MOBILE SOLUTIONS TO TACKLE THE INCREASING TB BURDEN IN INDIA

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ABSTRACT
India is among the top countries with the high prevalence of TB cases. The incidence of multidrug resistant tuberculosis (MDR-TB) and extremely drug resistant tuberculosis (XDR-TB) are increasing in the countries like India and as a result, there is a need to adopt and develop novel solutions. In India the prescription hand-off process is quite complex and time consuming on the part of physicians, patients and pharmacists because of illegible handwriting or unclear abbreviations in prescription which sometimes leads to delay or dispensation of wrong medicines. To tackle this problem, 1mg in collaboration with the government of Andhra Pradesh took initiative to develop APeRx mobile applications and mandate the usage of these mobile apps to prescribe and dispense the TB medicines. The application helps streamline the prescribing process by allowing only the registered pharmacies to dispatch the medicines as prescribed by the doctor through APeRx mobile application. This case study shows that how this tool is contributing towards having controlled dispatch of medicines and real time data available on patients and their usage patterns of medicines.

KEYWORDS: Multidrug Resistant Tuberculosis (MDR-TB), Extremely Drug Resistant Tuberculosis (XDR-TB), e-Prescription.

INTRODUCTION
A Public Health Crisis: India accounts for a large proportion of new TB cases occurring worldwide. In 2017, eight countries accounted for two-thirds of the new TB cases and India was amongst them. Adherence problems and difficulties in tracking patients has given rise to rapidly proliferating incidence of multidrug resistant tuberculosis (MDR-TB) and extremely drug resistant tuberculosis (XDR-TB). Given the high incidence of TB patients dropping out of the prescribed treatment cycle and falling prey to MDR-TB in countries like India, there is an increased need to adopt novel solutions to combat the disease.

Current Challenges of the Prescription System in India: While the official number is difficult to estimate, physicians in India would be writing a few billion prescriptions each year. In United States four out of five patients who visit a physician leave with at least one prescription[1] and a similar trend is expected in India. 65% of the Indian population use a prescription medication each year. However, the prescription hand-off process leads to several complexities and potential delay in dispensation on account of illegible handwriting, unclear abbreviations and doses thus leading to time consuming verbal communication among physicians, patients and pharmacists in order to correctly comprehend the written prescription. Generally, in Indian scenario, the physician writes the prescription and hands it to the patient. The patient then carries the prescription and takes it to the pharmacy. However, this process is not safe and secure as there are chances that patient might lose the prescription, chances of multiple dispensation against a single prescription, inability to understand prescription and dispensation of wrong medications due to illegible handwriting. This demonstrates the severe lack and need of strict monitoring of the entire prescription process especially antibiotics.

Medication errors attributed to prescription severely impacts patient safety, quality of care, compliance and productivity. A Harvard study shows that 5.2 million medical errors are happening in India annually.[2]

Prescription Process / Stages

A. Choosing a medicine

B. Prescription writing

C. Dispensing of medication

D. Administering/taking the medicine

E. Monitoring therapy

How can Digital Solutions help?

The crux of the problem lies in the fact that there is no structure data being captured at the point of care for the purposes of monitoring irrational use, understanding evolving resistance patterns, and communicating the same to prescribing physicians.

The hand written prescriptions are difficult to digitize due to

- Difficulty to digitize into readable format using OCR technology.
- Pharmacists do not always have computer access to digitize the prescriptions.
- Converting the prescriptions into digital format inside a billing system or similar recording system can be very time-consuming exercise at the point-of-care.

Thus arises the need of developing a system that solves the above critical aspects.

With mobile devices increasingly becoming an essential part of people's day-to-day lives, digitization of prescriptions for TB patients by generating prescription from mobile application would be a practical solution. Also, if the system is synchronous with a mobile application at pharmacy's end, it will ensure a smooth streamlined process for dispensation of the medicine, and also provide real time access to structured data for all stakeholders.

Digitization using the mobile applications for generating and dispensing TB prescriptions will enable the stakeholders in addressing below three critical aspects:

i. Prevention of Irrational Use (usage without a prescription).

ii. Prevention of Medication Abuse (usage not as per prescription).

iii. Accountability checks for doctors, pharmacies and patients.

