SMS Gateway Application for Suspected Tuberculosis Reporting

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Background: Tuberculosis (TB) remains a major health problem in the world. Surabaya city had the highest number of TB cases in the province of East Java (3990 cases). The purpose of this research was to develop a network system of SMS Gateway to assist health cadres in attracting new TB suspects. This system would need active participation of the social environment, especially health cadres/community. *Methods*: This study was a qualitative and applied research. In this study, SMS Gateway System was built based on System Development Life Cycle (SDLC) method. The feasibility of this system was reviewed on health cadres in one of the health centers in Surabaya. The feasibility review was done by the level of acceptance (convenience and usability) of the system. *Result*: Analysis on the acceptance level of SMS Gateway was done by comparing the results of in-depth interviews and the results of observations. The results of in-depth interviews to 5 health cadres showed that this system was very useful and very easy to do. The reporting of new TB suspect was only done via SMS and did not need to be reported to the health center. The patients also gained benefits because of the rapid response of health assistance. Cadres were also very enthusiastic to use this SMS and willing to be the cadre in TB suspect reporting. *Conclusion*: SMS Gateway application can be used as a tool for suspected TB reporting. SMS Gateway is a method of active case finding. It requires the active participation of the community.

Keywords: SMS Gateway, Suspect, Tuberculosis, Reporting.

1. INTRODUCTION

The highest number of Tuberculosis (TB) incidence in the province of East Java city was in Surabaya (3990 cases).[1] TB deaths in Surabaya were estimated at 10108 patients with BTA positive. One of the health center which has a low case detection rate (CDR) in Surabaya was "Pacarkeling" Health Centre with a CDR about 52.46%.[2] This rate will show unfavorable if the real conditions of number of TB cases is greater than this value. People with latent TB is a threat to the increase in new cases of TB.

The low rate of detecting of new TB cases are caused by a lack of knowledge in community about the importance of cure from TB and TB control. Social support of controlling TB is also needed to reduce TB cases. Public perception about TB is still a minor, that TB is considered a disease that is taboo to be known by others. It causes difficulty of finding new TB cases, as well as the level of public knowledge about TB is still lacking. How do we make community support indispensable in prevention of the TB's spread? Community must respond to the emergence of new cases of TB and response to patterns of TB treatment that takes a long time. And drop out treatment is very risk for community too. Community awareness programs, especially in

high-risk environments the rate of transmission can be initiated with the support of community leaders and health workers.

This study aimed to develop a network system SMS Gateway to help the health workers in capturing new TB suspects with the active participation of the social environment, especially cadres, to report early via SMS network Gateway.

2. METHODS

This research was applied research by performing application SMS Gateway as a technology for capturing new cases of Tuberculosis. Implementation of SMS Gateway was done by empowering health cadres. The acceptance rate SMS Gateway was explored and analyzed qualitatively. Samples in this research were TB program manager in Health Centre "Pacarkeling" Surabaya and health cadres. Purposive sampling technique was taken according to their information needs. The variable in this study is the perception of TB program manager on TB recording and reporting system in health centre and acceptance level of application from health cadres as user. Variables in SMS Gateway to capture new suspected TB, i.e., characteristics of TB suspect and symptoms related to the perceived suspected TB. The information that has been included in the SMS Gateway system was stored in the system database and was kept confidential by giving limited access rights to the database. The information then used

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to control TB transmission in health centers where the research was conducted.

This research had been reviewed conduct by the ethics committee of the Public Health Faculty Universitas Airlangga with the certificate number of 544-KEPK (2nd December 2014).

3. RESULTS

This study consisted of three stages. The first stage was identifying the level of information needs in the recording and reporting of TB. The second stage was building a network of SMS Gateway for detecting suspected tuberculosis. The third phase was applying SMS Gateway application to TB program manager and to health cadres. The third stage also evaluated the results of the implementation of the network's SMS gateway.

3.1. Needs Identification About TB Recording and Reporting TB

This stage aimed to determine the TB reporting and recording system that had been conducted in Health Centre "Pacar Keling." Interviews results to the manager of TB program showed that in general there was no problem in the process of TB recording and reporting. However, the target for TB coverage had not been achieved.

