Design and development of web-based dental electronic medical records according to ministry of health standards

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ABSTRACT

Background: *Implementation of electronic medical records in health facilities is still very rare. The issuance of Regulation No. 24 of 2022 by the Minister of Health, which requires electronic medical records, means that all health facilities in Indonesia must be prepared to use electronic medical records. The results show that the format of electronic medical records, especially in dental facilities, is incomplete and non-standardized.*

Method: *The methods type is research and development with an action research approach. The method used to create the application is SDLC (Systems Development Life Cycle), which includes problem identification, design, application development, testing, implementation and maintenance.*

Result:*, The results of dental electronic medical record system application has 100% complete formats according to the minimum requirements of the minister of health regulations, including patient identity formats, patient medical record formats, odontogram formats, medical treatment formats, supporting examination upload formats, and informed consent upload formats .*

Conclusion: *This research has succeeded in creating an web-based application for an electronic medical record system for dentistry that has standard specifications of the Ministry of Health.*

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INTRODUCTION

Medical records for dentists are very important and cannot be ignored. One of the functions of the medical record is official data or legal aspects of the dentist's responsibility regarding the treatment procedures carried out for the patient. However, the results of several studies conducted still show that the use of medical records has not been carried out correctly and optimally. Completion of patient odontograms is rarely done (5%), even though this has been made a national standard in the preparation of medical records in dentistry. Even among dentists, there are still differences in writing procedures, terms or notes used to document odontograms and diagnoses. This can lead to misunderstandings when the medical records are used by other authorized parties, for example in a legal process[1-3].

Given the many weaknesses in completing manual dentistry medical records, the development of dental electronic medical records is important. In Indonesia, the conversion from paper-based medical records to electronic medical records is not yet well advanced, lagging far behind America, which started in 1999, England since 2000 and New Zealand since 2002. The use of electronic medical records in health facilities is still very rare[4-5].

With the issuance of the Minister of Health Regulation No. 24 of 2022 on medical records, all health facilities in Indonesia must be prepared to use electronic medical records, as it is mandatory. Research to assess the implementation and completeness of dental electronic medical record formats has not been widely conducted. The results of Erdianto's research (2022) stated that in several hospitals, the electronic medical record format in the dental polyclinic was still incomplete. Some of the data found to be incomplete included identity data, patient objective examination data, dental odontogram symbols, dental condition codes, ICD 10 diagnoses, supporting examination forms and consent forms. It is important to address the issue of dentistry electronic patient records, in this case, it is necessary to develop and create web-based dental electronic medical records in accordance with the Ministry of Health's Guide to Dental Patient Records and the Minister of Health's Regulation No. 24 of 2022 concerning medical records[6-8].

RESEARCH METHODS

This type of research is research and development with an action research approach, namely the design of a web-based dentistry Electronic Medical Record system using the SDLC (Systems Development Life Cycle) method or often referred to as the waterfall approach. Broadly speaking, the waterfall method includes the following steps: problem identification, application design, application development, testing, application implementation and maintenance. The identification was done through the method of observation, interviews with users (dentists) and studies of laws and regulations to get an overview of the need for standard dental electronic medical record systems. Furthermore, the design,system development, testing and qualitative analysis of the results were also carried out.

RESULTS AND DISCUSSION

The dentistry electronic medical record system application has 4 users, namely admin, the dentist, the registration officer and the nurse. Each user has different access rights according to the rules for completing medical records. An explanation and description of the access rights of each user can be found in the following context diagram