### MATERIALS AND METHODS

APeRx Mobile Prescription System

1mg Technologies Private Limited has collaborated with the Government of Andhra Pradesh to take an initiative to develop APeRx mobile applications and mandate the usage of these mobile apps to prescribe and dispense the TB medicines. APeRx comprises of two mobile applications one for the doctors and the other pharmacies. It will have a central database that stores all the e-prescriptions and their dispensing details against unique doctor, patient and pharmacist ID. The system also comprises of a monitoring dashboard to monitor use of Anti-TB medicines, prescription pattern, dispensations and usage related trends.

In the current approach, the doctors and pharmacies will self-register using their certificate or registration license, license number and other basic information. The registered doctors can write prescription through APeRx doctor's mobile application. Once the doctor submits the prescription an auto generated Prescription ID is shared with the patient on his mobile number. Patient can use the prescription ID received against the prescription generated by the visiting doctor, to get the medicines dispensed from any registered pharmacy. Pharmacy using the "APeRx – mobile application for pharmacies" and the "Prescription ID" provided by the patient, accesses that particular prescription and dispenses the medicines either partially or completely as per the patient's request. Several safeguards have also been taken so that it will not be misused by the public and the pharmacies. Prescription can only be generated by APeRx registered doctors through their Doctor application. Also, once the prescription is completely dispensed, the prescription will be closed and can't be accessed or dispensed again by any pharmacy.

It was also considered and taken care in the process so that the same medicine is not circulated again and again to the public and same is not brought back at discount by pharmacies and recirculated to the public. Patient's prescription history will be maintained and will remain available for the doctor through APeRx application. Patient's prescription history and dispensation history will help in curbing the repeated prescription of medicines and circulating back to pharmacies. Precautions were also taken to stop duplicate entry of patients, as Patient will be registered by using his mobile number and one can't use the same mobile number to register any other patient or same patient. APeRx applications will be integrated with Praja Sadhikaritha Survey data - PSS database and each patient will be uniquely identified to stop duplicate registrations of patient even with different mobile numbers.

Apart from tackling the pain points in implementing the government strategy to combat TB, APeRx has enabled many possibilities for doctors, pharmacies and government departments by making real time data available on patients and their usage patterns for them. Also, these mobile applications are being considered for implementing different other government programs and combating wide spread problems like antibiotic resistance etc.
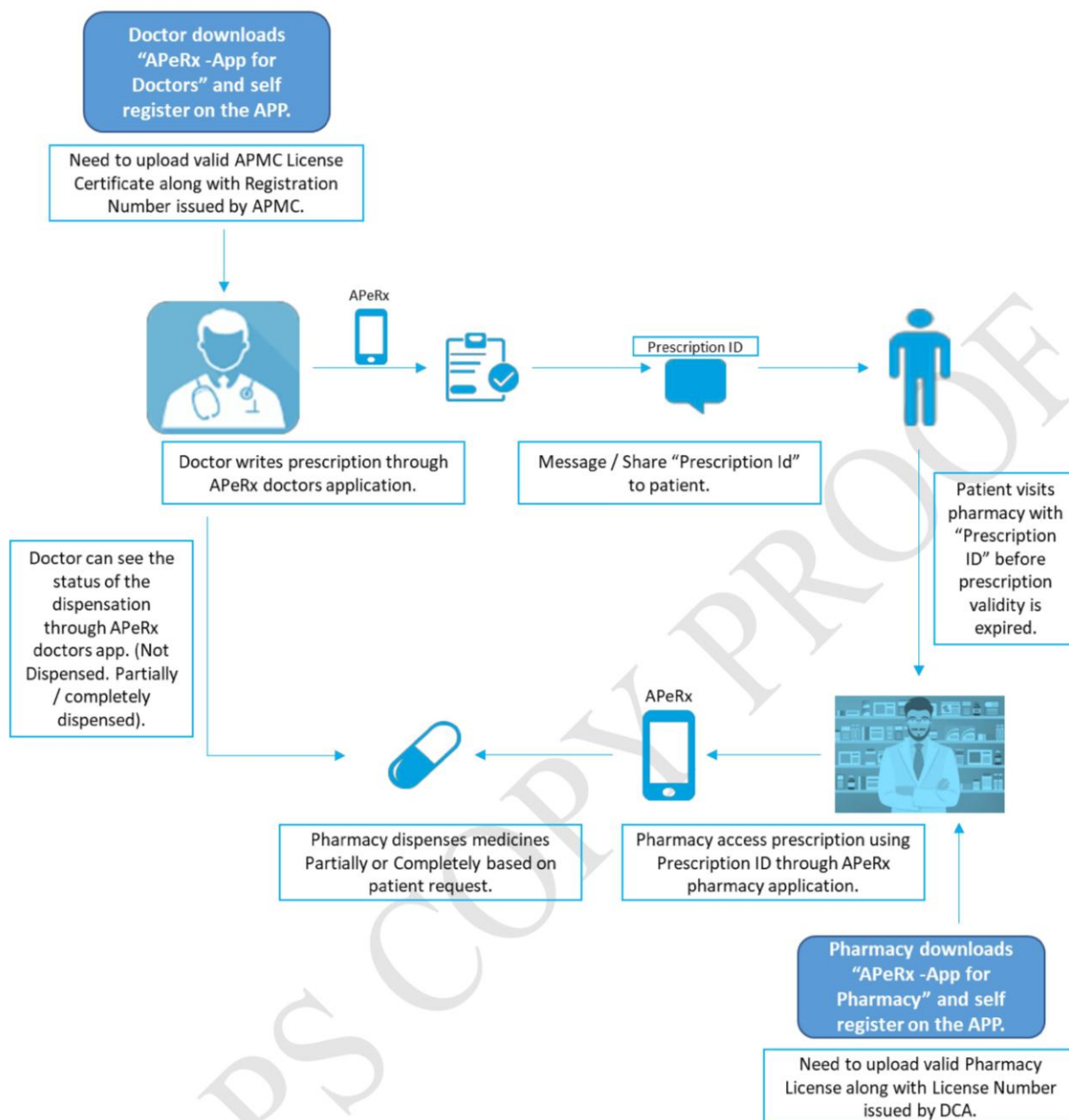
ApeRx Solution Usage Flow

