CURE
(Capacity Upgrades on Reaching Elimination)
TB Project in Cambodia

Korean National Tuberculosis Association
StopTB Partnership
hosted by UNOPS
Community Chest of Korea
Background

Jan. 2020 ~ Dec. 2021
(screening: 110 days)

Stop TB Partnership
TB REACH
hosted by UNOPS
Community Chest of Korea

Korean National Tuberculosis Association

Siem Reap PHD, CENAT/NTP
02 Program Planning

1 Ultra-portable x-ray device
- 1.8kg Light Weight
- Ultra Low Dose
- 70kV
- 2mA

1 CAD solution (offline)

4 GeneXpert machines

2 Special Monitors for reading digital x-ray images
**Program Planning (cont.)**

- **Ultra-portable X-ray**
  - MINE 2.7 full kit
  - Accessories
  - Installation and Training
  - 5 yrs warranty

- **CAD**
  - Lunit INSIGHT
  - Offline

Total 59,600 USD
CXR & CAD in the field
Program Planning (cont.)

MOU with NTP and Siem Reap PHD

CATA Screening Field Visit

Launching Ceremony
Program Planning (cont.)

Training

Preliminary test / Pilot
Threshold Score Selection

- Threshold Score: 15 for TB Score
- 30% of presumptive TB cases
- Xpert capacity per day
## Mobile Screening Process on spot

1. **REGISTRATION**
   - Check basic information of participants like name, address, age and etc.
   - 1) 1 Head of Community
      2) 1 VHSH

2. **INTERVIEW**
   - Interview all clients 15 years old and above for symptom screening
   - 1) Receptionist
      2) 1 Health Center Staff

3. **X-RAY TEST**
   - Take digital chest X-ray (DXR) of all interviewed clients
   - Rad Technician

4. **X-RAY READING**
   - Distinguish “Presumptive TB” by (CAD)
   - 1) Lab Technician
      2) 1 Health Center Staff

5. **Bacteriological TEST**
   - GeneXpert RIF/MTB Test of Presumptive TB cases selected by TB symptoms and CAD
   - Data Manager

6. **DATA SHARING**
   - All data sent to ACRH physicians on daily basis
   - Receptionist

7. **REFERRAL**
   - Submit “Daily TB PATIENT REFERRAL LIST” to the Health Center

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### Data Manager
- Rad Technician
- Receptionist
- Data Manager
Process after mobile screening

8. **CXR Rereading**
   - Physicians from ACRH read all clients' CXR again on the daily basis and make a clinical/final diagnosis.

9. **Specimen Collection**
   - The additional sputa/cases which CAD misses are collected by the mobile team.

10. **Bacteriological Test**
    - GeneXpert RIF/MTB Test of Presumptive TB cases found by ACRH physicians

11. **Referral**
    - Submit “Extra TB Patient and Other Diseases Referral List” to the Health Center

12. **Treatment**
    - Register TB Patients according to national guideline by national institution

13. **Check Results**
    - Data Manager will collect Tx results of patients found by the project

4 physicians from ACRH

**Mobile Team**

**Lab Technician**

1) Data Manager
2) Receptionist

**Health Center / DOTS**

**Data Manager**
Screening Algorithm

Screening of all clients 15 years old & above:
1. Symptomatic Screening through interview
2. Radiographic Screening through Digital Chest X-ray regardless of TB symptoms

(+) 15dC or H&B; (+) CXR for TB (by CAD or Physician)
(-) 15dC or H&B; But (+) CXR for TB (by CAD or Physician)
(+) 15dC or H&B; but (-) CXR for TB (by CAD and Physician)
(-) 15dC and H&B; (-) CXR (by CAD and Physician)
(-) 15dC and H&B; (-) CXR for TB
Other disease suspected

Label as **Presumptive TB** for GeneXpert

Xpert(+ RIF- S) Xpert(+ RIF - R) MTB detected RIF Resistance Indeterminate or MTB detected trace

Refer to Health Centers or register Treatment on spot

Xpert Invalid /Error/ Not done
Repeat Xpert

Physician may decide to treat as CD TB

Suspect for other disease

15dC: ≥ 15 days of cough
H&B: hemoptysis or blood-tinged sputum
CXR: Chest X-ray
CD: Clinically diagnosed
S: Susceptible
R: Resistant

**Note 1:** For RIF Resistance Indeterminate Genexpert results, no need to repeat the test in terms of the Cambodian national guideline.

