



Electronic-Based Medical Records Auditing System in Indonesian Hospital: Development and Trials

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ABSTRACT

Medical records must be made and completed immediately after the patient receives the health services. To maintain the quality of medical records, medical records must be documented completely. Checking the medical record completeness can be done using medical record analysis or audit techniques. During this time, the audit process of medical records in hospitals is still largely carried out conventionally or manually. The increasing use of information technology in the health sector has encouraged Yogyakarta City General Hospital to develop and use an electronic applications for medical audit activities, particularly in relation to the incomplete of medical records. This study aimed to design a prototype of an electronic-based medical record review system in Yogyakarta City General Hospital. This study used a research and development method with prototyping approach. The research was carried out starting from qualitative data collection by observations, interviews, focus group discussion, and documentation study. The design process uses a prototyping scheme by involving the medical records officers as research subjects. The prototype of a web-based electronic medical record review system has been developed and has been evaluated. The results in the aspects of system usefulness, information quality, and interface quality shows that 66.77% of respondents feeling satisfied with the prototype that has been developed. The prototype that has been developed needs to be further evaluated so that user needs and

compliance with standards relating to medical record review can be accommodated properly.

Keywords: *Information systems, medical records, audit*

I. INTRODUCTION

Quality in filling out medical record data is the responsibility of health workers who provide health services to patients. Regulation concerning medical records in Indonesia states that every doctor and dentist in carrying out medical practice must provide a medical record. The regulation also explained that medical records must be made immediately and completed after patients receive services [1]. Most of Indonesian hospitals still use paper-based medical records. There are various problems that often occur in the use of paper-based medical records including documents that are not well managed, easily damaged, found incomplete, and data redundancy [2]. Therefore, to overcome specially to the incompleteness problem, a medical records audit/review must be conducted in order to check the medical records data completeness.

Medical records audits are used in two ways, namely quantitative analysis and qualitative analysis [3]. Quantitative analysis activities are intended to access the completeness and accuracy of the inpatient and outpatient medical records owned by health service facilities. Quantitative analysis of inpatient medical records can be



carried out while the patient is still in a health facility/hospital (concurrent analysis) or after the patient returns (retrospective analysis). In its development, concurrent analysis hereinafter referred to as review of open medical records while retrospective analysis referred to as review of closed medical records. A quantitative health record review is carried out by evaluating the completeness of various types of forms and data/information (paper and electronic based) [4][5]. Based on reference, the quantitative analysis components are patient's identity, important reports, authentication, and correct documentation [6]. During this time, the medical records audit process in Indonesian hospitals is still largely carried out conventionally or manually. However, the increasing use of information technology in the health sector has encouraged Yogyakarta General Hospital to develop and use software applications for medical records audit activities, particularly in relation to the incomplete analysis process of medical records. This study aims to design a prototype of a medical-based medical record review system in Yogyakarta General Hospital.

II. METHODS

This type of research was a research and development methods with a prototyping approach. The research was directed to get in-depth information related to the process of medical records auditing process. The subjects were 13 medical record officers in Yogyakarta General Hospital whose involved in the medical record audit activities. All subjects were met research inclusion criteria which were must be involved in medical record auditing activities for at least 2 years or more, registered as legal employees at Yogyakarta General Hospital, and willing to become research respondents. The objects of this research were the medical records audit information system and data items on the medical records form which are analyzed for data completeness.

We used observation, interviews, study documentation, and a focus group discussion

to collect the data. Observations were made by observing officers in implementing and using the application of a medical record review system in Yogyakarta General Hospital. Interviews in this study were conducted to research subjects to obtain information relating to the needs of the medical record review system. Study documentation is used to identify data items for the development of a medical record review system. A focus group discussion was done by collecting systematic data and information about the results of the design of a medical record review system through group discussions. Activities involve research subjects that are planned to be carried out after the prototype was finished and after the trial was conducted.

III. RESULTS AND DISCUSSION

A. Present condition

The medical record audit system in Yogyakarta General Hospital consists of several stages, namely: 1) KLPCM audit (timeliness and completeness of filling medical records); 2) close review of medical records; 3) open review of medical records; and 4) completeness analysis of the informed consent (IC). All processes can be seen in Fig 1.