How is the system beneficial for the government?
The eRx (ePrescription) system offers several advantages to the government:

• Monitoring of entire patient journey from hospital visit to adherence
• Less total initial investment
• Seamless real-time data that prevents irrational use of antibiotics and antibiotics abuse

• Ensures no self-medication, non-dispensation of antibiotics without any prescription and single dispensation against a prescription
• Improves patient safety by having end to end visibility on entire prescription process / steps from choosing medicines to monitoring therapy.

While a major challenge for the government is resistance to change and adoption, effective collaboration between all stakeholders is resulting in steady growth in the adoption of the platform.

RESULTS
e-Rx Findings – Physician Impact

Benefits	New Challenges
• Facilities currently using electronic Physicians Orders will see modest change or disruption to current workflow • Ability to transmit orders directly to the pharmacy yielded benefits in reduced rework and call-backs • Management of Orders at the facility streamlines reconciliation processes	• Prescriber adoption is vital • Integration with clinical systems (EHR) is critical • Data entry errors can still happen

e-Rx Findings – Pharmacy Impact

Benefits	New Challenges
• Demographics pre-populated on new admissions • Straightforward new order processing • Discontinued orders • Readmissions streamlined • Do not have to manage MARs and Order Sheets • Refill requests streamlined	• Combination & Tapered Orders – Need codified SIG standard • Transcription accuracy • Timely transmission on admission orders • Fax mode for controlled substances leads to process inconsistencies

Key Learnings
• Well Defined Objectives and Clear Focus is essential for efficient implementation.
• Involvement of Senior Officials and Close Monitoring has helped in getting a direction.
• Change Management and Extensive Support for involved stakeholders.
• Appropriate Government Orders / Notifications / Memos and Manuals to Support the New System.
• Careful Selection of Implementation Partners.
• Extensive Testing and Continuity of Team during Implementation.

Also, Importance of creating an electronic record of practitioners, patients and pharmacies and synchronising them with existing data pools is the key to project success and quick implementation.

Learnings from implementation and adoption challenges have helped in refining the approach and overall solution.

Future Goals for APeRx application suite
Targeting to decrease medication drop outs by 50% by achieving APeRx adoption of over 90% levels by the end of 2019.
o The cascade study[3] shows even after diagnosis, people don't s start treatment or drop out later. With plans to link APeRx with TB diagnosis records, the patient journey starting from diagnosis to treatment completion will be monitored by the government departments to avoid patient drop outs.

To achieve huge savings in government costs with a minimal and effective investment in technology.
o The APeRx mobile solution for TB control is very cost efficient and easily scalable to other treatment areas and geographies. Which ultimately leads to huge government cost containment.

To collaborate with other departments /organisations in the treatment value chain including teams involved in active case finding, supervision of medication adherence etc. to achieve complete convergence of various efforts.

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