LETTER TO THE EDITOR

Public Health: Information Technology Innovative Interface

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India, being the tuberculosis (TB) capital of the world, contributes to 50% of the global relapse cases. Nearly 2.2 lakhs of patients go into relapse every year.[1] One of the leading causes of relapse is non adherence to TB medication.[2,3] As stated in previous studies, the causes of non adherence included side effects of the medication, unsuitable place and time of drug delivery, loss of daily wages, long waiting hours, undernutrition, and migration.[4,5]

We proposed a multipronged approach to improve medication adherence and treatment monitoring. The solution addressed the three key factors for non adherence:

1. Access to medication: Smart information technology (IT)-enabled pill box.
2. Awareness: Automated voice messaging to provide TB education and counseling.
3. Monitoring: Use of incentives to improve adherence reporting.

This solution was the winner of Mumbai Jugaadathon 2017, a health care hackathon, organized by CAMTech-X (Massachusetts General Hospital) and Indian Institute of Technology Bombay. The implementation team comprised of doctors, engineers, designers, a health care entrepreneur, and a pharmacist.

PROPOSED SOLUTION

Access to TB medication was simplified through a smart pill box, which would decrease the patient-to-pill time, reduce waiting hours, and also reduce the burden on the DOTS provider. The prototype model developed could dispense TB medication to up to 100 patients a day. The

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patient identification would be either through a unique bar code printed on the patient enrolment card, Aadhar ID, ATM-like medication card, or biometric system. It would use real-time server access to send voice alerts and reminders to patients. This device would help track patients in the private sector who are often lost. The pill box would be capable of dispensing both intensive phase and continuous phase pills. The pill box would connect to the RNTCP database to check for any changes in medication prior to dispensing the medication. Figure 1 illustrates the proposed designs of the smart pill box

The model was also prepared to improve awareness through easy-to-understand picture guides focusing on nutrition, cough etiquettes, disposal of sputum, and side effects of TB medications, and how to manage them.

The third component of the model proposed to test adherence to medication through urine tests to detect the presence of the drug metabolites.[6-8] These tests would be done along with other tests done on a regular monthly basis to assess the health status of the patient.

The fourth component of our proposed model included incentivizing adherence.[9-11] This ranged from daily incentives in the form of mobile talk time to weekly nutrition supplements, both of which would be distributed using a voucher dispensed from the pill dispenser. A monthly lottery for financial assistance was proposed to be developed to further motivate adherence. Figure 2 explains the working of the integrated solution.

The merits of the model included intersectoral collaboration in the form of use of IT for dispensing drugs and tracking patients, importance of nutrition, and counseling regarding side effects of drugs, rewarding desired behavior, and monitoring adherence.
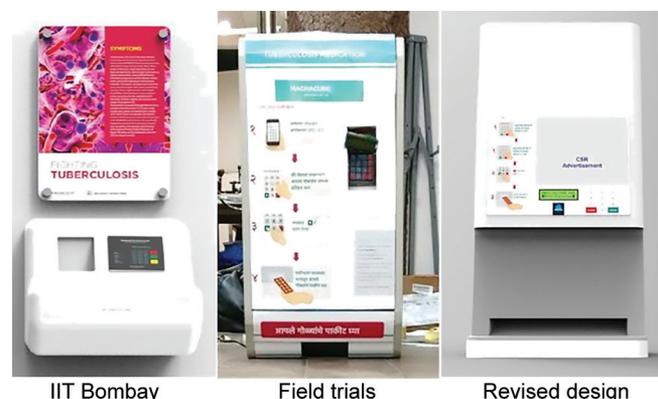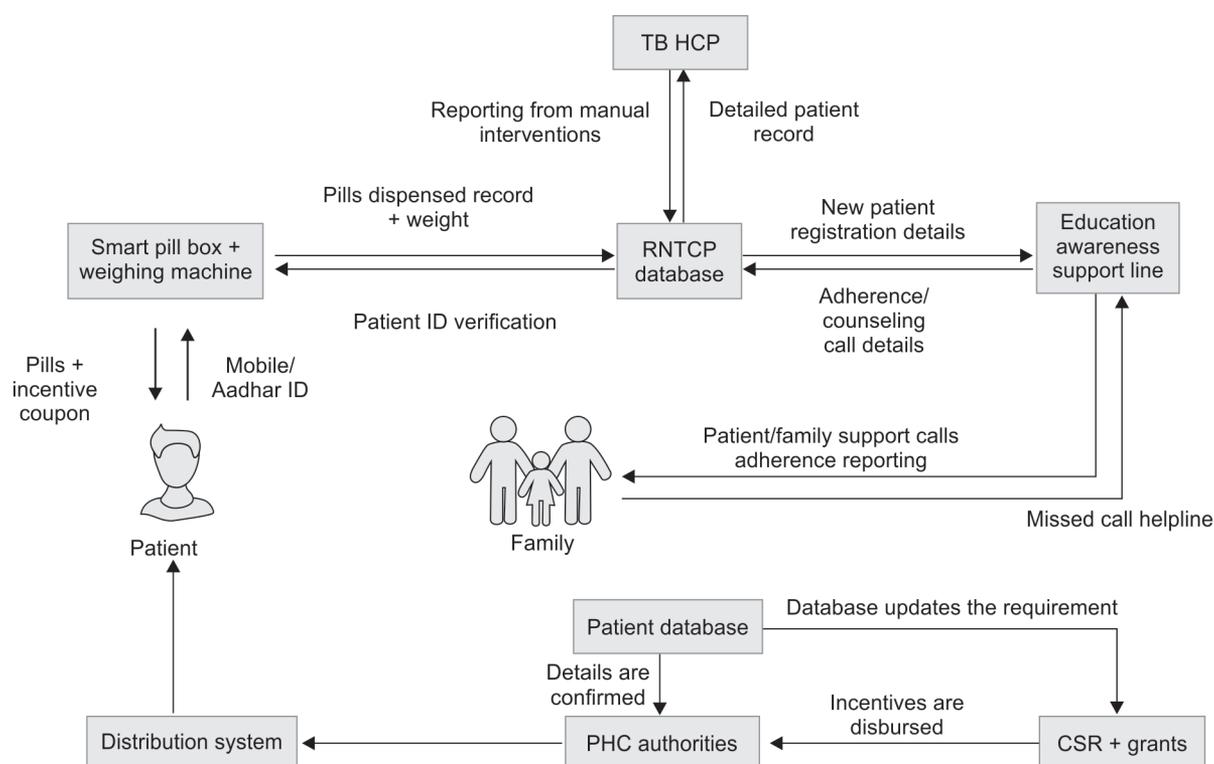