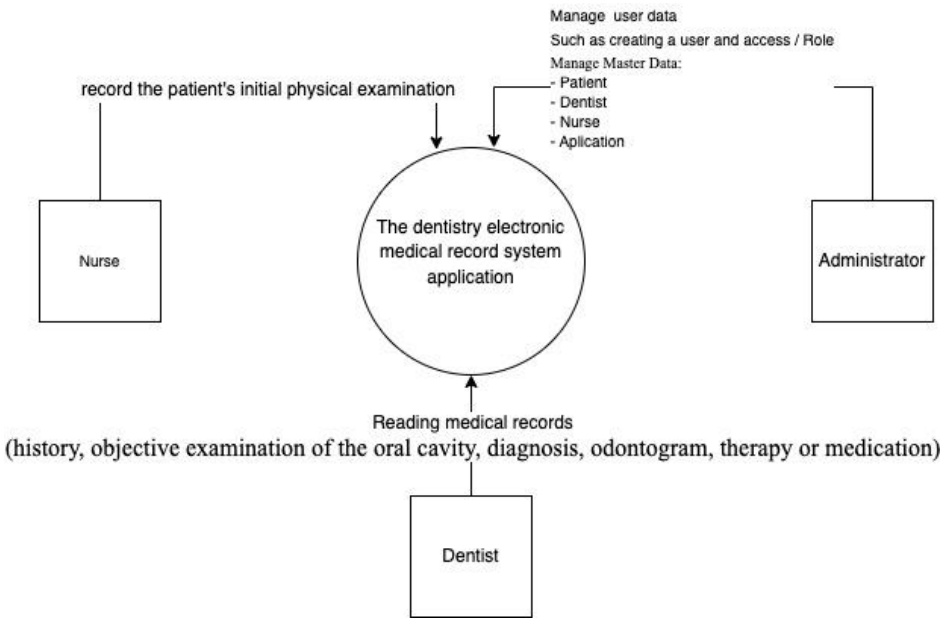

Figure 1. Context Diagram

The first page that appears in the system when it is started is the login page, as a security page for users who have the right to access it. To take advantage of this system, users - registrars medical record officers, dentists and nurses - must first access the login page by going to https://rekamedis.createsistem.online/login. Below you can see the interface of the login page for the electronic patient record in dentistry.

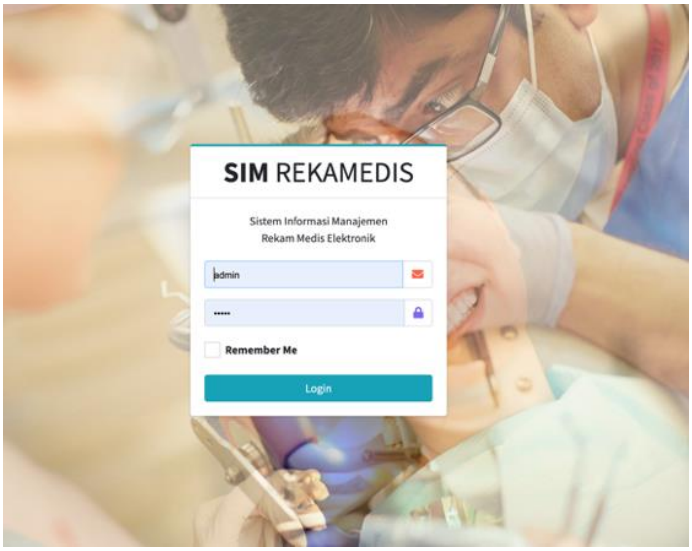

Figure 2. Login Page

The next page is the display of the patient registration page. The purpose of displaying this page is to register new and old patients. If the patient has registered earlier, it can display their card number, which you can later enter *"Form Cari Pasien"*. If you are a new patient who has never registered before, you can register by clicking on the *"Daftar Sekarang"*.

