

# Telenursing Using Mobile Phone Features For Medication Adherence Tuberculosis Patients: A Systematic Review

Novita Surya Putri, Esa Rosyida Umam, Dika Lukitaningtyas, Grispenjas Sumartono Mahira Putra  
R.A

*Master of Nursing, Faculty of Nursing Universitas Airlangga, Surabaya, Indonesia  
{hany.putri2006,esarosyidaumam}@gmail.com, dikalukitaningtyas@gmail.com, grisakbar@gmail.com*

**Keywords:** Telenursing, Mobile Phone Features, Tuberculosis, Medication adherence

**Abstract:** Background: The Direct Observation of Therapy (DOT) is recommended by World Health Organization to observe directly the medication adherence of TB patient which is conducted by health personnel, but limited health personnel and patient barriers to access treatment causes the role of DOT is diverted to the family, so it is less effective. Telenursing based mobile phone features can be used for remote DOT because mobile phone is a communication technology commonly used by people around the world and has various features. Method: Searching article in electronic database; Ebsco, Science direct, ProQuest, Pub Med, Wiley, Springer Link, dan Journal Ners limited range of the last 10 years 2007 to 2017. Result: From 15 journals conducted review the number of samples vary between 30-6.203 respondents and duration of intervention by telenursing based mobile phone features (Short Message Service, Telephone, and Videophone) between 2 months up to 18 months. All research related with telenursing is effective as DOT and improve the medication adherence of TB patients through mobile phone features. Conclusion: Telenursing based mobile phone features can be implemented to DOT in medication adherence of TB patients with direct observation by health personnel

## 1 BACKGROUND

Tuberculosis (TB) is an infectious disease that becomes a major problem for society in developing countries. At 2015, 10.4 million people are infected by TB, 1.8 million of them die because of TB. Over 95% mortality rate because of TB occur in low- and middle-income countries. In addition, by 2015 (Zare, Asadi, & Shahroodi, 2017). Treatment is needed by tuberculosis patients, in newly cases diagnosed TB is given combination therapy for six months and eight month therapy for TB case review (Farooqi, Ashraf, & Zaman, 2017). Long term treatment of Tuberculosis (TB) is at risk of treatment failure and resistance to Anti Tuberculosis Drug so, it causes continued transmission or death (Fox, 2017). The Direct Observation of Therapy (DOT) is recommended by World Health Organization (WHO) to observe directly the medication adherence of TB patient in which is health personnels are assigned to pay attention to the daily medication of each patient. However, limitations of health personnel and patient access barriers result in less effective DOT (Mohammed, Glennerster, & Khan,

2016). Innovation is needed to observe patient medication adherence directly, telenursing can be applied as DOT in TB patients. Telenursing of care management and provision of health services through information and telecommunication technology (Mishbahatul, 2015)

Telenursing based mobile phone feature can be used for remote DOT, because mobile phone is communication technology that is commonly used all over the world. mobile phone provides some features like video, audio, telephone, and Short message service (SMS) to communicate (Farooqi et al., 2017). In low- and middle-income countries mobile phones have been used for long-distance public health programs. Intervention of telenursing based Telecommunication can improve medication adherence and have been adopted for many diseases. Telenursing based on mobile phone (SMS, telephone, Videophone and Smart phone Application) (Dj, Rylands, & Sinclair, 2016).

## 2 METHODS

In this Systematic Review method used is the selection of the topic that is Medication Adherence In Tuberculosis Patients. Then determined keywords to search on several journal databases such as Scopus, Ebsco, Science Direct, ProQuest, Pub Med, Wiley, Springer Link, and Journal Ners (National Journal of Airlangga University). Keywords used are "Tuberculosis" and "Medication adherence", and additional keywords are "telenursing", "mobile phone", "SMS", "Telephone" nursing with mobile phone features (SMS, telephone, and Videophone) and medication adherence in TB medication. An exclusion criterion is an article that does not have full text of pdf format, providing intervention in addition to telenursing with mobile phone usage. Type of articles study to be reviewed consisted of Randomized Control Trial (RCT), and expanded with non-RCT research because of the limitations of journals with topics.

