

An Advanced Digital Surveillance System for Daily Observed Treatment, Short Course (DOTS)

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ABSTRACT

In India today, two deaths occur every three minutes due to tuberculosis (TB) (www.timesofindia.com). It is spread through the air by a person suffering from TB. A single patient can infect 10 or more people in a year. Controlling TB in India is a tremendous challenge. The TB burden in India is still staggering. Every year, 1.8 million persons develop the disease, of which about 800,000 are infectious; and, until recently, 370,000 died of it annually —1,000 every day. The disease is a major barrier to social and economic development (www.tbcindia.nic.in). An estimated 100 million workdays are lost due to illness. Society and the country also incur a huge cost due to TB—nearly US\$ 3 billion in indirect costs and US\$ 300 million in direct costs (www.tbcindia.nic.in). It is seen that with appropriate antibiotic treatment, TB could be controlled. In order to provide these antibiotics to the patients, DOTS (Directly Observed Treatment, Short-course) is the name given to the tuberculosis control strategy recommended by the WHO, to be the most effective and efficient method to cure and prevent TB. The personals involve with the DOTS program are made responsible of providing the medicines to the patients every two/three days and make sure that they consume it as well. But the problem is that the DOTS provider often does not do that. (www.satyamevjayate.in, 2014)

In the paper, we will be discussing as to how we can make sure if the medicines are been regularly provided to all the patients and monitoring their health parameters digitally. To achieve this, we shall be using a device that would contain a thumb scanner in it and a band (like GoQii band) that has several sensors embedded in it to monitor the patient's health metabolic activities associated with TB viz. pulse rate, Blood Pressure, Breath Pattern etc. Every time a DOTS provider provides a medicine to an enrolled patient; he must tie the band on the wrist of the patient and ask him to put his thumb on the thumb scanner. With the successful detection of the thumb print, the band on the wrist is initialized and the sensors sense the health parameters and save it in the database corresponding to the patient's UID or his thumb print. This UID and the thumb print could be easily implemented, assuming that all the TB patients are AADHAR card holders and if not, a particular enrolment can be done in each small area exclusively for TB patients.

With this, the software at the back end monitors if all the patients are provided the medicines in the prescribed duration or not and shall be capable of generating an alert if a particular DOTS Provider is not doing its job ethically. Since the basic health parameters are also diagnosed during every dose, the software shall also be able to interpret the patient's health status and the same can be done by any medical analysts in any place at any part of time. Thus the basic aim of

providing the medicines to the patients regularly can be regularly monitored and any authority can access the day anywhere.

This automation will not only help the patients excessively but will also help the officers monitoring the DOTS provider. It would reduce the cases of the providers not providing the medicines regularly or selling them out, thus reducing corruption. In a village, only that no. of instrument is required as many DOTS provider have been appointed, thus no big costs are involved. Moreover, UN has put TB as one of the few diseases on their priority for curing and prevention, thus this model helps it achieve even more efficiently

General Terms

Digital surveillance system

Keywords

Finger Print Scanner, DOTS, Vaccine Consumption, Regulation, Surveillance, Sensors.

In India today, two deaths occur every three minutes from tuberculosis (TB).Every year, 1.8 million persons develop the disease, of which about 800,000 are infectious; and, until recently, 370,000 died of it annually —1,000 every day. The disease is a major barrier to social and economic development. An estimated 100 million workdays are lost due to illness. Society and the country also incur a huge cost due to TB—nearly US\$ 3 billion in indirect costs and US\$ 300 million in direct costs. (www.tbcindia.nic.in)

It is seen that with appropriate antibiotic treatment, TB could be controlled. In order to provide these antibiotics to the patients, DOTS (Directly Observed Treatment, Short-course) is the name given to the tuberculosis control strategy recommended by the WHO, to be the most effective and efficient method to cure and prevent TB (WHO). The personals involve with the DOTS program are made responsible of providing the medicines to the patients every single/alternate days and make sure that they consume it as well. But the problem is that the DOTS provider often does not do that. They either black the TB medicines or just take the patient's signature once in a week or month without even providing them the medicines regularly. (www.satyamevjayate.in, 2014)

According to W.H.O., in 2013, 9 million people fell ill with TB and 1.5 million died from the disease. Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top 5 causes of death for women aged 15 to 44. In 2013, an estimated 550 000 children became ill with TB and 80 000 HIV-negative children died of TB. It is therefore it is very clear that why do we need to worry about TB. Now, to cure TB, Indian government has implemented RNTCP program using DOTS scheme to provide necessary medicines

to the patients. Although a lot of people consider that it is one of the best programs of the country, but it is also seen that it has some big flaws.

Poor monitoring of the program, Shortage of drugs, Timing of DOTS centre and corruption is among the top drawbacks of the current existing program. In this paper are proposing a model through which correct and precise monitoring can be achieved of the program. (www.satyamevjayate.in, 2014)

We propose the use of an android tablet to which a finger print scanner and a band like device can be attached. Assuming that every citizen of India now has an AADHAR card, therefore the government agencies must have a database consisting of information corresponding to a thumb print. The band shall be having different sensors like Pulse Sensor, Blood Pressure Sensor etc that can monitor basic health parameters of the patient.

Whenever the patient comes to consume the medicine, the DOT provider must tie the band on the wrist of the patient and shall ask him/her to put his thumb on the scanner. With a successful detection of the thumb print, the software will initialize the band, and the band would record the health parameters like pulse rate, blood pressure, breathing pattern etc.

As the exact time and date of medicine consumption is recorded in the database, and that too initialized by patient's thumb print, there shall be no chance of any false signature or medicine consumption record. Since the basic health parameters are also recorded in the database during each drug dose i.e. every alternate day, therefore effective monitoring of the patient can be achieved. Also, the software shall be made mature enough to plot graphs and charts using those health data, making it accessible to the skilled trainers at the other end to monitor as to how many patients are improving, how many are stable and how many are should be taken care of even more. The software shall also monitor if a DOTS provider is providing the medicines regularly or not, if not alert shall be generated. It would also monitor if each patients are taking the treatment properly or not, if not similar alert can be generated as well.

This automation will not only help the patients excessively but will also help the officers monitoring the DOTS provider. It would reduce the cases of the providers not providing the medicines regularly thus reducing corruption. In a village, only that no. of instrument is required as many DOTS provider have been appointed, thus no big costs are involved. This model if implemented can bring about a lot of changes in current scenario of DOTS and TB treatment. Since a strict monitoring is been done, there is no scope of irregularity in dose consumption. Also, since basic health parameters are also been checked thoroughly continuously therefore a check is easily kept on the patient's health improvement. Also, the same model can also be incorporated in several other date related schemes like NREGA where we can monitor if each

labor gets a guaranteed 100 day job or not. Moreover, UN has put TB as one of the few diseases on their priority for curing and prevention, thus this model helps it achieve even more efficiently

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