**Note 2:** List of clients with other diseases or exceptional cases should be reported to health centers.
Algorithm for Xpert MTB/Rif

05

Eligible for screening

Symptomatic screening

(Cough for ≥ 15 days or hemoptysis or bloody sputum for ≥ 1 day)

(CAD for ≥ 15 score)

Lunit INSIGHT

Xpert MTB/Rif

1st opinion

2nd opinion

Angkor Chum Referral Hospital
Data Management

- Developed the electronic local data management system to use without access to the internet in the field.
- Only persons allowed to log into the system could manage data.
- Not integrated with the HIS, but only the TB patients’ list was reported to the designated HCs.
## Results

<table>
<thead>
<tr>
<th>Contents</th>
<th>Total</th>
<th>Rate(%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Participants</td>
<td>5,583</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of CXR test</td>
<td>5,510</td>
<td>98.7</td>
<td></td>
</tr>
<tr>
<td>No. of Presumptive TB</td>
<td>1,688</td>
<td>30.6</td>
<td>• NNS = 3</td>
</tr>
<tr>
<td>No. of Xpert test</td>
<td>1,630</td>
<td>96.6</td>
<td></td>
</tr>
<tr>
<td>No. of Bac+ confirmed</td>
<td>100</td>
<td>5.9</td>
<td>• MTB+/Rif-: 71, MTB+ trace: 29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• New &amp; Relapse: 93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• NNT = 16</td>
</tr>
<tr>
<td>No. of Clinical Diagnosis</td>
<td>20</td>
<td>1.2</td>
<td>• New &amp; Relapse: 19</td>
</tr>
<tr>
<td>No. of All Forms of TB</td>
<td>120</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>
Results (cont.)

Clients*

Sx+/CAD+ : 255
Sx+/CAD- : 485
Sx-/CAD+: 861
Sx-/CAD- : 3955

Xpert exam

+ive: 37
-ive: 217
other: 1
CD TB: 4

+ive: 7
-ive: 471
other: 7
CD TB: 2

+ive: 56
-ive: 801
other: 4
CD TB: 10

+ive: 0
-ive: 39
other: 48
CD TB: 4

MD final+: 87
MD final- : 3868

Eligible for ATT

* Excluding the person on TB treatment: 27

No further evaluation
### Results (cont.)

<table>
<thead>
<tr>
<th>Contents</th>
<th>Bac+ confirmed TB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>CAD reading</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presumptive TB Need Sputum Exam</td>
<td>93</td>
<td>1,023</td>
</tr>
<tr>
<td>Non TB No Sputum</td>
<td>7</td>
<td>4,360</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>5,383</td>
</tr>
</tbody>
</table>

Sensitivity = 93/100*100=93%, Specificity=4,360/5,383*100=80.9%

<table>
<thead>
<tr>
<th>Contents</th>
<th>Bac+ confirmed TB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Symptom Screening</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cough&gt;2wks or Hemoptysis Need sputum exam</td>
<td>44</td>
<td>688</td>
</tr>
<tr>
<td>Non TB No sputum</td>
<td>56</td>
<td>4,695</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>5,383</td>
</tr>
</tbody>
</table>

Sensitivity = 44/100*100=44%, Specificity=4,695/5,383*100=87.2%
## Success Stories

<table>
<thead>
<tr>
<th>TB history of enrolled treatments</th>
<th>No. of All TB patients started on treatment</th>
<th>Treatment outcome (by Feb 2022)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Relapse</td>
<td>Other</td>
</tr>
<tr>
<td>93</td>
<td>19</td>
<td>8</td>
</tr>
</tbody>
</table>

89 ppl (Bac+ 73)
Scaling Up

- Tried to propose a new plan to KOICA

- Donated X-ray & CAD and Xpert machines to NTP and Siem Reap PHD for national TB control

- Trained end-users at ACRH
## Experience with the X-ray and CAD vendor(s)

<table>
<thead>
<tr>
<th>X-ray</th>
<th>CAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Very small, thin and light</td>
<td>1. Fast for finding presumptive TB</td>
</tr>
<tr>
<td>2. Easy to move and use</td>
<td>2. Easy for use</td>
</tr>
<tr>
<td>3. Clear images</td>
<td></td>
</tr>
<tr>
<td>4. Possible to take 100 ppl a day</td>
<td></td>
</tr>
<tr>
<td>1. Malfunctioned in a month, but the replacement was ready</td>
<td>1. The laptop was too big and heavy to carry and difficult to handle</td>
</tr>
<tr>
<td>2. Produced unclear images for the person having a big body or being overweight</td>
<td></td>
</tr>
<tr>
<td>3. Possible to miss the small lesion</td>
<td></td>
</tr>
</tbody>
</table>

- Difficult to connect between the X-ray and CAD vendors
- No local office for A/S
Challenges & Lessons learned
Acknowledgment

Our sincere gratitude and thanks to

• Stop TB partnership / TB REACH Wave 7, Dr. Robert Stevens and McGill International TB Center

• Cambodian Team of CURE Project

• Dr. Kros Sarath, Mr. Boramey Sokhom and Siem Reap PHD team

• Dr. Huot Chanyuda, Dr. Tieng Sivanna and NTP/CENAT team

• Dr. Mao Tan Eang, MOH

• Mr. Monyraph CHRY, CATA

• Siem Reap Provincial Hall, Angkor Chum Operational District, Health Centers, Village Health Support Group (VHSG) and TB affected communities
THANK YOU

CURE TB PROJECT