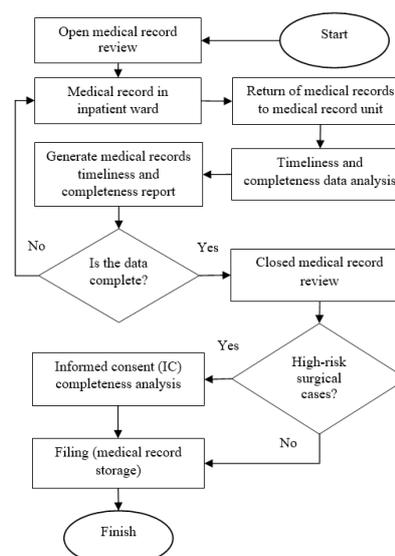


Figure 1. Medical Records Audit Framework

The hospital has already used some electronic based information systems. However, the current systems are still not optimal. This is because the applications used are various and have not been integrated with each another. In addition, the medical records officers must analyze the outputs of each application manually to make a related report. The respondents expect that the newly system can solve the documentation problem, easily accessed, and integrated between one activity with another

activity. Other respondents stated that the system must be able to maintain the confidentiality of medical record data. In addition, the system must also be opened on a smartphone or tablet so that later can be used portably to the inpatient ward during open medical records review (Table 1). As a part of electronic medical records, the system must also be able to produce the required reporting format because one of the criteria for a quality electronic medical record is being able to produce the required report output validly and accurately [7].

Table 1. Respondent’s Interview Quotes

Respondent	Interview Quotes
A	The application that is currently available is still not good ... yeah because we use Access and hospital management system, so it hasn’t been connected yet
B	The existing system has actually helped us to conduct an audit / medical record review but the results are still in the form of a recapitulation table ... after being exported, we have to process it manually to produce the required reports and information
C	Well ... it’s better if the system can accommodate the needs of all related officers. The system must be able to solve documentation problems. The system must be easily accessible anytime and anywhere. In addition, the system is also connected between one activity and another
D	The system must guarantee the confidentiality of patient data in medical records. Then, if possible, the system can also be opened on a smartphone or tablet so that later can be used portably to the inpatient ward during open medical records review

B. System Development

The system is developed by following the steps in the prototyping method. This method use software development experience and experiment based approach. Prototyping process resulted in an early version of a software (prototype) that is describe the system all possible developers do experiments and contact with potential

users for identify deficiencies and get suggestion for system refinement [8]. The interface design is divided into several designs, namely: login page, dashboard, medical record expedition, medical record trace, open/close medical record review, and informed consent review. Display design can be seen in the following image (Fig. 2 – 7).

