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Implementation of Pulmonary TB Management Program with Pulmonary Tuberculosis Patient Treatment Monitoring Information System (SISFOTBPARU)

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ABSTRACT

Various factors are thought to hinder the success of TB treatment, including failure of therapy due to non-compliance as one of the main factors. The solution is expected to be the development of an android-based pulmonary tuberculosis patient treatment monitoring information system application (SISFOTBPARU). This study aims to assist the operational health officers of the Kampung Sawah, Satellite, and Kedaton Bandar Lampung Health Centers in monitoring the treatment of TB patients at their Health Centers. Based on the results of the black box testing that had been carried out, the application could run according to the development design. In the UAT test using a list of questions for each application user using Likert's summed rating scaling calculation technique, for users of Kampung Sawah, Satellite, and Kedaton Health Center Officers in Bandar Lampung, 76.0% of users stated that it was very appropriate and 24.0% stated that it was proper that the menus displayed on the application met the expectations of health center officers. In the Testing of the Application for Patient Users of Kampung Sawah, Satellite, and Kedaton Health Centers in Bandar Lampung, 78.7% of users stated that it was very appropriate, and 21.3% stated that it was proper that the menus displayed on the application made it easier for patients to report their treatment activities. This study proves that the criteria for success include the web and Android TB patient treatment monitoring applications used by health workers at Kampung Sawah, Satellite, and Kedaton Health Centers and TB patients.

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INTRODUCTION

Multiple factors influence indicators of success in controlling and reducing TB. One of them is that the implementation of the TB treatment program with the DOTS approach has not been optimally implemented, which occurs because cooperation is still lacking and ongoing from the Health Center, commitment of health cadres, suboptimal drug monitoring (PMO), knowledge of TB survivors, side effects of drugs, and the Covid-19 pandemic, family affective function, counseling, and limited health promotion (Alfaiza & Wuryaningsih, 2022; Widya & Maharani, 2022; Mellania & Zainafree, 2022; Iksan, 2020; Kumalasari & Prabawati, 2021).

The development of medication monitoring information system applications to improve compliance with chronic disease treatment such as diabetes (Mulvaney et al., 2012), heart disease (Gandapur et al., 2016), stroke, and asthma (de Jongh et al., 2012) is very rapid in the world, while for infectious TB disease, it is still limited. SISFOTBPARU is expected to play a role in achieving the target of the Tuberculosis (TB) Eradication policy in Indonesia, namely the elimination of TB in 2030 and a TB-free Indonesia in 2050.

The design of the TB treatment compliance Android application that is currently being developed is expected to overcome problems related to TB treatment compliance by involving the concerns of various parties, including family and friends. Health workers (doctors, nurses, TB program participants), cadres, peer educators (former patients who are dedicated to supporting the success of TB treatment), and even psychologists who can provide strong motivation will change patient behavior to be compliant with TB treatment, which supports the success of TB elimination and eradication in Indonesia, in 2030 and 2050.

To achieve this target, the Ministry of Health has taken several steps. First, the

preparation of the Presidential Regulation discusses the handling of TB to support all parties; second, an agreement with the Ministry of Health and other ministries or institutions is essential to increase the role and support between sectors; third, handling TB with stunting disorders in 160 districts/cities. Fourth, implementing the mechanism for Monitoring drug consumption by TB patients in digital form is intended so that TB patients can receive treatment until they are cured (Ministry of Health of the Republic of Indonesia, 2021).

The Health Office no longer needs to re-register with each Health Center; by applying the pulmonary tuberculosis patient treatment monitoring information system (SISFOTBPARU), the Health Office can view all data reports directly from the web. The implementation of the pulmonary tuberculosis patient treatment monitoring information system application (SISFOTBPARU) was carried out at the Kampung Sawah, Satelit, and Kedaton Health Centers in Bandar Lampung City with the pulmonary tuberculosis patient treatment monitoring information system application (SISFOTBPARU) through the application.

The importance of using the pulmonary tuberculosis patient treatment monitoring information system application (SISFOTBPARU) in the digital era to facilitate two-way information exchange between health workers, families, and patients, therefore, a monitoring system application was built that is used by health center health workers and TB patients. Health center officers can monitor patient treatment activities, and patients can report their treatment activities.

