STOP TB FOCUS GROUP ON AI-BASED IMAGING FOR TB (FG-AITB)
WEBINAR 7

Implementing CAD AI and X-Ray - Experience from Vietnam projects by FHI 360 & Friends for International TB Relief (FIT)

To share and learn from early implementation experiences of using ultra-portable X-ray devices and computer-aided detection (CAD) AI software in high-burden countries, Stop TB Partnership is excited to invite you to this upcoming webinar: *CAD AI and X-ray in Vietnam - Implementation experiences and lessons learned from the projects by: FHI 360 & Friends for International TB Relief (FIT)*

Wednesday 31st August (8 am Nigeria/DRC, 9 am Geneva, 10 am Kenya/Uganda, 1 pm Bangladesh, 2 pm Vietnam, 3 pm Philippines)

Presentation	**Access recording below**
FHI 360: USAID Support to End TB in Vietnam https://docs.google.com/presentation/d/17VT63hAdh4a4oYo7BUDagrwQF2PPY0Qi/edit?usp=sharing&ouid=106144367183648595713&rtpof=true&sd=true FIT: Experiences with CAD-assisted TB screening using ultraportable X-ray devices in Viet Nam https://docs.google.com/presentation/d/185yuwoxSJSIN72T4jwMC8hRNzODIfsz_/edit?usp=sharing&ouid=106144367183648595713&rtpof=true&sd=true	https://drive.google.com/file/d/18ghszOxLWb5X5Zs-VHIjIBD9uTilivzT/view?usp=sharing

This webinar aims to share the experiences of FHI 360 and FIT in Vietnam in implementing Portable X-Ray and CAD AI, as well as lessons learned during implementation. There will also be the opportunity for attendees to ask questions and discuss any similar issues and experiences they may have faced in their own implementation journeys.

Wider objectives of this webinar and the Focus Group on AI-based Imaging for TB are:

- To facilitate south-south learning on early experiences and exchange lessons learned on CAD AI and X-ray implementation.
- For Stop TB, USAID, IDDS and manufacturers to understand challenges in planning and implementation and identify solutions.

BACKGROUND

To meet global demand for support in rolling out AI/CAD and digital X-ray, Stop TB launched the

Focus Group on AI-based Imaging for TB (FG-AITB), the first global platform that brings together implementers of CAD AI and X-ray.

This is the 5th webinar of a series of webinars hosted by the FG-AITB to share results, challenges faced, and lessons learned from implementers of CAD AI and X-ray from global country projects and beyond. Implementers will present their experiences in the webinar in the following thematic areas:

- Screening Algorithm involving CAD AI and X-ray
- Customs clearance & local radiation authority approval
- Digital X-ray image quality
- Product cost
- Experience with the selected X-ray and CAD AI vendor
- Threshold score setting
- Linkage to confirmation test and treatment
- X-ray CAD AI data storage and backup
- Interoperability with other health information system
- Data privacy and security measures
- Quality control
- Success Stories
- Scaling up
- Challenges
- Other lessons learned

Webinar 7 will focus on the projects in Vietnam implemented by FHI 360 & FIT

AGENDA (1.5 HOUR)

Facilitators: Zhi Zhen Qin (Digital Health Specialist, Stop TB Partnership)	**Time *(CEST)***
Welcome Remarks (TBC) Asso. Prof. Nguyen Binh Hoa, MD, PhD. Vice - Director of National Lung Hospital, Vice - Manager of Vietnam National Tuberculosis Programme, Vice - Director of Vietnam Integrated Center for TB and Respirology, Research - VICTORY, Vice - Director - Vietnam Global Fund TB Project. Dr. Hoa Binh Nguyen has been co-PIs of multiple research projects in TB. He was involved in the implemented; analysis and writing the report of the first TB prevalence in Vietnam 2006-2007. He's also being a coordinator of the second TB prevalence survey in Viet Nam 2017. Dr. Lopa Basu, HIV and TB Technical Advisor, USAID Vietnam. A public health specialist, she holds a joint appointment in health policy and management at the Johns Hopkins Bloomberg School of Public Health. Dr. Basu is also a hospitalist with Johns Hopkins Community Physicians at Howard County General Hospital. Dr. Basu earned her	9:00 am - 9:10 am *10 mins*