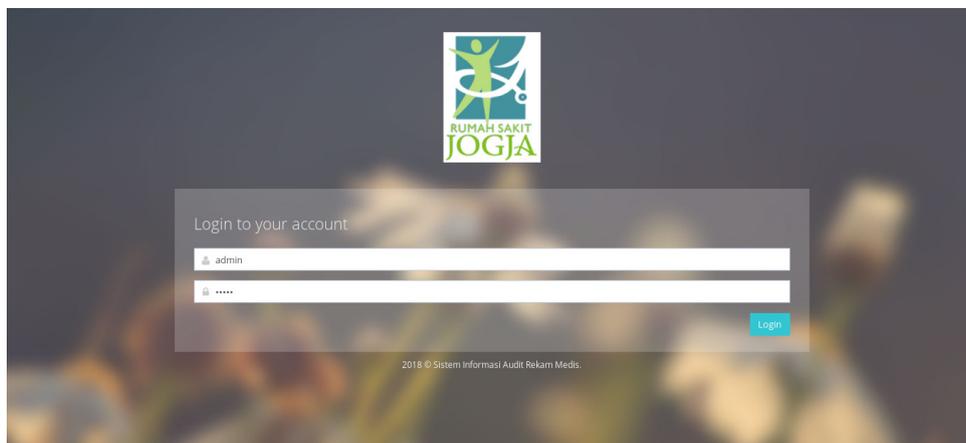


Figure 2. System Login Page

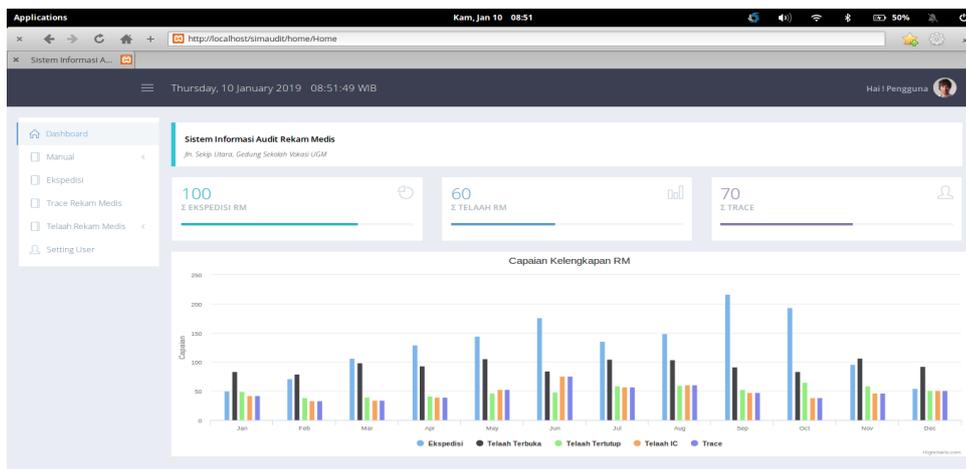


Figure 3. Dashboard

Nor Register	No.RM	Nama Pasien	Tgl Ranap	Bangsal	Tgl RM Keluar	Tgl RM Kembali	DPJP	Ket RM	Action
1	01-01-78	Budli	10/10/2018	Bangsal Flamboyan	10/10/2018		dr. Susan H	Poli Bedah	Edit Delete
2	10-10-10	Valhya	15/10/2018	Bangsal Flamboyan	15/10/2018	20/10/2018	dr. Susan H	Filing	Edit Delete
TOTAL BRM									2