METHOD

The research implementation consists of three basic stages: finding and analyzing problems, developing systems, and making reports. The issues in this study were identified and analyzed using the field survey method. The field survey was conducted at the Kampung Sawah, Satellite, and Kedaton Bandar Lampung Health Centers. This field survey was followed by collecting the necessary files and interviews with leaders and officers related to the research.

This application is built based on a website and developed to be based on Android. This development is due to the increasing mobility of Android users to reach most mobile device users in various fields (Herlinah & Musliadi, 2019). Application development uses the System Development Life Cycle (SDLC) waterfall model. While the preparation of reports functions as research documentation, the author conducts stages in system development. The SISFOTBPARU model is one of the methods used in the System Development Life Cycle (SDLC) (Pressman &Lowe, 2008). The model has several stages, starting with data collection, needs analysis (obtaining system and user requirements specifications), application design (modeling based on requirements specifications), implementation (creating applications based on designs that have been made), testing (testing applications that have been built), and maintenance (periodic checks to maintain system stability and fix future bugs).

Data collection was performed by collecting any information needed to achieve the final goal of the study. Various methods were used for data collection. In this study, the author conducted observations, namely, visiting and observing the operations of the Kampung Sawah, Satelit, and Kedaton Bandar Lampung Health Centers; interviews with the head of the health center and health workers who handle TB cases; and literature studies, namely, studying the health center's TB documents, related journals, and books that have relevant information.

The data obtained during the data collection stage was analyzed at the needs analysis stage. Needs analysis is divided into system (hardware and software) and user needs. The system must analyze the minimal hardware or software needed to develop an application. User needs include analyzing what the user can do, the interactions available, and the data flow involved in the application.

This research has ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Tanjung Karang No.383/KEPK-TJK/IV/2024.

RESULTS

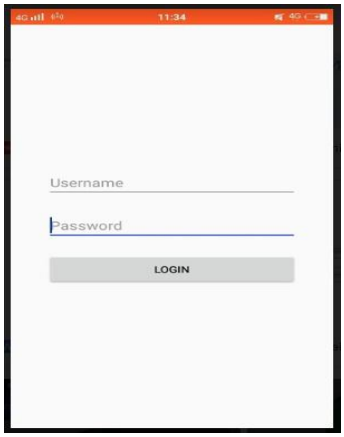

Figure 1. Page of login

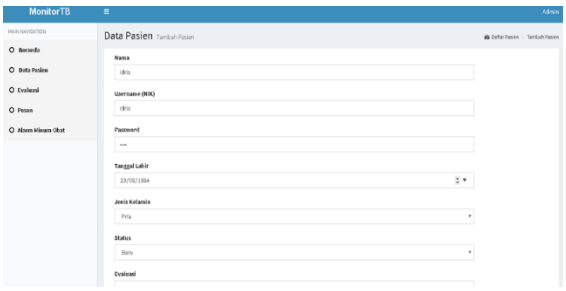

Figure 2. Page of add patient

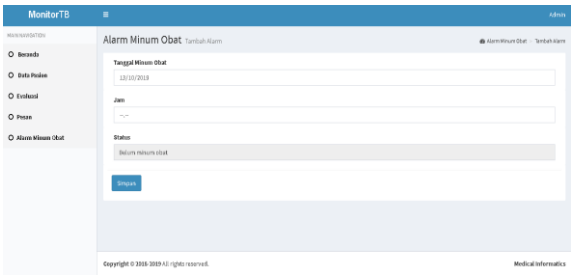

Figure 3. Page of adding alarm take the medicine

Some stages must be performed in scenario monitoring services using the system, as follows:

1. When patients arrive, those who do not have TB-01 will have the TB-01 form created first. If the patient has already completed the TB-01 form, the officer will find it in the storage file at the health facility.
2. The officer will fill in form TB-01
3. Patients who do not yet have an account will make an account.
   The account obtained is used to fill in medication attendance online and receive online control/visit schedules.
4. Patients will be directed to use the application and encouraged to log in to the mobile application.
5. Officer health facilities will send timetable alarm drink drugs to patients using the system.
6. The medication alarm schedule that has been sent is received by the patient via a mobile phone application. An alarm can be observed in the take-medication menu.
7. The medication alarm schedule that has been sent is received by the patient via a mobile phone application. An alarm can be observed in the take-medication menu.
8. Health facility officers also send patient visit schedule (control) messages using the system.
9. The patients can then receive the message sent through the application on their mobile phones. The message they receive can be seen in the message menu.

