mHealth for improving Tuberculosis (TB) treatment adherence and follow up system in south India

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Outline

- Background
- Rationale and research question
- Methodology
- Results
- Discussion and limitations
- Questions
Background

- TB is a major public health problem in India
- WHO estimated numbers
- Revised national TB program - DOTS
- Progress so far

Challenges for TB management

- Target based approach
- Definition of success
- Delay in diagnosis
- Direct observation
- Mid-treatment drop out/default
- Implementation challenges- human resource etc.
- Access to DOTS- only 46%

Key points

- DOTS is the best solution available
- Patient centric approach is needed
- Reminders are needed
- Constant motivation and feedback required
Relevance of mHealth in India

- Tele-density
- Cheap voice calling rates (less than a cent/minute)
- Cost effective and efficient
- Favorable environment

(Telecom Regulatory Authority of India (TRAI), 2012)
mHealth for treatment compliance

Akter 2012, Earth Institute Columbia University 2010, West 2012,
Hypothesis and research question

Can a customized ICT enabled platform, facilitate successful treatment adherence and follow-up for effective implementation of TB treatment?
Methodology

- Mobile phone based registration of TB patients
  - Customised registration form on mobile phone equivalent to the RNTCP card, unique ID
  - Drop down menus, uploaded via GPRS to a central database
- SMS and/or voice call reminder enabled treatment adherence support
  - Voice messages in local language
  - Content
  - Schedule (preferred time and alternate day)
- Real time reporting and monitoring
- Study site
- Quantitative and qualitative data

Congrats!
You have killed 90% of the TB bugs.
# Revised National Tuberculosis Control Programme

## Treatment Card

### Personal Information
- **State:** 
- **City/District with code:** 
- **TB Unit with code:** 
- **Name:** 
- **Sex:** ( males, females )
- **Age:**
- **Occupation:**
- **Patient TB No./Year:**
- **PHI:**
- **Name and designation of DOT provider & Tel. No.:**
- **Complete Address & Telephone number:**

### Contact Information
- **Name and Address of Contact Person & Telephone Number:**
- **DOT centre:**
- **Signature of MO with date:**

### Initial Home Visit
- **Initial home visit by:**
- **Date:**

### Disease Classification
- **Pulmonary**
- **Extra Pulmonary**

### Type of Patient
- **New**
- **Relapse**
- **Transfer in**
- **Failure**
- **Treatment after default**
- **Other (Specify):**

### Treatment Regimen

#### Intensive Phase
- **Prescribed regimen and dosages:**
  - **Category I**
    - (Pulmonary Smear-Positive, Seriously ill Smear Negative, or Seriously ill extra pulmonary)
    - **3 times / week**
    - Regular doses: 
      - H
      - R
      - Z
      - E
      - S
  - **Category II**
    - (Retreatment, relapses, failure, treatment after default, others)
    - **3 times / week**
    - Regular doses: 
      - H
      - R
      - Z
      - E
      - S
  - **Category III**
    - (Pulmonary Smear Negative, not seriously ill; or extra pulmonary, not seriously ill)
    - **3 times / week**

#### Tick appropriate date when the drugs have been swallowed under direct observation; make a circle (O) on the date of missed doses.

| Month/Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
### II Continuation Phase

**Prescribed regimen and Dosages**

- **Category I**
  - 3 times / week
  - [ ]
  - [ ]
- **Category II**
  - 3 times / week
  - [ ]
  - [ ]
- **Category III**
  - 3 times / week
  - [ ]
  - [ ]

Enter X on date when the first dose of drugs has been swallowed under direct observation and draw a horizontal line (x__________) to indicate the period during which medicines will be self administered.

| Month / Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

**Treatment out come with date:** ____________________________

**Signature of MO with date:** ____________________________

**Details of X ray / EP tests**

**Remarks**

- ____________________________
- ____________________________
- ____________________________
- ____________________________

**Retrieval Actions for Missed Doses**

<table>
<thead>
<tr>
<th>Date</th>
<th>By whom</th>
<th>Whom contacted</th>
<th>Reason for missed doses</th>
<th>Outcome of retrieval action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Household Contacts (Children < 6 yrs)**

<table>
<thead>
<tr>
<th>No</th>
<th>Chemoprophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Additional Treatments**

- **HIV status:** [ ] Unknown  [ ] Pos  [ ] Neg (date) ____________
- **CPT delivered on (date):** (1) (2) (3) (4) (5)
- **Pt referred to ART centre (date):** ____________
- **Initiated on ART:** [ ] No  [ ] Yes (date) ____________
Results

- 104/196 TB patients recruited
- 78% males, 55% were more than 45 years of age, 5% HIV co-infection
- 66% owned their own mobile phones
- 81% chose to receive voice calls, the rest both SMS and voice and none chose SMS alone
- 98% preferred receiving messages in the morning
- No loss to follow up- all patients were followed up
Treatment outcomes

<table>
<thead>
<tr>
<th>Treatment outcomes</th>
<th>N = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>84</td>
</tr>
<tr>
<td>Failure</td>
<td>4</td>
</tr>
<tr>
<td>Death</td>
<td>8</td>
</tr>
<tr>
<td>Transferred out</td>
<td>4</td>
</tr>
</tbody>
</table>
Correlation coefficient = 0.848
<table>
<thead>
<tr>
<th>Percentage of call attended (X)</th>
<th>Number (%) of Patients who completed treatment (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>5 (6)</td>
</tr>
<tr>
<td>20-40</td>
<td>4 (4)</td>
</tr>
<tr>
<td>40-60</td>
<td>8 (9)</td>
</tr>
<tr>
<td>60-80</td>
<td>18 (21)</td>
</tr>
<tr>
<td>80-100</td>
<td>52 (60)</td>
</tr>
</tbody>
</table>
Qualitative feedback

“I usually remember to take the tablet without fail every day, and my family keeps a watch… but on days that we forget, the messages were extremely useful for us”

“During times when I felt vexed about having to take medicines everyday and felt why I had to be victimized by such a disease, listening to the messages which told me that I was not alone in this fight against TB, and that adherence to the treatment will lead to cure was very inspiring”

‘acted as a trigger’ ‘habit to expect calls’ ‘support system’ ‘personalised care’
Key findings

- 4 relapse patients – cured in this round of treatment
- 4 transferred patients were confirmed to be cured through phone calls and validation from DOTS officers
- 77% patients had more than 60% call attendance
- Field investigator played an important role
- DOTS provider can take the role of the field investigator
- Mobile phone recording system can replace paper based recording system
- First study to correlate the effectiveness of voice calls with successful TB treatment outcomes
Policy relevance

- Solution aligns with the goals of Global Plan to Stop TB 2006-2015
- RNTCPs National strategic plan 2012-2017
- International standards of TB care (standard 9)
Limitations

- Need prompt updates on treatment status and outcomes
- Commitment from health staff
- Inability to follow up transferred out patients
- Confirming whether a person has actually taken a medication
Way forward

- RCTs
- Scaling up the initiative
- Applying for grants
Acknowledgements

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