M.B.A. from Saint Joseph's University. She received her D.O. from the Philadelphia College of Osteopathic Medicine and completed her residency at Medstar Union Memorial Hospital. She also earned an M.P.H. from the Johns Hopkins Bloomberg School of Public Health.	
Experience sharing from the project in Vietnam Anh Innes MD, Senior Technical Advisor, Tuberculosis, FHI 360: **USAID Support to End TB in Vietnam** Andrew Codin, M&E Director, FIT: **Experiences with CAD-assisted TB screening using ultraportable X-ray devices in Vietnam**	9:10 - 9:55 am *45 mins*
Q&A	9:55 - 10:25 am *30 mins*
Closing remarks	10:25 - 10:30 am *5 mins*

INVITED PARTICIPANTS

- National TB Programmes, USAID country missions,
- Implementers of digital X-ray with / without AI (iNTP, GF, LON etc)
- Delft Imaging Systems, Fujifilm, Qure.ai and other developers in the X-ray CAD AI space
- Stop TB, USAID Washington and IDDS

Q/A Session

Q1. Gunta Dravniece (TB People Ukraine) to Anh: What was the purpose of stage 1 - retrospective analysis?
A1. Anh answered in chat: We did retrospective analysis mainly because the procurement followed our first ACF campaign (data privacy discussions with NTP). So it was largely a function of time, but the retrospective analysis was quite helpful nonetheless, since it was also used to compare against the central radiology reference standard.

Q1.1. Gunta Dravniece (TB People Ukraine) to Anh: Are some of your materials - SOPs, questionnaire, algorithms, training materials available for other partners? How and why did you select qure.ai?
A1.1. Anh answered in chat: We're happy to share our experience, so far we haven't shared our materials with others, but we can be in touch. For selection of Qure.ai, it was a combination of qXR performance to date (procurement was in 2020), being in the Asia geographic code as per USG regulations (we are funded by USAID Vietnam, thus our vendors need to be within Asia). I would have considered CAD4TB but Delft is outside of our geocode so it was not an option for us.

Q2. Brenda Mungai (Kenya) to Anh: Great work. Are there below the threshold score that got sputum due to symptoms/clinician identified? If so, were there positives and what were the scores?
A2. Anh answered in chat: We do have a small number (%) of normal CXR with xpert test---primarily done for symptoms and yes, there are Xpert positive specimens. I need to look at the data to get the score for these normal/not TB CXRs. We're also in the process of looking in more detail at CXR abnormalities (not just the score); some CXR abnormalities result in higher qXR scores (CXR opacity, consolidation, cavity, fibrosis, nodule).

Q3. Brenda Mungai (Kenya) to Anh: One of the additional benefits of qXr is highlighting of the other non TB abnormalities, were you able to also compare this? And probably help in programmatic validation?
A3. Anh answered in chat: Yes, agree, there are 10 CXR abnormalities all of which can result in different qXR results. In our data, the abnormalities that have weaker association with Xpert positive sputum are pleural effusion, cardiomegaly, pneumothorax, hilar lymphadenopathy. The abnormalities that have stronger association with Xpert positivity are listed in A2, above. We're in the process of looking more at these CXR abnormalities especially in the elderly, who have abnormal CXR (high qXR scores) but lower Xpert positivity rates than younger age. I am wondering if this is minimal disease/early disease. You may also be asking about qXR for lung cancer---we have not started this yet but I do know they have that software package.

Q4. **Abiot Banti to Anh:** Thank you Anh for the nice presentation. Can you tell us Who were involved in ACF activity (HCWs and supporting staff)?
A4. Anh answered in chat: ACF activity---we work closely with all levels of the TB system, provincial/district/commune and also village health volunteers, community volunteers. The campaigns are a lot of work! And require the whole TB system to ensure implementation. The commune and village level staff are the ones who do home visits prior to the campaign to inform household contacts about the upcoming campaign.