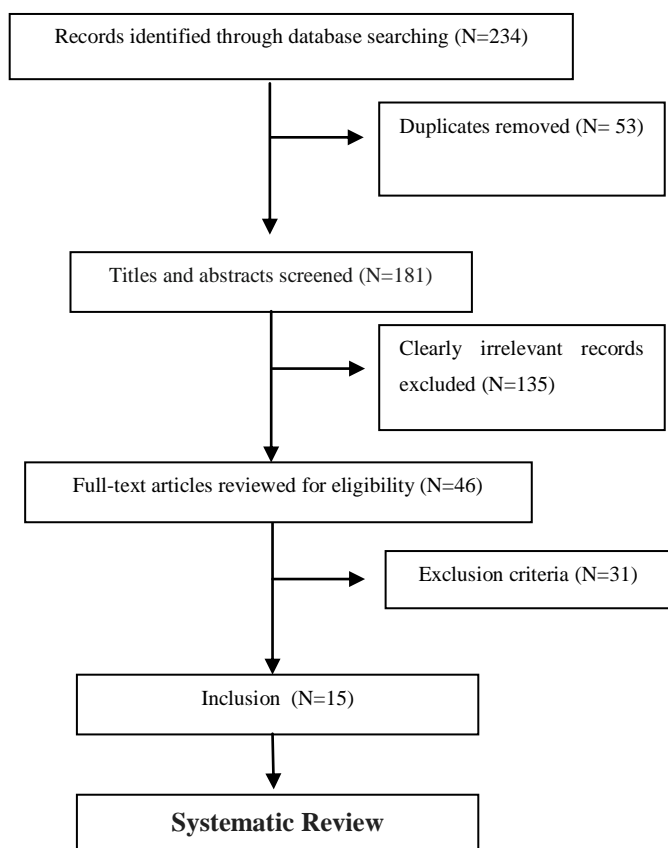


Figure 1: Flow chart.

and "Videophone". The article is restricted from the last 10 years 2007 to 2017. The search results identified 27 articles from Scopus, 14 articles from EBSCO, 22 articles from Science Direct, 98 articles from ProQuest, 40 articles from Springer Link, 23 articles from Pub Med, 10 articles from Journal Ners and after being reviewed further, 14 International Journals and 1 National Journal are elected for review.

Articles conducted review based on studies adjusted by inclusion criteria. The inclusion criteria in this Systematic Review are articles about telen

## 3 RESULT

### 3.1 Literature search and study selection

A total of 234 articles were found using the selected keywords.

### 3.2 Study Characteristic

#### 3.2.1 Population

From 15 journals conducted review the number of samples vary between 30-6.203 respondents.

#### 3.2.2 Intervention Characteristic

Intervention by telenursing using mobile phone features (Short Message Service (SMS), telephone, and videophone) and duration between 2 months up to 18 months. All research related with telenursing is effective as DOT and improve the medication adherence of TB patients using mobile phone features.

### 3.3 Results of individual studies

#### 3.3.1 Mobile phone

High mobile phone usage in low and middle income countries as well as various features provided by mobile phones, such as; video, audio, text messaging, telephone, etc. to communicate with each other, The complete mobile phone features can be used as an innovation in health interventions based mobile phone to improve public health level, especially to improve medication adherence in patients with chronic diseases, one of them is tuberculosis (Mohammed et al., 2016).

#### 3.3.2 Short Message Service (SMS)

One of the mobile phone facilities developed for health system intervention is text messaging or short message service (SMS). SMS is a cost-effective means and eliminates distance barriers and

networking difficulties. Evaluation by using medication adherence of patients with tuberculosis is by using SMS reminder (Farooqi et al., 2017).

Short messages or SMS can be an approach between healthcare personnel and patients to strengthen adherence, awareness and promote health to TB patients (Chen et al., 2011).

### **3.3.3 Telephone**

DOTS innovation based technology that uses mobile phones as phone call reminders is to improve patients to take medication regularly, reminding patients to send their sputum specimens and to improve medication adherence. Based on the results of the study call reminder can make patients more obedient because patients feel better due to get attention, feel not alone in the treatment because of getting supports from health workers (Kunawararak et al., 2011).

### **3.3.4 Videophone**

The mobile phone ownership increases Globally in India, Myanmar and Indonesia, 50% Smartphone from all mobile subscriptions and 80% of all new subscriptions. The high prevalence of Smartphone ownership can be an intervention to solve disobedience of TB patient medication by developing DOT. The telenursing service can eliminate the problem of direct observation of patients in drinking and swallowing, videophone can be used as a real time direct observation of the activity of TB patients in taking medicine and also this service is cost-effective (Wade, Karnon, Elliott, & Hiller, 2012). The Fox studi (2017), telenursing with videophones using smart phone-based technology can be used although it is at remote area, since the prevalence of smart phone ownership is growing rapidly, videophones are effective for remote observation of drug ingestion in TB patients.

### **3.3.5 Mobile phone (SMS, Telephone, and Videophone) to medication adherence patients tuberculosis**

From 15 journals reviewed, results showed significant p value that is telenursing by using mobile phones (SMS, telephone, and videophone) can improve Medication adherence of TB Patient.

Telenursing research using mobile phone text message by Liu et al (2015), provides SMS intervention in patients with TB. There were 4 control groups in this study, SMS group, drug monitor group, combination group of drug monitor and SMS. Drug doses were passed 29.9% in the

control group, 27.3% in text messages, 7.0% on the treatment of the monitor arm and 13.9% in the combined SMS and monitor Shows the combined intervention of drug monitor monitors / DOT with effective text messages to improve patient medication adherence by monitoring the pills consumed.

The similar study conducted by Mohammed et al (2016) showed there is no significant difference between the control group and the intervention group with SMS, due to the limitations that clinic did not correctly record the treatment result to meet the success level expected.