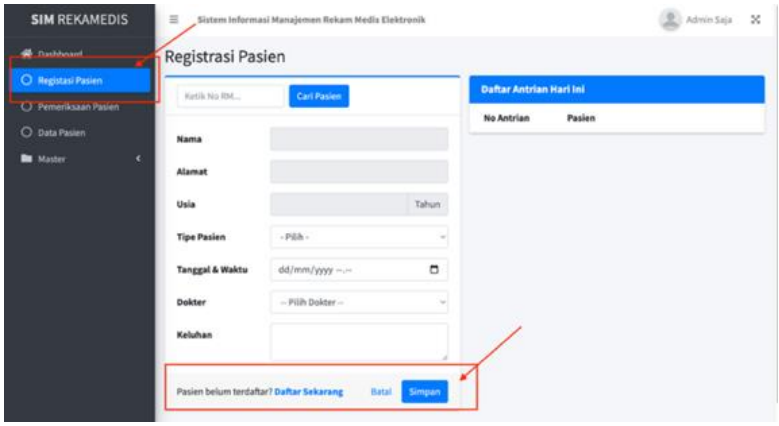

Figure 3. Patient Registration Page

The medical data and physical examination of the patient are quite important in the dental patient record. This application provides a complete page of the patient's medical data page in accordance with the standards of the Ministry of Health. This system is designed to facilitate the filling of the patient's medical data, so that dentists or nurses only have to select from the available options. The display of the patient's medical data page is shown in the picture below.

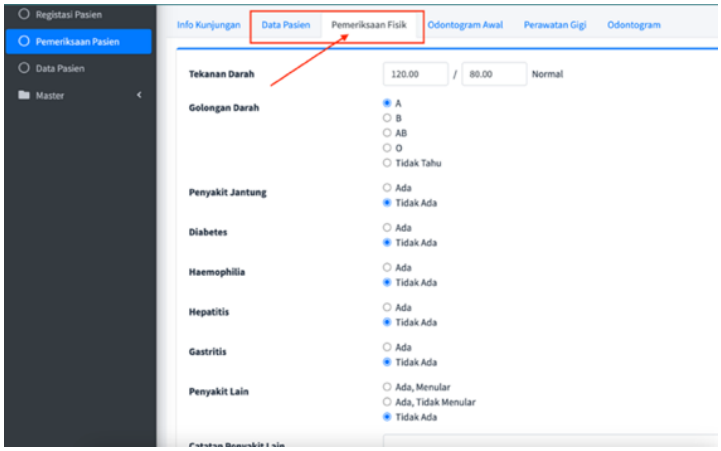

figure 4. Patient Medical Data Page

The odontogram page is a difference between dental medical records and general medical records. The odontogram page allows dentists to enter odontogram data in the form of the name of the dental condition and a picture symbol of the dental condition in accordance with Ministry of Health standards. The condition of the teeth referred to can be in the form of D-Car

(Distal Caries) or M-Car (Mesial Caries) and so on, depending on the type of treatment performed[9]. After selecting the condition of the tooth, it will be saved and a tooth image icon will automatically appear. The appearance of the final odontogram filling page can be seen in the following image.

