efficient and safer so that operators only need to input, change and delete data according to their needs and make it easier to search for patient data or patient medical records. Reduce the error rate in carrying out data management activities.

### 2.2 System Development Method

The system development method is a method for compiling a new system to replace the old system as a whole or improve the existing system in this study the author uses system development with a waterfall model or waterfall For more details, the

system development method according to Abutaleb et al. [12] which the author applies in the study can be seen in the following figure:

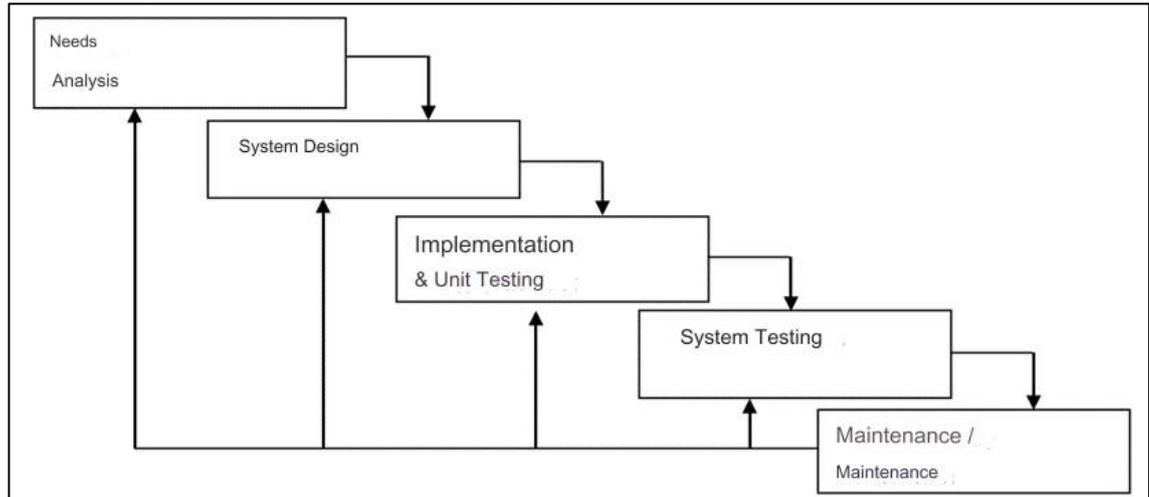


Figure 1. Waterfall Method

In general, the stages in the waterfall method consist of analyzing needs, system design, implementation & unit testing, system testing and maintenance. As for the author only conducting a research, then system maintenance is not applied to this research activity as for the stages that the author uses only up to the time of system testing.

### 3. Result and Discussion

#### 3.1 Analysis System

Sukajadi Health Center Bandung City is one of the health centers in Bandung located at Jln. Sukagalih no 26 Bandung City which has been established since 2001. Puskesmas was established at the suggestion of the mayor of Bandung who saw the number of hospitals that treated patients at expensive prices so that the mayor had the aim of establishing a puskesmas that could be reached by patients at an affordable price and could provide public health services so that the health level of Bandung city would be better.

#### 3.2 Use Case Diagram

In this system process the author uses use case diagrams as a tool to model aspects of system behavior each use case diagram shows a set of use cases, actors and their relationships use case diagrams are useful for visualizing, specifying and documenting system behavior. The following is a picture of the use diagram of the application being built:

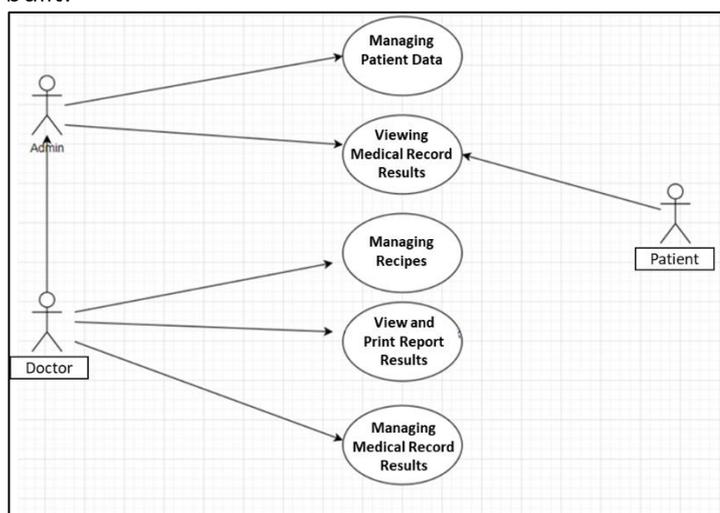


Figure 2. Use Case Diagram

### 3.3 Program Design

Figure 3 New Patient Data

At this stage, new patients will be registered by the puskesmas admin and require filling in all data. This is the first step for new patient registration and after that an RFID card will be given instead of a medical record card. No RFID has a unique number, so that each card has its own ID number that is not the same as the others.

Figure 4. Patient Medical Record Data

At this stage, the doctor will examine the patient and record all the results that have been obtained from the patient. The doctor only enters medical record data as shown above.

Figure 5. Medicine Medical Record Data

At this stage the doctor will prescribe medication to the patient from the results of the examination that has been carried out previously.

Figure 6. Patient's Medical Record History

At this stage the doctor can see the patient's medical record and drug history using an RFID card. The patient only needs to paste the RFID card and all patient history data will come out completely from the beginning to the end of the patient's arrival.