Figure 4. Medical Record Expedition

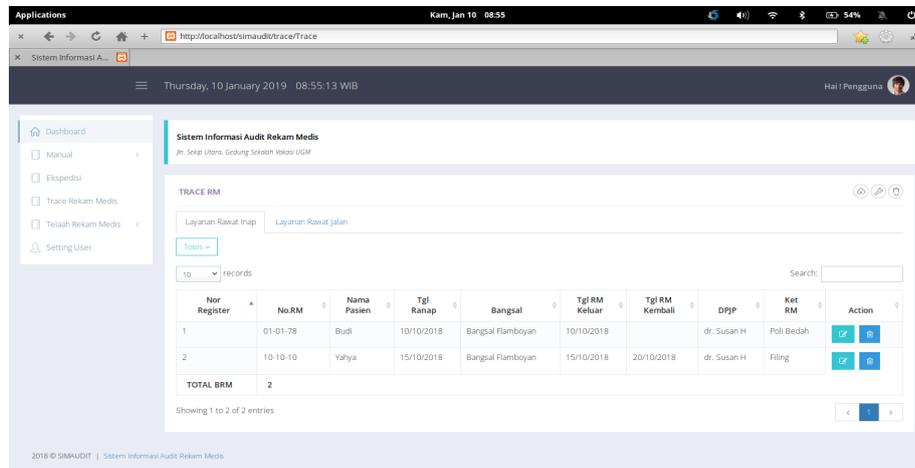


Figure 5. Medical Record Trace

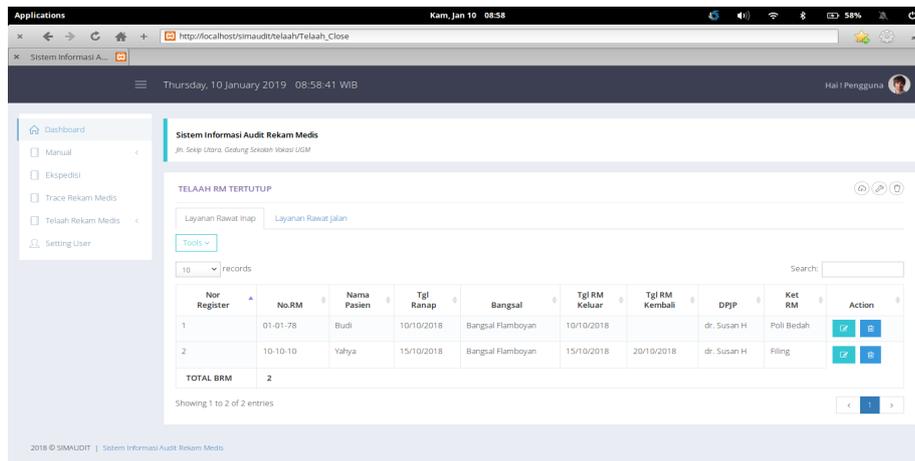


Figure 6. Open/Close Medical Records Review

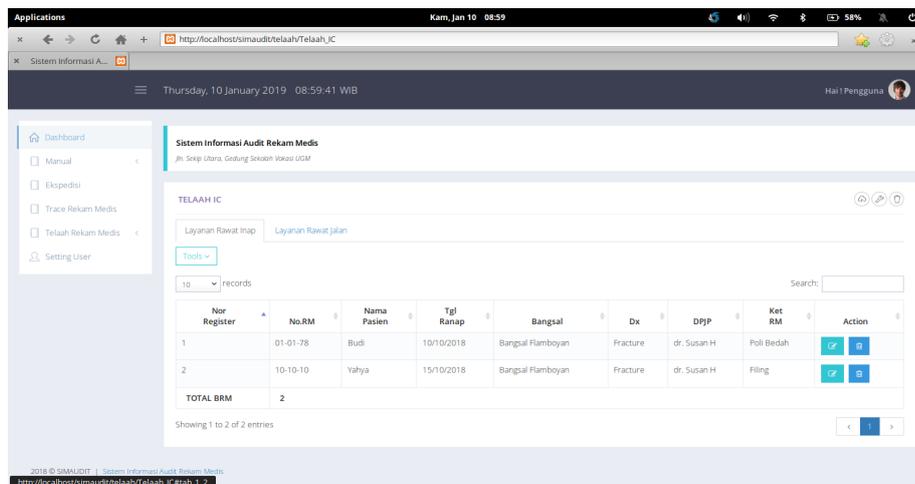


Figure 7. Informed Consent Review



C. System Testing and Evaluation

The prototype of an electronic medical record that has been developed was tested beforehand at the Medical Records Laboratory in Vocational School, Universitas Gadjah Mada. The test results show that the system prototype can be operated smoothly. Furthermore, the system prototype is then presented and tested to 25 respondents in hospital to Respondents were given guidance to try and use the prototype. After that, all respondents were given a questionnaire based on Post-Study System Usability Questionnaire [9] which include system usefulness, information quality, interface quality, and user satisfaction. This questionnaire is proven still relevant enough to evaluate various types of computer systems [10]. The results are presented in Fig 8.

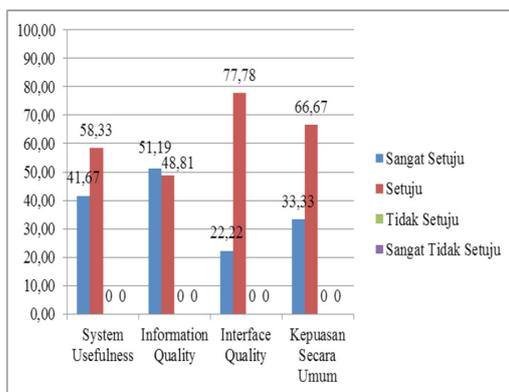


Figure 8. System Evaluation Results

From Fig. 8, it is known that in general respondents were satisfied with the system prototype that had been developed. Out of all respondents who filled out the questionnaire, 66.77% of respondents agreed and 33.33% strongly agreed. There were no respondents who stated neither agree nor strongly disagree. In the aspect of system usefulness, 58.33% of respondents agreed and 41.67% strongly agreed. In the

aspect of information quality, as many as 48.81% of respondents agreed and 51.19% of respondents strongly agreed. The results of the assessment on the aspect of interface quality showed 77.78% of respondents agreed and 22.22% of respondents strongly agreed.