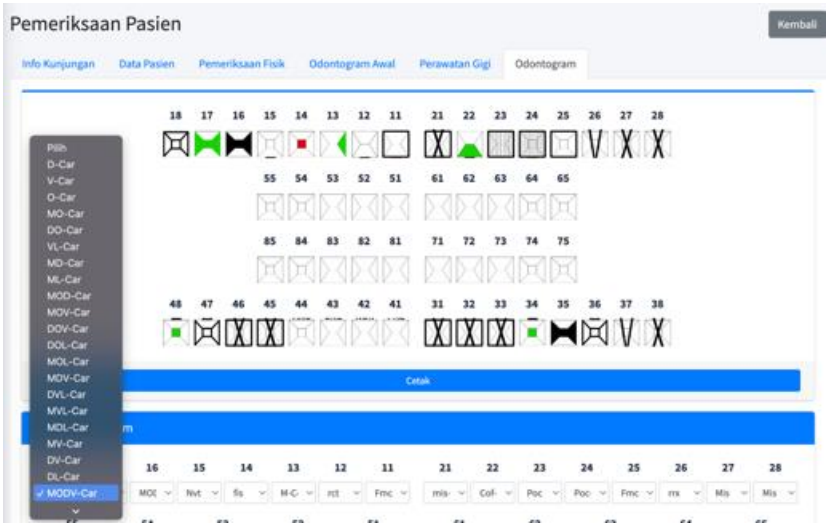

Figure 5. Odontogram page

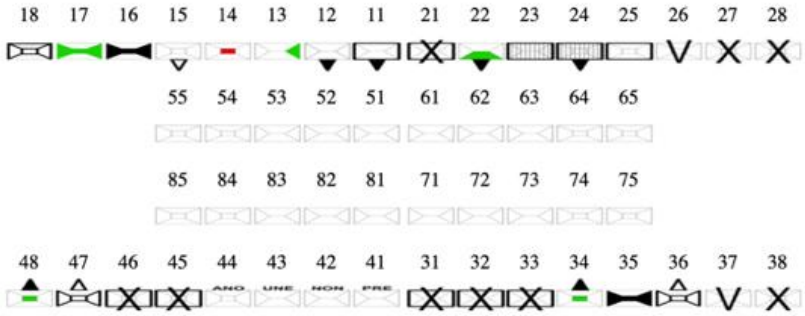

Figure 6. Odontogram page

On the dental treatment page, the dentist can fill in the results of the patient's dental examination with the input of dental elements, complaints, diagnosis (ICD Code 10), Treatment Actions (ICD Code 9) and other information if needed and can then be printed or printed. In this page display, it is necessary to input master data in the form of diagnosis (ICD Code 10) and master data for dental treatment (ICD Code 9). The data is adjusted to standards from the Ministry of Health so that it can be synchronized with the BPJS system. The display of the patient's dental care page can be seen in the following image.

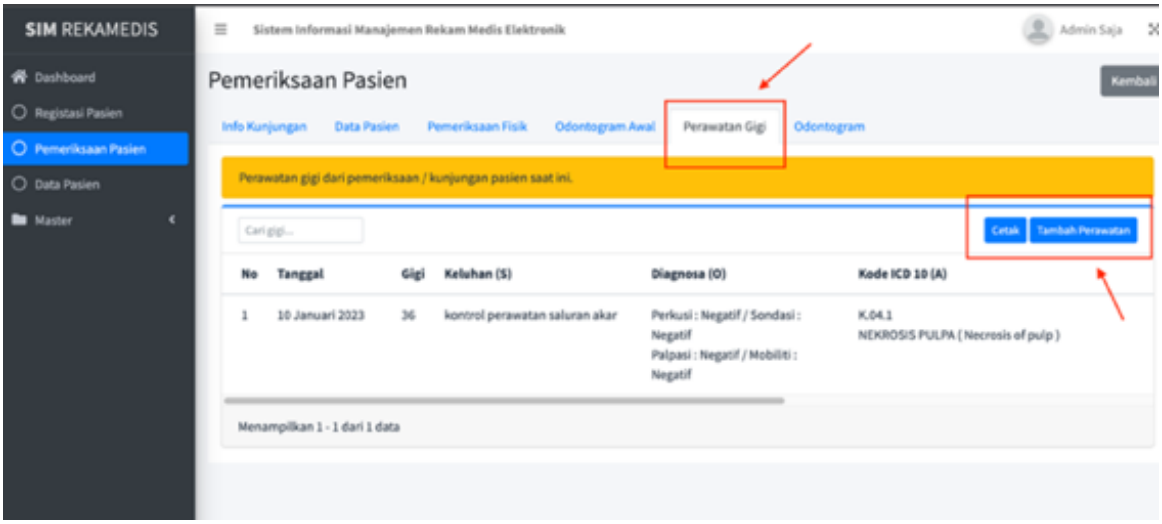

Figure 7. Dental Treatment Page

The assessment of the completeness of dental electronic medical record formats refers to the book "Dentistry Medical Record Guide" published by the Ministry of Health in 2014. The following table shows the results of the checklist of research on the completeness of dental electronic medical records in this study.