Application testing

At the testing stage, the application is tested against a developed system. Testing was performed to determine how well the system can fulfill user needs. The test carried out is alpha testing. Alpha testing was performed independently and within the internal scope. Its purpose is to ensure that the created system is free from defects or errors when used by customers.

Alpha testing can be divided into two categories: normal and abnormal.

Normal

1. After completing the process, the successful logins are displayed with an alert box. When the data of patients succeed, an alert box appears.
2. When data patients are deleted, an alert box Will appear.
3. When the data patient succeeds in deleting, an alert box appears.
4. When the visit data are successfully added, an alert box will appear. The alert box's appearance is as follows.
5. When the visit data are successfully changed, an alert box will appear. The alert box display that appears.
6. When the visit data were deleted, an alert box appeared. When the visit data are successfully deleted, an alert box will appear. The alert box display that appears.

Abnormal

1. When login fails, writing appears.
2. An alert box appears when a patient has the same username as another patient; an alert box will appear.

User acceptance testing

Process user acceptance testing of the TB patient treatment monitoring application was performed on users. Testing this application is done to produce documents proving whether users can accept the application developed. If the results obtained from the UAT test indicate that the application can be considered to meet user needs, then the application can be implemented. Testing with UAT is performed by asking health workers at the Kampung Sawah, Satelit, and Kedaton Bandar Lampung Health Centers, who act as health center administrators and TB patients. This test involved 5 health workers and 3 TB patients with TB. In the questions for health center health workers and patients presented, there were two criteria, namely numbers 1-5 questions on the appearance of the application and 5-10 questions

on the function of the application being built. The results of user acceptance testing are assessed with five answer choices, namely SS (Very appropriate), S (In accordance), KS (Not enough in accordance), TS (No appropriate), and TJ (No answer).

The following is a table of the results of UAT testing of the application for users of the Kampung Sawah, Satellite, and Kedaton Bandar Lampung Health Center officers:

Table 1. Applications for health center officers' testing

Item	5		4		3		2		1		Amount	
	F	%	F	%	F	%	F	%	F	%		%
X1.1	9	60.0	6	40.0	0	0	0	0	0	0	15	100
X1.2	11	73.3	4	26.7	0	0	0	0	0	0	15	100
X1.3	10	66.7	5	33.7	0	0	0	0	0	0	15	100
X1.4	12	80.0	3	20.0	0	0	0	0	0	0	15	100
X1.5	9	60.0	6	40.0	0	0	0	0	0	0	15	100
X1.6	13	86.7	2	13.3	0	0	0	0	0	0	15	100
X1.7	10	66.7	5	33.7	0	0	0	0	0	0	15	100
X1.8	11	73.3	4	26.7	0	0	0	0	0	0	15	100
X1.9	15	100.0	0	00.0	0	0	0	0	0	0	15	100
X1.10	14	93.3	1	6.7	0	0	0	0	0	0	15	100
Average		76.0		24.0								100

Information

X 1.1 = Is the main page display on this TB patient treatment monitoring application attractive?

X 1.2 = Are the TB patient treatment monitoring application menus sufficient to monitor patient treatment activities?

X 1.3 = Is the display of this active patient menu attractive?

X 1.4 = Is the appearance of this patient data menu attractive?

X 1.5 = Is the appearance of this distribution map menu attractive?

X 1.6 = Is the application built to register TB patients?

X 1.7 = Is the application built to monitor activities? TB patient treatment

X 1.8 = When this application is run, is there a menu that does not run?

X 1.9 = When this application is run, is there no error?

X 1.10 = Can this application help in decision-making?

After conducting the system testing using the user acceptance testing method then, the following conclusions can be drawn: from testing officer health using the UAT method, it was found that 76.0% of users stated that it was very appropriate. Moreover, 24.0% declared that the menus displayed in the application met the expectations of health center officers. Measurement using Likert's Summated Rating scaling technique produces a total overall score of 15 or a percentage of 100% so that the web-based TB patient treatment monitoring application is included in the criteria for being considered successful.