3.2. Preparation of SMS Gateway Application

In this research SMS Gateway application was built by System Development Life Cycle (SDLC) Method.[3] SDLC method was carried out in 5 phases:
(1) Project Identification: Identification of variables which were reported as the new suspected TB and the report will be included in the network system SMS Gateway,
(2) Planning: Planning process was begin by identifying the needs of infrastructure for developing SMS Gateway network,
(3) Analysis: Process of analyzing the Data Flow Diagram (DFD) of SMS Gateway application. DFD of SMS Gateway application is shown in Figure 1,
(4) Design: SMS Gateway application was built using PHP script and My SQL as the database and also using Gammu script. Gammu script is an applications that connect computer systems with mobile operator networks,
(5) Application: It will show information from cadres which was sent by SMS about report of TB new suspects.

The report contain suspect's conditions which was obtained from suspect's answers the following questions:
(1) Did the suspected has cough for more than 2 weeks?,
(2) Did the suspected has hemoptoe or hemoptysis?
(3) Did the suspected feel breathless?,
(4) Did the suspected has chest pain?,
(5) Did the suspected has a decreased appetite?,
(6) Did the suspected has weight loss?,
(7) Did the suspected has night sweating without physical activity?,
(8) Did the suspected has fever with chills for more than 1 month?

Figure 2 through Figure 4 display the interface of application for TB program manager to monitor the progress reports of SMS Gateway which were reported by health cadres via SMS Gateway. Figure 3 shows data view of TB suspected identity which
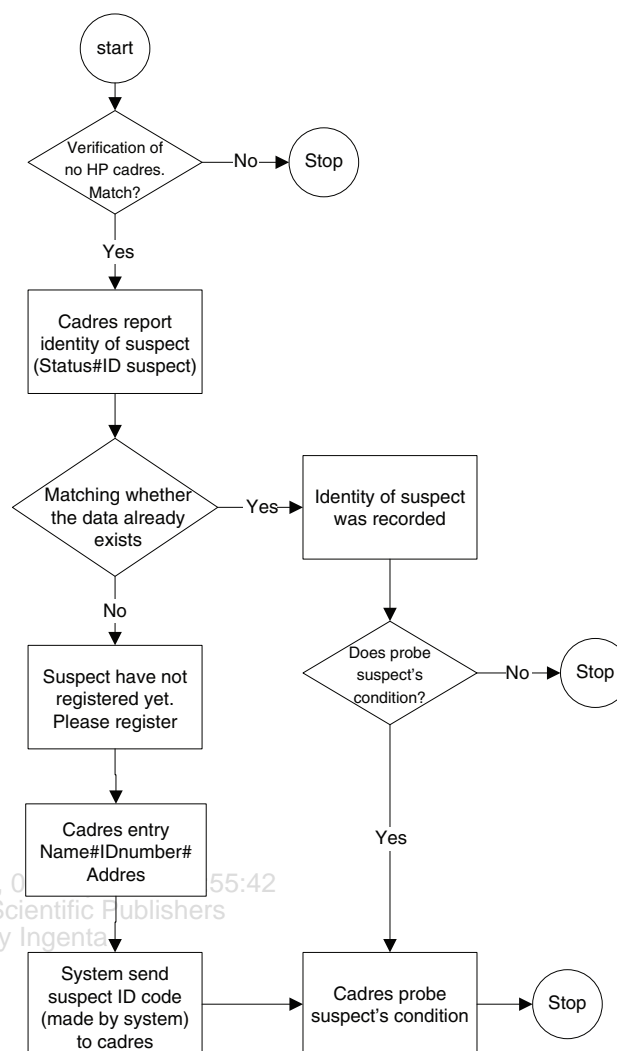

Fig. 1. Data flow diagram of SMS gateway application.

were reported. Figure 4 shows a view to determine the status of TB suspected diagnosis based on information from the health cadre. Figure 5 shows a view of the recapitulation of TB suspected diagnosis. Once the TB program manager received the report, the health officer visited the patient to perform sputum examination.

3.3. Acceptance Level of Health Cadres About SMS Gateway Application

Acceptance level was measured from the easy to use and the level of usefulness of SMS Gateway.[4] SMS Gateway applications have been tested on 5 health cadres in Health Centre "Pacar Keling." Health cadres usually have some roles in the social activities of the community. Besides of the social activity in health, cadres also be the member of organization in small community (hamlet) for fostering family welfare, or also as the environmental cadres, facilitators in early childhood education programs and other social activities. Health cadre usually is someone who has a very high social awareness and attention to their community.