IIT Bombay   Field trials   Revised design
Fig. 1: Smart pill box designs

Fig. 2: Schematic diagram of the integrated model

The model does not address the stigma associated with the disease. It does not ensure that the patient takes the dose at the right interval. The economic viability of the smart pill box needs to be evaluated. This model needs to be tested on a large scale to prove its applicability. However, it has the potential to be a breakthrough in improving drug adherence among TB patients.

REFERENCES

1. Revised National Tuberculosis Control Programme. National strategic plan for tuberculosis elimination 2017–2025. New Delhi: Central TB Division, Directorate General of Health Services, Ministry of Health with Family Welfare; 2017.
2. De S. High relapse rate in RNTCP: an increasing concern and time to intervene. Lung India 2013 Jan;30(1):85-86.
3. Thomas A, Gopi PG, Santha T, Chandrasekaran V, Subramani R, Selvakumar N, Eusuff SI, Sadacharam K, Narayanan PR. Predictors of relapse among pulmonary tuberculosis patients treated in a DOTS programme in South India. Int J Tuberc Lung Dis 2005 May;9(5):556-561.
4. Munro SA, Lewin SA, Smith HJ, Engel ME, Fretheim A, Volmink J. Patient adherence to tuberculosis treatment: a systematic review of qualitative research. PLoS Med 2007 Jul;4(7):e238.
5. Bagchi S, Ambe G, Sathiakumar N. Determinants of poor adherence to anti-tuberculosis treatment in Mumbai, India. Int J Prev Med 2010 Fall;1(4):223-232.
6. Whitfield R et al. Point-of-care test to monitor adherence to anti-tuberculous treatment. Ann Clin Biochem 2004 Sep; 41 (Pt 5):411-413.
7. Hanifa Y et al. Evaluation of the Arkansas method of urine testing for isoniazid in South Africa. Int J Tuberc Lung Dis 2007;11(11):1232-1263.
8. Meissner PE et al. The value of urine testing for verifying adherence to anti-tuberculosis chemotherapy in children and adults in Uganda. Int J Tuberc Lung Dis 2002;6(10):903-908.
9. Georgette N, Siedner MJ, Petty CR, Zanoni BC, Carpenter S, Haberer JE. Impact of a clinical program using weekly Short Message Service (SMS) on antiretroviral therapy adherence support in South Africa: a retrospective cohort study. BMC Med Inform Decis Mak 2017 Feb;17(1):18.
10. Holden RJ, Karsh BT. The technology acceptance model: its past and its future in health care. J Biomed Inform 2010 Feb;43(1):159-172.
11. Mohammed S, Glennerster R, Khan AJ. Impact of a daily SMS medication reminder system on tuberculosis treatment outcomes: a randomized controlled trial. PLoS One 2016 Nov;11(11):e0162944.