Table 2. Applications for users/patients testing

Item	5		4		3		2		1		Amount	
	F	%	F	%	F	%	F	%	F	%		%
X1.1	14	93.3	1	6.7	0	0	0	0	0	0	15	100
X1.2	11	73.3	4	26.7	0	0	0	0	0	0	15	100
X1.3	11	73.3	5	26.7	0	0	0	0	0	0	15	100
X1.4	12	80.0	3	20.0	0	0	0	0	0	0	15	100
X1.5	10	66.7	6	33.7	0	0	0	0	0	0	15	100
X1.6	14	93.3	1	6.7	0	0	0	0	0	0	15	100
X1.7	10	66.7	5	33.7	0	0	0	0	0	0	15	100
X1.8	11	73.3	4	26.7	0	0	0	0	0	0	15	100
X1.9	12	80.0	3	20.0	2	0	0	0	0	0	15	100
X1.10	13	86.7	2	13.3	0	0	0	0	0	0	15	100
Average		78.7		21.3								100

Information

X 1.1 = Is the main page display on this TB patient treatment monitoring application attractive?
X 1.2 = Are the TB patient treatment monitoring application menus sufficient to monitor patient treatment activities?
X 1.3 = Is the display of this active patient menu attractive?
X 1.4 = Is the appearance of this patient data menu attractive?
X 1.5 = Is the appearance of this distribution map menu attractive?
X 1.6 = Is the application built to register TB patients?
X 1.7 = Is the application built to monitor activities? TB patient treatment
X 1.8 = When this application is run, is there a menu that does not run?
X 1.9 = When this application is run, is there no error?
X 1.10 = Can this application help in the TB treatment process?

Testing TB patients using the UAT method revealed that 78.7% of the users stated it was very suitable. Moreover, 21.3% declared that the menus displayed in the application made it easier for the patients to report their treatment activities. The application can document the activities of the treatment patients. Measurement Using Likert's Summated Rating scaling technique, the Android TB patient treatment monitoring application met the criteria for success.

DISCUSSION

Along with the expansion of global internet connections, smartphone usage in the world in the last decade has increased rapidly, including in Indonesia. As many as 84.3% of households have smartphones, equivalent to 54.8 million households, where most of the users are of productive age and workers with access to health and health services of 38.8% (Ministry of Communication and Information of the Republic of Indonesia, 2015). Thus, digital health products are increasingly accessible to the public, including to support TB treatment and control programs. The Pulmonary Tuberculosis Patient Treatment Monitoring Information System Application (SISFOTBPARU) has been developed in various health sectors. Still, its use for monitoring treatment compliance behavior with family support is limited in Indonesia. Smartphone applications are ideal for improving health because of their popularity, connectivity, and sophistication. The application of the pulmonary tuberculosis patient treatment monitoring information system (SISFOTBPARU) can support functions such as communication and enable real-time connections, with feedback, interactive and connected to social media to allow interventions for behavioral changes in adherence to TB treatment using the media of the pulmonary tuberculosis patient treatment monitoring information system (SISFOTBPARU) with a behavioral change theory approach that is appropriate for intervention via the internet, namely the behavioral change intervention model via the internet and behavioral change through social communication (DiStefano & Schmidt, 2016; Ritterband et al., 2009).

Previous research found that the current recording and reporting system still needs to be done manually. In data access, report creation, and indicator analysis, there are still many obstacles in terms of time, energy, and error level. The advantages of developing the TB information system in reports and indicator programs are that it can be obtained automatically based on the data entry (Trigunarso et al., 2022). The reports produced include medication schedules, treatment schedules, and medication collection schedules. Regarding organization, human resources, facilities, infrastructure, and funds, the Kampung Sawah, Satellite, and Kedaton Health Centers of Bandar Lampung City are considered ready to implement this information system. This system is quite applicable based on the ease of operation and the output produced. The reports and indicators produced by the system can be a reference and data source for TB program managers in planning, monitoring, and evaluating the implementation of the TB eradication program at the Kampung Sawah, Satellite, and Kedaton Health Centers of Bandar Lampung City.

The results of user acceptance testing for each user application using Likert's Summated Rating scaling technique prove that the web and Android TB patient treatment monitoring application used by health workers at the Kampung Sawah, Satellite, and Kedaton Health Centers and TB patients meet the criteria for being considered successful.

CONCLUSION

The website and Android version of the TB patient treatment monitoring application allows patients and health center staff to monitor medication intake activities and side effect

conditions and view a map of the distribution of pulmonary TB patients' residences. Tests conducted in the study to test when monitoring pulmonary TB patient treatment and reporting treatment activities showed criteria that were considered successful.

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