The interview results to cadres and TB program manager showed that TB program manager found this application was
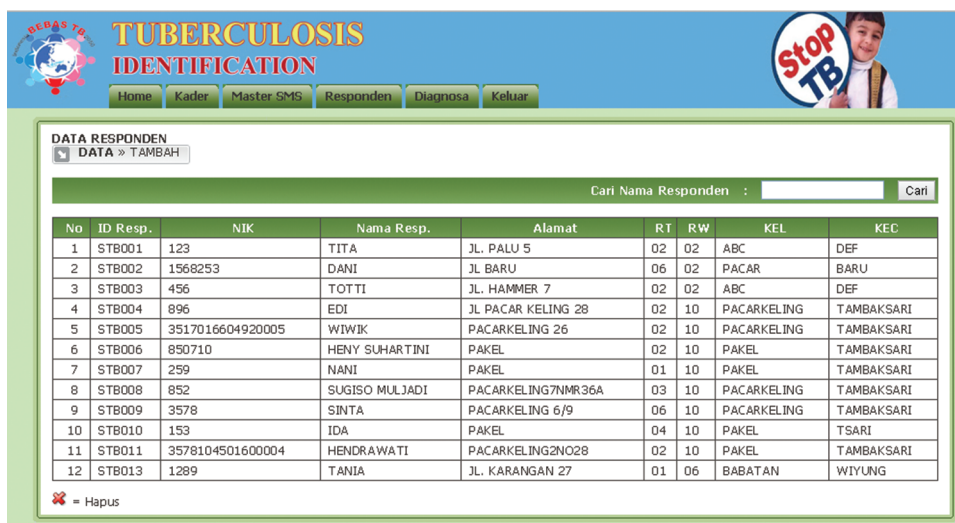
Fig. 2. Application interface of suspect TB database (this interface provides suspect TB identity data, such as: ID suspect, name, address).

Fig. 3. Application interface of TB diagnosis (this interface is a menu to analyze the condition of the suspect based on the data reported).
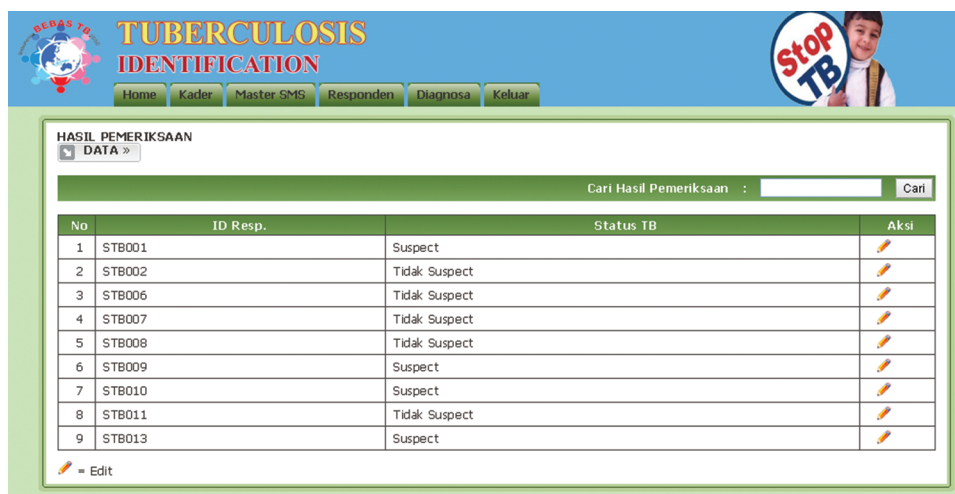

Fig. 4. Application interface of TB diagnosis results (this interface provides recapitulation results of interim diagnosis from the menu of Fig. 3).

helpful for the community because the community can give report about their health condition without coming to Health Centre. This application also help them to prevent the spread of TB. SMS Gateway application is easy to use and give quick response from the system. Results of in-depth interviews showed that TB program manager and health cadres were willing to use this application, if the application continued to detect the new TB suspected. Difficulty of SMS Gateway application was not in use the application, but on the approach to the community, especially with TB suspected and the TB suspected's family. Cadres should give understanding to the families of TB suspected on the importance of TB treatment. Capacity building for cadre is needed to be able to approach the community.

The cadres still got difficulty in using mobile phone with the new function of the buttons. The main difficulty occurred when they typed the message with a hash mark (#), for example, for sending a report they had to type: # NIK_suspect status. They've never use the hash mark before, therefore for them it was quite difficult. By doing many times trials, the health cadres were getting used to. In general, cadres were familiar and accustomed to use SMS facility.

