

## Background

- Ciudad Juárez (CJ) is the second largest Mexican city on the US-Mexico border with a population of 1.4 million (INEGI).
- In 2016, CJ reported 258 cases, of which 77.9% were pulmonary (201), and had a case rate of 18/100,00. That year, 78.5% of individuals starting TB therapy had a successful treatment outcome, with 71% having a bacteriologically confirmed cure (predominantly by smear) and 7.5% reported as treatment completed. The abandonment rate was 9.9%. A major identified barrier was the need for patients to come to their local health center (HC) for directly observed therapy (DOT), a particular problem for those living further away from the HC.
- Mobile technology for DOT is being increasingly adopted to enhance patient-centered care. This strategy may be useful in Mexico to improve treatment success. In 2017, the first Mexico-initiated use of video DOT technology was launched in CJ, Chihuahua, Mexico. The TB Control Program in CJ, in coordination with the nonprofit organization Amor pro TB (ApTB), started an operational project using emocha video DOT (miTAES) to increase treatment adherence and reduce abandonment. The results of this operational project are presented.

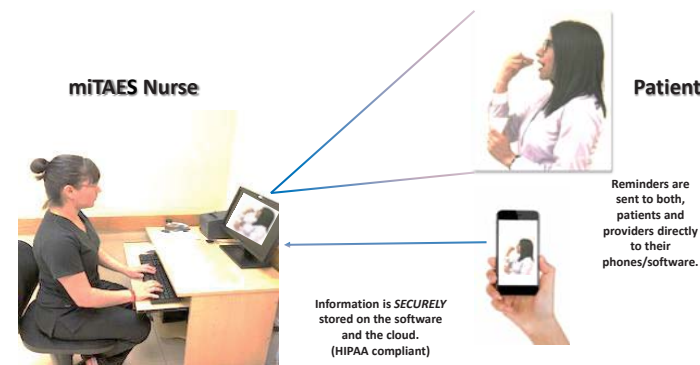


## Methods

- The project sought to enroll 10 patients. Patients were proposed by the CJ jurisdiction based on criteria 1) ≥18 years old, 2) stably housed and >1 mile from the HC, 3) no substance abuse, 4) no known resistance to the four first line medications, and 5) willing and able to provide consent.
- Patients with pulmonary TB had baseline smears, cultures and susceptibility testing. Specimens were collected every month until treatment was completed.
- All patients were visited at home to explain the project, answer privacy or other concerns, and confirm they met criteria. Enrollment, smartphone, and system training were done in the home. A smartphone was provided to each patient to use emocha system. Patients self-recorded videos taking each dose of TB medication, Mon-Sat (intensive) and 3 times per week (continuation).
- Four jurisdictional TB nurses, trained by the Project Coordinator, monitored the patients using the emocha system. The nurses documented uploaded videos. If a patient noted a side effect or did not send a video as expected, the nurse contacted the patient and reported the incident to the treating MD. Doses were “monitored” if patient was clearly seen swallowing the medication. If a technical issue was identified, nurse contacted a technician. Monthly reports of adherence were sent to the patient’s HC and Project Coordinator.
- Outcome measures: % of monitored/expected doses, % of pulmonary patients with smear and culture conversion, and overall % treatment completion. Dose not “monitored” were considered missing, even if video was received.
- At the end of treatment, patients completed a satisfaction questionnaire.

## emocha System

miTAES includes a smartphone application for securing the recording, transferring and storing the videos and a web-based client management system used by TB program staff. The videos are encrypted and sent to secure server via Wi-Fi network. If service is unavailable the video remains on the phone until connection is restored. To maintain confidentiality, videos cannot be viewed on the phone and are automatically deleted after being sent.



Actual houses of patients enrolled on miTAES program in Ciudad Juárez, Mexico.

## Results

Median age was 25 years (range 17-60), 50% were female. Nine patients used miTAES until completion of treatment (90%). Pt #8 did not follow project protocol, in-person DOT was offered. 879 doses of an expected 921 (95.4%) were monitored by video. Pts completed a median of 95.7% of expected doses (range 86.7%-100%). 100% of pulmonary patients had smear and culture conversion. Based on post-treatment survey, 90% of patients enjoyed using the smartphone, had high satisfaction using video for DOT rather than travelling to the HC, felt the strategy was more private and avoided stigma encountered when attending a HC. Eight of the 10 patients reported not having a problem using the technology.

Patient	Age	Gender	Smear	Sputum conversion	Culture conversion	Monitored doses/ expected doses (%)
1	36	F	2+	2mo.	2mo.	102/105 (97.1%)
2	17	M	1+	2mo.	2mo.	101/105 (96.2%)
3	18	M	3+	2mo.	2mo.	70/75 (93.3%)
4	19	M	3+	2mo.	2mo.	100/105 (95.2%)
5	18	F	2+	2mo.	2mo.	105/105 (100%)
6 <sup>1</sup>	60	F	L.N. TB	N/A	N/A	39/45 (86.7)
7	24	F	1+	2mo.	2mo.	101/105 (96.2%)
8 <sup>2</sup>	55	M	2+	2mo.	1mo.	64/66 (97%)
9	26	M	2+	3mo.	3mo.	99/105 (94.3%)
10	31	F	1+	2mo.	2mo.	98/105 (93.3%)

<sup>1</sup>Enrolled after completing 5 months of treatment.  
<sup>2</sup>Patient had relapsed drug use, failed to adhere to project protocol and was withdrawn.

## Discussion

The video miTAES system had good acceptance among TB patients and health providers. Patients liked the strategy because it avoided the time and expense of travelling to a HC, did not restrict their daily activities and reduced stigmatizing interactions. Patients gave examples of the value of this strategy; e.g. allows continued adherence even when dirt roads become impassable after rainstorms.

Providers and nurses supported the strategy because it provided high quality DOT while using fewer staff resources. Videos could be reviewed at convenient times and facilitated rapid recognition of patient side effects. Nurses found it very easy to operate the database.

Another theoretical advantage of using video DOT is the reduction of community transmission of TB. In this project, we found that most patients would have used public transportation to attend HC DOT visits; with travel time as long as an hour.

Some key elements in developing and expanding use of this strategy:

- Support of health authorities to implement and/or sustain the system.
- Maintenance of vehicles for staff to visit patients in their homes.
- High quality training for patients in how to use the system and smartphone.
- Access to a technical expert to troubleshoot connectivity problems and smartphone issues (sometimes at the patient’s home).
- Strategies to reduce smartphone damage, loss or sale.
- Collaboration with non-governmental organizations to support elements of the program (e.g. smartphones, technical support, vehicles).



Actual patients that completed therapy in an underserved community using miTAES.

## Conclusion

Mobile technology for TB treatment adherence shows promise in Mexico. High rates of adherence are possible and is likely to be well accepted by patients and providers. Resource and infrastructure challenges will be encountered as these systems are implemented.

## Contact

**Hector Perez, MD, MPH**  
Coordinator  
Amor-ProTB. Cd. Juárez, Mexico.  
[hector.perez@puentes-de-amor.org](mailto:hector.perez@puentes-de-amor.org)

**Joaquin Cervantes, MD, MPH**  
Panel Physician | TB Medical Advisor  
Clínica Médica Internacional | Amor-ProTB  
[icervantes@grupo-cmi.com](mailto:icervantes@grupo-cmi.com)

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