System's usefulness is one of the determining factors successful implementation of a system information [11], meanwhile information quality is the most frequent dimension evaluated [12]. At the facility health, one of the elements of measurement user satisfaction with the system the information used is the interface quality [13]. Evaluation on aspects the quality of the user interface is not will instantly be able to identify lack of systems in terms of perception users regarding system usability [14]. Respondents' satisfaction to all aspects of the system indicating that this prototype has the potential considerable success on implementation stage. However, one of the development key elements of software prototypes is by communicating effectively with potential users. Further developments and prototype improvements will be continued until it get approval by prospective user so it can be implemented successfully [15].

IV. CONCLUSION

The prototype of a web-based electronic medical record review system has been developed at Yogyakarta General Hospital and has been evaluated. Most of respondents (66.77%) feeling satisfied with the system prototype. The prototype of an electronic medical record that has been tested needs to be evaluated and further developed to be able to accommodate further needs.



V. ACKNOWLEDGEMENT

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VI. REFERENCES

- [1] Regulation of the Minister of Health of Republic of Indonesia number 269 of 2008 concerning medical records. Accessed from <https://dinkes.surabaya.go.id/> on March 12nd, 2018.
- [2] A. M. Uslu, & J. Stausberg, Value of the electronic patient record: An analysis of the literature. *J Biomed Inform*, 41(4), 2008, pp. 675–682.
- [3] G. R. Hatta, *Guidelines for Health Information Management in Healthcare Facilities*, rev ed. Jakarta: UI-Press, 2013.
- [4] J. S. Clark, *Documentation for Acute Care*, Revised. Chicago: AHIMA, 2004.
- [5] M. L. Johns, *Health Information Management Technology: An Applied Approach*. Chicago: AHIMA, 2002.
- [6] E. K. Huffman, *Health Information Management*. Illinois: Physicians' Record Company, 1994.
- [7] C.-J. Hsiao, E. Hing, T. C. Socey, & B. Cai, Electronic health record systems and intent to apply for meaningful use incentives among office-based physician practices: United States, 2001-2011. *NCHS Data Brief*, 79, 2011, pp. 1–8.
- [8] R. Budde, K. Kautz, K. Kuhlenkamp, & H. Züllighoven, *H. Prototyping-An Approach to Evolutionary System Development*. 1992, Springer Berlin Heidelberg.
- [9] J. R. Lewis, IBM computer usability satisfaction questionnaires: Psychometric evaluation and instructions for use. *Int J of Hum-Comp Inter*, 7(1), 1995, pp. 57–78.
- [10] A. F. Rosa, A. I. Martins, V. Costa, A. Queiros, A. Silva, & N. P. Rocha, European Portuguese validation of the Post-Study System Usability Questionnaire (PSSUQ). 10th Iberian Conference on Information Systems and Technologies (CISTI), 2015, pp. 1–5.
- [11] M. M. Yusof, L. Stergioulas, & J. Zugic, Health information systems adoption: findings from a systematic review. *Studies in Health Tech and Inf*, 129(1), 2007, pp. 262–266.
- [12] M. J. Van der Meijden, Determinants of Success of Inpatient Clinical Information Systems: A Literature Review. *J of the Am Med Inf Assoc*, 10(3), 2003, pp. 235–243.
- [13] V. P. Aggelidis & P. D. Chatzoglou, Hospital information systems: measuring end user computing satisfaction (EUCS). *J of Biomed Inf*, 45(3), 2012, pp. 566–579.
- [14] H. A. Taylor, D. Sullivan, C. Mullen, & C. M. Johnson, Implementation of a user-centered framework in the development of a web-based health information database and call center. *J of Biomed Inf*, 44(5), 2011, pp. 897–908.
- [15] A. W. Kushniruk & V. L. Patel, Cognitive and usability engineering methods for the evaluation of clinical information systems. *J Biomed Inf*, 37(1), 2004, pp. 56–76.