Q5. Mary Rosary Santiago to Anh: Thank you very much Dr. Anh. Great presentation! May I inquire how did the team secured buy-in from radiologist esp. with the parallel implementation?
A5. Anh's answer: We actually found that in the first year of real-time CAD implementation (2021), the radiologists preferred the CAD parallel model, and in some provinces (e.g., Tien Giang) the radiologists did not appear to use the AI result in their triage decision. The NTP then met with the provinces and showed them the results, particularly the lower Xpert positivity rate from the 2021 campaign, and those results combined with the NTP recommendation resulted in the change in 2022, when we used the CAD first model. The radiologists actually seem to like using the AI software—we have heard/seen that they learn from the AI reading, which will hopefully improve interpretation skills over time.

Q6. TB People Ukraine to Anh: Could you, please, retell about protection for people who work with X-ray?

A6: Anh's answer: the radiology technicians and radiologists are protected by closing the door/moving behind a lead partition when the CXR is taken—this is done either in the mobile van or the radiology suite.

Q7.Masini E (STBP) to both: One of the challenges I have seen with active case finding interventions is a low sputum collection rate among clients with abnormal CXR sometimes leading to high clinical diagnosis. Have you experienced this? And how have you addressed it?
A7. Anh answered in chat: We've had very high sputum collection rates in our ACF campaigns. We try to do everything in "one setting" all during the campaign, so perhaps that helps to ensure a high rate of sputum collection. In facilities we sometimes have challenges with certain patient types (e.g., diabetics) who are unable to produce a sputum specimen. We don't do sputum induction even though it's part of the TB guideline (but not done for the most part), so it's down to coaching on expectation.

Q8.Jacob Creswell (STBP) to Andrew: If the pre-set thresholds seems to be not missing anyone - do you have any data that suggest they could be increased?
A8. Anh answered in chat: I agree, I think the threshold could be higher--qXR has a clear bimodal distribution for scores by Xpert result, and a wide range of scores for which sensitivity and PPV don't appear to change much---I believe this is seen in research studies but also we see this in our "pseudo" ROC results. In our implementation, the specificity appears to vary more with changes in the qXR score, so one could then hypothesize that a higher score is better (not much loss in sensitivity, with higher specificity), especially as NTP considers/plans for scale-up.

Q9. Gunta Dravniece (Ukraine) to Andrew: Andrew, did you have any complaints that radiation exposure is higher from portable X-rays? Did you measure, compare?
A9. Answered live

Q10. Brenda Mungai (Kenya) to Andrew: very interesting to see the operational set up. Do you have any data of the radiation assessment? Eg scatter radiation values?
A10. Luan Vo (FIT) answered in chat: To assess safety, we commissioned a radiologic inspection of the X-ray generator by the Institute for Nuclear Science and Technology (INST) within the Viet Nam Atomic Energy Institute under the Ministry of Science and Technology. The assessment included 14 core parameters. The assessment concluded that the generator performed well within nationally permitted tolerances on all measured indicators such as peak voltage, exposure time, tube current, output dose, etc. Based on these emissions, the leakage dose at SIDs of 1 m and 2 m is reported to be between 0.0073–0.0136 microSv and 0.0028–0.0055 microSv at 90 KVp and 2.5 mAs, respectively.

Q11.Gunta Dravniece (Ukraine) to Andrew: Andrew, how did you invite those people in remote areas for screening? Who helped you? Family doctors? Local authorities? How many people per day/site visit did you screen?
A11. Luan Vo (FIT) answered in chat: We work closely with the provincial lung hospital as well as district and commune People's Committees (municipal governments) and local civil

society like the women's union and Elderly person's association to send out invitations to key demographics (>55 years). We also host a consensus building meeting with neighborhood and civil society leaders to ask them to mobilize participants. Lastly, we invite all current and former TB patients to bring their contacts into these events.

Q12. Eze Chukwu (KNCV Nigeria) to Andrew: Great presentation Andrew, I like to know if you have collected sputum from clients that are below the set threshold for CAD, what was the criteria for collecting sputum from such clients?
A12. Luan Vo (FIT) answered in chat: We collect sputum for all persons that the radiologist interprets as abnormal, which include CAD scores below the threshold. We have yet to formally analyze the impact on additional persons with TB detected, but we do have a small subset of this scenario.