Table 1. Patient Identity

No	Medical Records		Complete Formats		Information
			Available	o	
1.	Patient Identity	Name	√		Suitable
		Place & Date of Birth	√		Suitable
		Number of Residential	√		Suitable
		Age	√		Suitable
		Gender	√		Suitable
		Race	√		Suitable
		Job	√		Suitable
		Home Address	√		Suitable
		Telephone	√		Suitable
		Office Address	√		Suitable
		Cellphone	√		Suitable

Table 2. Medical Data that Needs Attention

No	Medical Records		Complete Formats		Information
			Available	o	
2.	Medical Data that Needs Attention	Blood Identity	√		Suitable
		Blood Pressure	√		Suitable
		Heart Diseases	√		Suitable
		Diabetes	√		Suitable
		Haemophilia	√		Suitable
		Hepatitis	√		Suitable
		Gastring	√		Suitable
		Other Diseases	√		Suitable
		Medicine Allergies	√		Suitable
		Food Allergies	√		Suitable

Table 3. Odontogram and Intra Oral Examination

No	Medical Records		Complete Formats		Information
			Available	No	
3.	Odonto gram	Odonto gram Map Drawing	√		Suitable
		Odonto gram Writing	√		Suitable
		Form for Odonto gram Symbol	√		Suitable
	Intra Oral Exa mination	Occlusi	√		Suitable
		Torus palatinus	√		Suitable
		Torus mandibular	√		Suitable
		Palatum	√		Suitable
		Diastema	√		Suitable
		Anomai Teeth	√		Suitable
		Others	√		Suitable

Table 4. Treatment

No	Medical Records		Complete Formats		Information
			Available	No	
4.	Treatment Table	Date	√		Suitable
		Treated Teeth	√		Suitable
		Complain & Diagnosis	√		Suitable
		ICD 10 Code	√		Suitable
		Nurse	√		Suitable
		Dentist Initial	√		Suitable
		Information	√		Suitable

Table 5. Supplementary Attachment

No	Medical Records		Complete Formats		Information
			Available	o	
5.	Supplementary Attachment	Authorisation / Refusal of Medical Measures	√		Suitable
		Supporting Examination (Radiology)	√		Suitable
		Supporting Examination (Lab)	√		Suitable

DISCUSSION

The result of this research is an application for an electronic medical record system for dentistry with an odontogram form that can be used to enter dental chart symbols and codes according to the Ministry of Health's standard Dentistry Medical Record Guide. A form is available in the patient identity table to enter the complete patient identity including name, date of birth, NIK, age, gender, ethnicity/race, occupation, address and contact number. Completing a complete identity can serve as the main evidence that the patient has received care and treatment[10-12].

In the Medical Data table it can be seen that there is a form for entering the patient's medical data, which must be fully accounted for, namely blood group, blood pressure, heart disease, diabetes, haemophilia, hepatitis, gastroenteritis, other diseases, allergies to medicines, allergies to food. Incomplete medical records can impact dental procedures, for example, by affecting benefit assessments and delaying insurance claims[13,14]

Completing the odontogram is very important for patient identification, especially for completing ante mortem and post mortem data. The Odontogram table provides a form for entering the patient's complete odontogram and intraoral examination results. The odontogram in this application is specifically designed to display a complete image of the tooth symbol according to the standards set by the Ministry of Health. In this application, the dentist just selects the type of condition from the form provided, then a symbol corresponding to the condition of the tooth will automatically appear. The odontogram should be prepared as carefully as possible so that the condition of the teeth and the type of procedure performed are differentiated and known with certainty. The importance of the information in the odontogram is the reason why the dental record form must be prepared separately from the general medical record form[15,16].

The treatment table provides a form for entering the results of a complete examination and treatment of the patient, along with the standard ICD-10 diagnostic options and the standard ICD-9 dental treatment. Supplementary appendices are the final part of the dental patient record. The supplementary appendices store various things that complement the treatment provided, for example: patient x-rays, laboratory results, including informed consent and refusal of medical procedures (informed refusal)[17-19].

CONCLUSION

This research has succeeded in designing and creating an application for a dental electronic medical record system that complies with the standard specifications of the Minister of Health's Regulation No. 24 of 2022 on Medical Records and the Ministry of Health's Guide to Dental Medical Records. The application of the electronic medical record for dentistry in this study has a complete format

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