IMPROVING CASE DETECTION BY PROVIDING ACCESS TO LOW-COST, HIGH-QUALITY DIAGNOSTICS

Image: icddr,b

PROJECT OVERVIEW

Dhaka, Bangladesh

September 2013-December 2015

CAD4TB (Delft Imaging Systems)

International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b)

AI INTERVENTION

Bangladesh has one of the highest tuberculosis (TB) burdens globally and the capital, Dhaka – with almost 22 million people – is the fourth most densely populated city in the world.[1] Most people in Dhaka rely on private healthcare, which often provides **inappropriate or poor-quality diagnostic tests for TB**.[2] With support from the Stop TB Partnership's TB REACH initiative, *icddr,b* set about improving access to high-quality TB services: establishing three TB screening centers in the heart of Dhaka equipped with the latest screening and diagnostic tools.

The project brought some cutting-edge technology to Dhaka for the first time. This included digital X-ray with state-of-the-art artificial intelligence (AI) to automatically interpret X-ray images. Sick people were referred by their physicians to the nearest of the three units. There they received a free X-ray, which was read by the AI software (CAD4TB), as well as a high-quality molecular test for TB (GeneXpert). Those with a positive diagnosis then received treatment from their initial physician, as per national guidelines.

Using new TB diagnostics in screening centers in Dhaka. Image: icddr,b

> ***I THINK THE EXPERIENCE WE HAD WITH AI WAS PRETTY GOOD AND WE'VE HAD PAPERS TESTIFYING THAT AI IS SENSITIVE FOR IDENTIFYING TB. SO, I WOULD REALLY RECOMMEND THE USE OF CAD AS A SCREENING TOOL.***
>
> **– DR. SAYERA BANU**
> SENIOR SCIENTIST,
> *ICDDR,B*

This project ran from September 2013 to December 2015 and screened **655,751** people using X-ray and AI.

With the technical assistance from the Stop TB Partnership, the **largest independent external evaluation of AI software was conducted using chest X-rays from the project** and published on Lancet Digital Health. This provided **much-needed evidence** to support the World Health Organization's policy update that in 2021 approved the use of AI for TB screening and triage for the first time.

PROJECT IMPACT

- ✓ **6,192 people diagnosed and treated for TB**
- ✓ **13% increase in the number of TB cases detected**
- ✓ **Around 1/3 of new TB cases reported in Dhaka in 2015 were diagnosed in *icddr,b* centers.**

PROJECT IMPACT – NOT JUST NUMBERS

Fatema, a young secondary school student, was referred to one of the project's centers because she fell ill with a cough and other symptoms typical of TB. Her family were initially reluctant to act, fearing that a TB diagnosis would damage her prospects. But as her health got worse, they agreed that she should be tested for the disease at *icddr,b's* screening center . Fatema was then diagnosed with TB and given treatment.

Within weeks her health improved, and Fatema could once again attend school and study. She was even able to attend an upcoming exam. After six months of treatment, she was cured and is now back to full health.

Screening at an icddr,b TB screening centre. Image: icddr,b

Supplementing chest X-ray with AI improved sensitivity and helped to uncover some of the 'missing' cases of TB in Dhaka. AI was thought to be **very useful in high-population screening settings with too few radiologists**. After the conclusion of this project, *icddr,b* planned to continue using AI in its projects and was involved in piloting a new version of the CAD4TB product. However, the price of the AI was high compared to reading by local radiologists, so *icddr,b* did not use it for a while. Now, with more appropriate pricing structures becoming available as competing products emerge, and as CAD is featured in Stop TB Partnership's GDF Catalog, Stop TB Partnership and *icddr,b* are working with the National Tuberculosis Program on the **nationwide roll-out** of CAD in Bangladesh.

> ***"WITH AN AUTOMATED SCORING SYSTEM SAYING WHO SHOULD BE TESTED BY XPERT, WE CAN EASILY IDENTIFY THEM, COLLECT SPUTUM, AND HAVE XPERT DONE IN A VERY QUICK TIMEFRAME. SO, I THINK CAD IS A VERY HELPFUL TOOL FOR HIGH THROUGHPUT SETTINGS IN PRISONS OR SLUMS WHERE WE'RE DOING ACTIVE CASE FINDING."***
>
> **– DR. SAYERA BANU**
> **SENIOR SCIENTIST, *ICDDR,B***

FURTHER READING

Tuberculosis detection from chest x-rays for triaging in a high tuberculosis-burden setting: an evaluation of five artificial intelligence algorithms.

An evaluation of automated radiography reading software for tuberculosis screening among public- and private-sector patients.

REFERENCES

1. Stop TB Partnership | High Burden Countries. Accessed April 7, 2021. http://www.stoptb.org/countries/tbdata.asp

2. Wells WA, Uplekar M, Pai M. Achieving Systemic and Scalable Private Sector Engagement in Tuberculosis Care and Prevention in Asia. *PLOS Medicine*. 2015;12(6):e1001842. doi:10.1371/JOURNALPMED.1001842

ABOUT THIS DOCUMENT

This document is one of a series spotlighting the experiences of these early implementers when using artificial intelligence (AI) / computer-aided detection (CAD), to highlight the added value of CAD for TB programmes and inspire prospective implementers to innovate. Funding of this project was provided by the Stop TB Partnership's TB REACH initiative, launched in 2010 by Global Affairs Canada. In 2012, TB REACH first worked with implementing partners to pilot CAD software. Since then, it has implemented 3 different CAD products in 13 different countries in Sub-Saharan Africa, Latin America, Eastern Europe, and South and South-East Asia.