

ICT- Enabled Treatment Adherence and Follow-up System towards Successful Implementation of Revised National Tuberculosis Control Programme (RNTCP), India

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Tuberculosis (TB), a major public health concern, has an annual incidence of 2 million notifications and mortality of 330,000 in India (WHO India, 2012). Government of India's Revised National Tuberculosis Control Programme (RNTCP) employs Directly Observed Treatment Short course (DOTS) as its operating strategy for the management of TB. RNTCP currently reaches out through a network of 0.6 million DOTS providers (Ministry of Health and Family Welfare, Government of India, 2012), and calls for a standardized treatment regimen for a minimum period of six months. During this period, the patient is expected to take medication under direct observation of DOTS provider. However, for the increasing number of TB patients, especially in high burden countries like India, direct observation still remains a challenge (Figueroa-Munoz, et al., 2005) affecting the successful implementation of RNTCP.

With the mounting pressure on the healthcare system on the dearth of proactive follow-up at an individual level, the onus is largely on the patient to complete the treatment regimen. Hence, there is a desperate need for a system that facilitates better management of treatment adherence with minimum human resource engagement.

RECOMMENDATIONS & FINDINGS

ICT- Enabled Treatment Adherence and Follow-Up System

1. Real-Time Digitization of Patient Information:

Digitization of patient information upon registration and subsequent updation throughout the course of treatment using a simple user friendly form-based application hosted on a mobile phone is recommended.

A customized registration form on mobile phones as a digital equivalent of the RNTCP Treatment card assigned to every patient at the time of registration has been developed.

2. Dissemination of TB related information and awareness:

Provisioning individual patients with personalized health education content (a critical component of TB control) on their mobile phones is recommended.

Periodic voice/text messages which will act not only as reminders for medication compliance but also as a platform to spread awareness on the risks associated with irregular or incomplete treatment has been developed.

3. Follow-up and Tracking of Treatment:

A digital tracking system which ensures effective monitoring of treatment progress by recording every significant event throughout the period of treatment is recommended.

Web-based patient-centric treatment monitoring with updates from mobile phone based application ensuring that the patient is not lost to follow-up until the treatment outcome is known has been developed.

All of the above recommendations have been proved to be technically feasible and evaluated for user adoptability among 104 TB patients from Vellore District, Tamil Nadu, India as part of a study conducted by IITM's Rural Technology and Business Incubator in partnership with Infectious Disease Training and Research Centre, Christian Medical College Vellore.

THE RESEARCH

I. METHOD

The feasibility of implementing a mobile application which encompasses the above recommendations has been assessed by conducting a study among 104 TB patients. These patients were recruited from four randomly selected DOTS centres in Vellore District, TN, India, starting April 2012. Eligibility criteria included being above 18 years of age; having tested positive for TB; and starting treatment on or after the day of registration; access to mobile phone and willingness to participate in the study. Patients were registered from DOTS centers using a customized form on mobile phone enabling real time digitization of patient information. Patient data thus collected auto generated SMS and/or voice reminders for the entire period of treatment. The content of these messages, designed to disseminate TB related information and awareness, were based on individual needs and requirements.

The system allowed for the monitoring of progress of treatment using periodic lab result and treatment outcome update also using designated forms on mobile phone. All of the required updates along with the details on whether the reminder call has been attended/ picked up by the person (call attendance) and the duration of the call were made available on a web interface for continuous monitoring and follow-up of patients. Evaluation of the intervention consisted of qualitative in-depth interviews with patients and statistical analysis of data obtained from the study.

II. RESULTS

Of the 104 patients recruited, 100 patients were followed up until their treatment outcome was known. As the remaining 4 patients have been transferred out to a different DOTS centre beyond the scope of our study, their results have not been

included in the analysis. However, it is important to note that, these patients continued to receive the reminder calls and have known to have completed their treatment successfully. Of the followed-up patients, 88% have completed their full course of treatment, 5% of the patients have been identified as default i.e. patients who stopped taking medication midway for a consecutive period of two months due to medical, societal or family reasons; while 7% were notified as deceased.

Four patients who were registered in the system under the patient category of 'after default relapse failure' have successfully completed their treatment and have been cured. This is a significant finding as these are patients who were identified as 'default' in their first course of treatment, after which they relapsed back into TB treatment for the second time and during this course had become 'treatment failure'. The finding that these categories of patient who have a higher probability of treatment failure or defaulting have been cured in their third round of treatment in the presence of our mHealth intervention is noteworthy. Similarly, patients who have been identified to be co-infected with HIV, making the management of two very challenging health conditions further complicated (Ministry of Health and Family Welfare, Government of India, 2012), have fared well in our study.

III. DISCUSSION

It has been found that more than 77% of the patients exhibited greater than 60% of call attendance with a demonstrated association between their call attendance percentage with treatment completion.

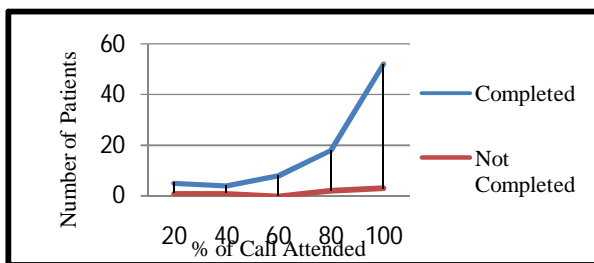


Figure 1. Percentage of Calls Attended Vs. Treatment Completion

Figure 1 shows a graph which has been plotted for the percentage of calls attended during the course of the treatment against the treatment completion status comprising of 'treatment complete' and 'incomplete treatment' (includes default and dead). Figure 1 show that as the call attendance percentage increases, the number of patients who have completed the treatment also increase significantly when compared to those who have not completed the treatment. This indicates that the calls have aided in ensuring that the patients who enrol in the treatment also completed the course. 94% of the patients who have successfully completed treatment have also regularly attended the calls.

A correlation analysis reveals that here is a high degree of correlation (0.848) between the percentages of calls attended by the patients to their completing the treatment, confirming that these variables move in tandem. Taking the analysis a step further, logistic regression for the treatment completion and other factors likely to impact the same were considered. These factors included gender, age, marital status, patient type, site of TB infection, smoking, alcohol consumption and reminder type preference (call/text/both). The regression results for the above mentioned factors were not significant. Logistic regression was also done for treatment completion and

call attendance percentage which was split into intervals of low (0-30% calls attended), medium (30-70% calls attended) and high (70-100% calls attended). The logistic regression showed that people with a high call attendance percentage were 5 times more likely to complete treatment than those with a low call attendance percentage with significance of .093.

Qualitative study consisted of in-depth interviews among patients from different treatment outcomes. The interviews brought out the extent to which voice calls acted as a reminder/trigger to take medication; their role in improving awareness about TB and its management and finally the support system provided by the intervention throughout the process of treatment. The interviews threw light on the patients' felt need for a medium expressing care and concern on their health; the promptness and regularity of the reminder calls was received among the patients as showing constant care and empathy.

The evidence obtained from this research study places a strong emphasis on the role of ICT interventions in facilitating better implementation and management of RNTCP. This need becomes much stronger with RNTCP's 'National Strategic Plan (2012-2017)', aimed at strengthening its implementation, recommending the incorporation of ICT for better patient monitoring and treatment completion. Implementing this low cost and simple application involving DOTS centres in a phased manner with an objective to scale will enable follow-up of all the patients who have been enrolled with RNTCP. This set up can be customized and seamlessly incorporated into any healthcare system that aims at the control of Tuberculosis and further to any other disease of public health concern.

SOURCES

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