Evaluating the Use of an Artificial Intelligence (AI) Platform on Mobile Devices to Measure and Support Tuberculosis Medication Adherence
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BACKGROUND
- The total number of TB cases reported in the US in 2018 was 8,696, with LA County reporting the highest number of cases in the nation. Data from the LA County Department of Public Health (LADPH) showed that 92% of LA residents with active TB disease if left untreated.
- There are an estimated 11 million cases of latent TB infection in the US, of which 5-10% could progress to TB disease.
- Challenges to in-person DOT include logistical requirements of in-person DOT causing delays in clinic performance.

METHODS
- The study included patients with active TB patients in the continuation phase of treatment and new LTBI patients who were enrolled in the study. Patients received real-time data encryption and transmission to secure cloud-based HIPAA-compliant AI software.
- The AI platform uses a combination of passive and active sensors to monitor patients. Passive sensors include ingestible sensors and electronic medication packaging, while active sensors include video-based DOT and remote monitoring devices.
- The primary endpoint is to demonstrate that automated monitoring of treatment is equivalent to video-based DOT (synchronous or asynchronous video transmission requiring full review of each dosing). The secondary endpoint is to demonstrate the value of automated real-time monitoring compared to other monitoring methods.

RESULTS
- A total of 42 patients enrolled (Table 1).
- Mean cumulative adherence of 94% based on visual confirmation of drug ingestion by the software algorithm (Table 1).
- High adherence rates and minimal loss of data suggest that automated treatment monitoring is a feasible and effective approach to support medication adherence.
- High patient likability and preference of the AI Platform over in-person DOT or vDOT.

CONCLUSIONS
- This innovative approach such as AI-DOT is being developed to improve the realization of real-time monitoring to support medication adherence needs (real-time monitoring data need to be collected and communicated in a timely fashion). Other approaches such as the use of video-based DOT and AI-DOT are being developed to support medication adherence needs.
- The authors acknowledge Stuart McMullen and Monica Rosales, PhD for their help in the design of the study.

REFERENCES

FIGURES & CHARTS
Figure 1. AI Platform Used in the Study
- Dashboard web-based Real-time alerts of missed/incorrect doses
- Software algorithms
- Cloud data storage
- Patient profile
- Real-time data are encrypted
- HIPAA-compliant AI software
- Dashboard web-based
- Patient profile
- Ingestible sensors
- Electronic medication packaging
- Real-time alerts of missed/incorrect doses

Figure 2. Value of Automated Real-time Monitoring
- Mean cumulative adherence of 94%
- High adherence rates and minimal loss of data suggest that automated treatment monitoring is a feasible and effective approach to support medication adherence.

Figure 3. Logged interventions by clinic staff based on real-time dosing data
- Real-time data are encrypted
- (HIPPA-compliant) Real-time data are encrypted
- (HIPPA-compliant) Real-time data are encrypted
- (HIPPA-compliant) Real-time data are encrypted

Table 1. Enrollment Status
<table>
<thead>
<tr>
<th>Patient Status</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active TB</td>
<td>24</td>
<td>57</td>
</tr>
<tr>
<td>Latent Infection</td>
<td>18</td>
<td>43</td>
</tr>
</tbody>
</table>

RESULTS
- Mean cumulative average adherence is 94% based on visual confirmation by the software algorithm (Table 1).
- 44 out of 1,057 doses (4.2%) were classified as: self-reported (on the protocol), reported (not confirmed by software algorithms). 44 out of 1,057 doses (4.2%) were classified as: self-reported (on the protocol), reported (not confirmed by software algorithms). 44 out of 1,057 doses (4.2%) were classified as: self-reported (on the protocol), reported (not confirmed by software algorithms).

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