Q13. H Linh (FHI 360) to Andrew: Do you upload the CAD results onto the ACIS system? Is the merging of ACIS-CAD data done by the ACIS system, or by other software FIT staff? Also, can you share the approx. number of CXRs and how do you manage the DCMs files. Thanks so much!
A13. Answered live by Andrew

Q14. Ольга Цвігуненко (Ружицька): How do you inform people about date and place of examination? Which channels do you use?
A14:

Q15. Kgurung to Andrew: How/when was sputum collected for those whose CXR was noted abnormal and follow up for those abnormal cases after the first screening?
A15. Luan Vo (FIT) answered in chat: The post-event follow-up for sputum collection usually takes 1-2 weeks, and linkage to care takes 1-4 weeks after the completion of the event depending on the ability to collect sputum and complete the clinical diagnostic algorithm as per national guidelines.

Q16. Eze Chukwu (KNCV Nigeria) to Andrew: Do the radiologists have to read all the images? or the images that meet the threshold?
A16. Anh answered in chat: CAD 1st model means the radiologist only reads the TB presumptive CXR (at/above the threshold). This in theory saves work for the radiologist. The CAD parallel model means the radiologist reads all the CXR in parallel with the software**. Luan Vo (FIT) answered in chat as well:** To date, the radiologist reads all images, but we will explore the normal-image triage use case in the future.

Q17. Gunta Dravniece (Ukraine) to Andrew: What (access to X-ray picture storage and/or X-ray description) and how did you share with family doctors and TB doctors serving the site, village, region?
A17. Answered by Jacob Creswell in chat: qXR now has offline and cloud sync - we are using it in Nigeria - works well

Q18. H Linh (FHI 360) to Andrew: What is the detection rate among 40,00CXRs screened in the vaccination model?
A18. Answered by Andrew in session: Detection rate was 470 per hundred thousand. Incidence is 170 in VN.

Q19. Eze Chukwu (KNCV Nigeria) to Andrew: How do you convince clients without symptoms who are positive for TB diagnosis to accept treatment?
A19. Answered live by Andrew

Q20. TB People Ukraine to Andrew: How do you choose locations for campaigns?
A20. Luan Vo (FIT): We work closely with the provincial lung hospital as well as district and commune People's Committees (municipal governments) and local civil society like the women's union and Elderly person's association to send out invitations to key demographics (>55 years). We also host a consensus building meeting with neighborhood and civil society leaders to ask them to mobilize participants. Lastly, we invite all current and former TB patients to bring their contacts into these events.

Q21. Gunta Dravniece (Ukraine) to Andrew: What about pediatric TB, for example i/th lymphnode TB? Any experience? Any experience also with CT scan analysis/interpretation?
A21. Answered live by Anh and Andrew: qXR software it not yet validated for use in people less than 6 years old, so we have not been able to use it—I assume you are referring to hilar lymphadenopathy as we normally don't use radiology imaging for other types of lymph node TB. We do have CT scans that are done for pediatric cases, but not using CAD AI.

Q22. Eze Chukwu (KNCV Nigeria) to Andrew: Have you had a scenario where both Radiologist and CAD reports a client as normal but the individual is symptomatic for TB, what do you do?
A22. Answered live by Andrew - a client with both CAD and radiologist normal is not tested. However in other projects including Anh's, a client with symptoms and 'double normal' will still be tested. **Anh's answer**: I need to go back to those who were tested below the threshold to see whether they were all "double normal", because I'm not certain on that point. Since we are not testing below the threshold systematically, the triage using symptoms (not CXR) is site dependent, and most of the cases came from one province with very high TB prevalence. The NTP wants to allow for clinical decisions "in the field", and I agree it's important to give people the option to triage for Xpert testing based on symptoms and/or risk factors. Of note, this is happening less frequently now that we've used CAD AI in real-time for 2 years, so the number (%) of testing below the threshold is lower in 2022 compared to 2020.

FEEDBACK FORM