## 4. Conclusion

From the research that has been done, it can be concluded that this research produces a Medical Record application design at the Sukajadi Health Center in Bandung City using an RFID card. With the record application can help activities in managing data both patients and drug data and more efficient and safer so that doctors can add or view the patient's medical record history.

## 5. Author's Declaration

**Author contributions and responsibilities** - The authors made major contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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## 6. References

- [1] Y. Zhan and Z. Xuan, 'Medical Record Encryption Storage System Based on Internet of Things', *Wireless Communications and Mobile Computing*, vol. 2021, pp. 1–9, Nov. 2021, doi: 10.1155/2021/2109267.
- [2] C.-L. Chen, P.-T. Huang, Y.-Y. Deng, H.-C. Chen, and Y.-C. Wang, 'A secure electronic medical record authorization system for smart device application in cloud computing environments', *Hum. Cent. Comput. Inf. Sci.*, vol. 10, no. 1, p. 21, May 2020, doi: 10.1186/s13673-020-00221-1.
- [3] W. A. Zgallai, A. Mahdi, A. Hamad, K. Saleh, M. Abdulla, and N. Ahmed, 'Electronic medical records integration in the UAE utilizing RFID and IOT', in *2022 Advances in Science and Engineering Technology International Conferences (ASET)*, Feb. 2022, pp. 1–4. doi: 10.1109/ASET53988.2022.9735115.
- [4] D. P. Kristiadi, M. Hasanudin, Sutrisno, Jawahir, F. Sudarto, and R. Tarmizi, 'INDHCl: Indonesian Districts Health Care Information Model', *J. Phys.: Conf. Ser.*, vol. 1764, no. 1, p. 012214, Feb. 2021, doi: 10.1088/1742-6596/1764/1/012214.
- [5] I. Keshta and A. Odeh, 'Security and privacy of electronic health records: Concerns and challenges', *Egyptian Informatics Journal*, vol. 22, no. 2, pp. 177–183, Jul. 2021, doi: 10.1016/j.eij.2020.07.003.
- [6] S. Tayyaba, W. Khalid, M. W. Ashraf, and V. E. Balas, 'Chapter 11 - Principles and paradigms in IoT-based healthcare using RFID', in *Healthcare Paradigms in the Internet of Things Ecosystem*, V. E. Balas and S. Pal, Eds., Academic Press, 2021, pp. 251–269. doi: 10.1016/B978-0-12-819664-9.00011-9.
- [7] R. Ganiga, R. M. Pai, M. M. Manohara Pai, R. K. Sinha, and S. Mowla, 'Integrating NFC and IoT to Provide Healthcare Services in Cloud-Based EHR System', in *Advances in Electrical and Computer Technologies*, T. Sengodan, M. Murugappan, and S. Misra, Eds., in *Lecture Notes in Electrical Engineering*. Singapore: Springer, 2020, pp. 361–371. doi: 10.1007/978-981-15-5558-9\_33.

- [8] A. Abu-Rumman, A. Al Shraah, F. Al-Madi, and T. Alfalah, 'The impact of quality framework application on patients' satisfaction', *International Journal of Human Rights in Healthcare*, vol. 15, no. 2, pp. 151–165, Jan. 2021, doi: 10.1108/IJHRH-01-2021-0006.
- [9] J. H. Kim *et al.*, 'Relationship between natural killer cell activity and glucose control in patients with type 2 diabetes and prediabetes', *Journal of Diabetes Investigation*, vol. 10, no. 5, pp. 1223–1228, 2019, doi: 10.1111/jdi.13002.
- [10] O. Enaizan, B. Eneizan, M. Almaaitah, A. T. Al-Radaideh, and A. M. Saleh, 'Effects of privacy and security on the acceptance and usage of EMR: The mediating role of trust on the basis of multiple perspectives', *Informatics in Medicine Unlocked*, vol. 21, p. 100450, Jan. 2020, doi: 10.1016/j.imu.2020.100450.
- [11] S. Fairouz, S. Y. Miti, Z. Islam, and M. T. Zaman, 'A medical history card utilizing the Blockchain technology', in *2023 5th International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA)*, Jun. 2023, pp. 1–6. doi: 10.1109/HORA58378.2023.10156689.
- [12] R. A. Abutaleb, S. S. Alqahtany, and T. A. Syed, 'Integrity and Privacy-Aware, Patient-Centric Health Record Access Control Framework Using a Blockchain', *Applied Sciences*, vol. 13, no. 2, Art. no. 2, Jan. 2023, doi: 10.3390/app13021028.
- [13] K. Zhang, W. Yang, H. Dai, and Z. Deng, 'Cardiovascular risk following metformin treatment in patients with type 2 diabetes mellitus: Results from meta-analysis', *Diabetes Research and Clinical Practice*, vol. 160, p. 108001, Feb. 2020, doi: 10.1016/j.diabres.2020.108001.
- [14] A. Gharat and G. Phadke, 'Smart Medical Health Card for Hospital Management', in *2022 2nd Asian Conference on Innovation in Technology (ASIANCON)*, Aug. 2022, pp. 1–4. doi: 10.1109/ASIANCON55314.2022.9909434.
- [15] S. Mittal, C. Monga, K. Upreti, N. Kumar, R. D. Raut, and M. S. Alam, 'Light Weight Cryptography for Cloud-Based E-Health Records', in *2022 7th International Conference on Communication and Electronics Systems (ICCES)*, Jun. 2022, pp. 690–696. doi: 10.1109/ICCES54183.2022.9835827.