TB program manager can analyze the interim diagnosis of TB suspect in this menu (Fig. 4) based on reported data by cadres. The report contained suspect's conditions which was obtained from the suspect's answers on the questions that have been mentioned before. If the suspect reported have strong symptoms (from the report in Fig. 4), TB program manager should motivated the suspect to take a laboratory test.

4. DISCUSSION

4.1. SMS Gateway Application

Preparation of SMS Gateway application was conducted using SDLC method to the stage of system implementation. Inconsistencies in the application process would be repaired to complete the SMS Gateway application in accordance with SDLD system.[5, 6] The preparation of these applications was suitable with the needs of reporting recording system on TB new suspect in Health Centre. Report of new data about TB suspected were recorded in the TB-06 form. TB-06 form was a standard form for TB recording and reporting from the government. Result recording is very important because Tuberculosis is an infectious disease.

A research conducted by Wardani (2010) on database of TB surveilance, had integrated data derived from TB reporting forms of 01 to 06 items, namely:

(a) TB-01 TB treatment card,
(b) TB-02 TB Patient Identity Card,
(c) TB-03 Register District,
(d) TB-04 TB Laboratory Register,
(e) TB-05 TB Report Application Form for sputum examination,
(f) TB-06 List of suspects (suspect) who Examined Sputum TB SPS.[7, 8]

However, this study did not discuss how to address the low CDR with the system. The number of TB reported coverage was predicted to increase by SMS Gateway application. The activeness of health officers were essential in improving CDR. Widjanarko et al.[9] reported that many factors affect the activeness of health officers in an effort toimprove CDR, i.e., the level of knowledge, attitudes, training, supervision of the management. Therefore the

participation of the community to improve the coverage of TB suspects was needed.[9]

Tuberculosis is transmitted through the air (droplets) when TB patients cough and spray their saliva which containing the bacteria and were inhaled by others while breathing. The incubation period is 3–6 months.[10, 11] TB treatment is lasted for 6 months without a break. If the patient decided to drop out from taking the medication, it will be one of the causes of the bacteria spread. TB transmission from TB patients who has not been identified by clinicians was a condition that is still prevalent in Health Centre "Pacar Keling." From the estimated number of 600 patients, only about 200 patients were identified. This condition is the result of in-depth interviews with TB program manager in Health Centre "Pacar Keling." In addition, transmission of TB is coming from TB patients who have not been identified, but it may also be derived from relapse patients, because the number of patients with Multi Drug Resistant TB (MDR) is rising. The number of TB cases with Human Immunodeficiency Virus/Aqcuired Immunodeficiency Disease Syndrome (HIV/AIDS) is increasing as well.

Environment factors are also risk factors for TB infection, for example, unhealthy home environment, dense settlements and slums. Kelurahan Pacar Keling RW VI and RW X is also a densely populated neighborhood, because it closely located to the traditional market. Environment health of some housing area did not meet the criteria for healthy living as the air circulation and lighting were poor and high density. Most people in Hamlet VI and Hamlet X were traders with long working hours, and they have low concern for health environment.

4.2. Acceptance Level of Health Cadre on SMS Gateway Application

The acceptance rate of health cadres in this application was measured qualitatively by in-depth interviews. The results of the analysis on the acceptance level of health cadres were done by comparing the results of in-depth interviews with the results of observation. The results of in-depth interviews with 5 health cadres showed that the cadres found this application were very useful and very easy to use. Because they could do through SMS and did not have to come to the Health Centre. This application was beneficial for the people who are sick because they quickly get help. These results were consistent with the observation when the test was done. The observation showed that health cadres were eager to try to SMS many times. Although it initially looks difficult, but this difficulty was resolved because basically the health cadres have been familiar with SMS facility on mobile communication devices (HP). Health cadres were also excited to be the cadres of the complainants. If this application will be used for capturing the TB suspected in Surabaya, health cadres were also willing to participate in the system.

5. CONCLUSION

SMS Gateway application can be used as a tool for reporting of TB suspected. SMS Gateway was a method of active case finding. It required the active participation of the community such as health cadres.

SMS Gateway application required a capacity building for health cadres to improve their ability to approach the community especially the families of TB suspected as sometimes the

family refused that the their family members were reported as TB suspected, although had TB strong symptoms.

Health cadres agreed that SMS Gateway application was useful and easy to use. Health cadres also willing to participate in reporting TB new suspected for preventing TB transmission.

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