Similar results in the Farooqi et al (2017) study, which provided daily SMS reminder interventions were sent to the patients at intervention group and the results of this study was the patient completed anti-TB treatment for six months; one patient experienced failure treatment in each group (both groups were comparable). Forty-nine patients had complete treatment in each group (both groups were comparable). Twenty-one patients had recovered in the intervention group compared with 20 patients in the control group. Three patients experienced defaults treatment in the intervention group compared with 4 patients in the control group. The number of default-treatment cases was lower in the "intervention group" than the "control group", but this numerical difference was not statistically significant.

In a research conducted by Kumboyono (2017) that there was no significant difference between the two methods in the Medication adherence between direct DOT and telenursing with SMS as DOT. Thus, SMS can be used as a substitute for systems by using field workers as DOT.

Telenursing intervention by SMS was also investigated by Wang & Wang (2017), in this study the intervention group was given SMS management and health education. The Results from this study was, treatment intervention groups completed Levels in the SMS group were higher than the control group ( $p = 0.002$ ) and the dose rate was missed and the interrupted treatment rate in the SMS group was significantly lower than the control group ( $p < 0.001$ ,  $p = 0.001$ ).

Mishbahatul (2015) conducted a study using N-SMSI (Nurse Short Message Service Intervention) which measured medication adherence and nutritional status of TB patients, independent t-test results were there were differences in adherence between treatment group and control group, with  $p = 0.031$  and there was difference of nutritional status

of treatment group before and after intervention seen from body weight (kg), with  $p = 0.001$ . Similarly, the control group, with  $p = 0.002$ .

Oren, Bell, Garcia, Perez-velez, & Gerald (2017) Oren, combine text message intervention and phone call reminders or telephone call reminders only (regular treatment), this study was conducted for 12 months in 40 patients with the aim of measuring adherence through increased completion rates treatment. Results of treatment adherence and completion rates for latent TB infection remain optimal in high-risk groups. Research by phone call reminders was also performed by Kunawararak et al (2011) with the results in the MDR-TB group treated using DOT and phone call reminders the success rate was 73.7% and in the MDR-TB group non treated with DOT without phone call reminders success rate is 96.7%.

In addition to SMS and phone call reminders to support technology-based remote DOT programs, there are video-taking interventions when patients swallow the drug, such as research conducted by Fox (2017) using Video Directly Observed Therapy (VDOT) the research result in medication adherence which is conducted within 60 days was Twenty one (71.1%) patients take every required dose, according to the count of pills. Four Patients missed four or more doses. Two participants are not complete follow-up and daily video has been properly uploaded, Thirty four (85%) patients missed less than four video uploads during follow-up.

Wade et al., (2012) conducted direct observation by videophone at home. results of this study revealed that videophone services are more effective than direct observation. A similar study conducted by Hoffman et al. (2010) with Mobile Direct Observation Treatment (MDOT) intervention, patients was encouraged to take the video while swallowing the drug and the results of this study that MDOT is a viable option

## 4 DISCUSSION

Directly Observed Treatment (DOT) has been implemented since 1992 proclaimed by WHO. Initially DOT was directly observed by health workers aimed to approach the patients and ensure adherence to TB therapy regimens. Difficulties in implementing DOT is a problem in many states, in some countries national policies are applied to TB control, treatment of TB patients is monitored by family members. Managing self-medication is done by more than half of TB patients that caused the

patients are lost from case management and they do not continue the treatment. Thus a special approach is required to monitor TB medication adherence (Liu et al., 2015).

Through telenursing by using mobile technology because it is more cost effective and efficient, as nearly 6.8 billion people use it to communicate. Mobile phone offers many features for communication such as SMS, audio, video and MMS calls. In addition to off-line applications, mobile phone can be used with on-line applications such as WhatsApp, BBM, Telegram, and others (Farooqi et al., 2017). DOT can be done directly by a professional health worker by telenursing using mobile phone. Mobile phones can monitor patients swallowing medicine every day with features provided by mobile phones either off-line or on-line (Elangovan & Arulchelvan, 2013).

## 5 CONCLUSIONS

Telenursing based mobile phones can be implemented for Directly Observed Treatment (DOT) on medication adherence with TB patient by direct observation of health professionals. Video is more effective than SMS and phone call reminders to improve adherence due to the video, patients can record and send swallowing activity, but the process of taking swallowing video cannot be applied to the patient because of the low socioeconomic person with less education to implement and the old age may also experience some obstacles. there is no significant difference between SMS and DOT directly, so SMS can save cost and replace DOT directly. an obstacle on A telephone reminder occurs when a patient receives a call from health workers.

Telenursing based on mobile phone should be developed in Indonesia to optimize the DOT program on medication adherence of TB patient, the development of online application through media such as Whatsapp, BBM, Telegram, etc. or by making smart phone application because most of people already have mobile phone based smarthphone.

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