VIRTUAL INNOVATION SPOTLIGHT

AI FOR SCREENING, CONTACT TRACING & TRIAGING FOR TB & COVID-19
QURE.AI
APRIL 8, 2020
3:00-4:00 PM (CEST)

QUESTIONS & ANSWERS SUMMARY

A. Technical

1. Which algorithm is applied for qXR for TB and COVID-19?

qXR leverages deep learning techniques to identify clinically relevant abnormal findings to aid in detection and diagnosis of diseases auch as Tuberculosis, COVID-19, Other viral and bacterial pneumonia, COPD etc.. qXR TB, identifies signs of pulmonary Tuberculosis as well as extra pulmonary tuberculosis from the X-rays and is optimised for Bacteriological confirmatory results and hence can be used as a screening tool with high sensitivity and specificity. qXR COVID detects radiological manifestations such as ground glass opacities, bilateral consolidations and factor in contra indications to accurately predict likelihood of disease. The software also estimates the percentage of lung affected predicting the severity of disease, therefore enabling it to be used for triaging and disease progression monitoring.

2. How does accuracy differ across the different types of x-rays?

The qXR platform is trained with over 3 million X-rays from over 20 different machine models. The software can also read digital as well as analog X-ray films. In the validations done so far, the accuracy as well as the ability to generalize to previously unseen chest X-rays has not been compromised. qXR can process PA/ AP views of the chest and patient positions that are erect or supine.

3. Is there any correlation of asymptomatic COVID-19 contact or high risk group, PCR test positivity and AI reading by CXR?

qXR is been used for screening and in institutional quarantine facilities for triaging and decisions of swabbing an individual based on the radiological manifestations and prediction of likelihood of disease by the software. There has been a high yield of over 78% that has been observed while used in triaging setting.

Further, qXR COVID is used for mass screening of asymptomatic individuals activity devised in containment zone and future hotspots in Mumbai, India and has empowered the healthcare systems for better patient management by identifying individuals that need to be institutionally quarantined or managed at home.

We have ongoing evaluations in different countries on specific aspects of the qXR COVID-19 capabilities

4. What about the correlation with CT scan which is used when available for COVID-19?

Currently, there has not been any study conducted comparing qXR's results with CT scan for detection COVID-19.

5. Any co-morbidity findings with COVID-19 and TB suggestive from the CXR either in low or high TB prevalent countries?

qXR TB and COVID are used currently in few high TB prevalent countries for screening activities currently and we have observed co-occurrence of TB and COVID 19. We will furnish more details on this when we have in-depth analysis of the data.

6. Are you also planning to build in dosage tracking for TB patients, given that adherence is a common issue?

qXR TB can be used for disease progression monitoring from chest X-rays. Used in conjunction with drug information, the tool can be used for TB drug efficacy. Our partners at SureAdhere and Everwell can consume this information in their software for treatment adherence by V-DOTS and Patient management.

7. Have you compared how AI works for fixed vs. mobile x-rays and, for example, with or without a grid?

qXR platform is vendor agnostic and works well equally on fixed and portable X-ray machines without compromising on accuracy. The training data consists of more than 20 commonly used machine models that contains X-rays taken with or without grids/ fixed or portable. We currently do not have peer reviewed publications on the performance of fixed vs portable chest X-rays but our internal validation results on a heterogenous test set have demonstrated that there is no drop in performance of qXR in detecting critical findings.

8. How do you see the role of CXRs for TB diagnosis/triaging evolving given that we are moving more and more into PoC that have really reached a 5-10 min even for RT-PCR?

In active/intensive case finding setting, large proportion of individuals are either symptomatic or with risk factors. Specifically in high TB burden countries, large proportion of cases are asymptomatic. Point of Care RT PCR tests for all the symptomatic and at-risk population would be high cost burden to the country. Chest X-rays being effective, easy to use and an affordable modality ($3 vs $12.5 and above for RT PCR), can be used for mass screening in the high risk countries and pockets to screen the individuals who can undergo the RT PCR test, for effective cost optimisation of countries and their programs.

Further, chest X-rays can be used as a surveillance tool to immediately alert individuals visiting the hospitals with other ailments, when there are signs of Tuberculosis. This further enables increase in case notification of individuals who would have been otherwise missed in the healthcare system, thus identifying the missing millions.

9. How did you go about collecting the data, including apicolordotic readings?

Qure.ai has a network of global collaborators and partners that provide data that feeds into the training of the algorithms. The training set for the chest X-ray data includes PA/AP views from fixed and portable X-ray machines contributing erect and supine positions. We currently do not train algorithms on lateral or apicolordotic chest X-rays, but will be incorporating some of these to help localize lesions or overcome bony overlaps in lung apices in our Product Roadmap.

10. In the training phase of qXR model, how much NLP was useful? Where there any challenges in parsing reports?

At Qure.ai our NLP capabilities have surpassed State of the Art results in peer review literature on published datasets. This has helped us accurately parse Radiology reports, to identify and label images with the corresponding reports. Due to the diversity of our dataset, we've overcome multiple nuances in reporting styles in every region and made our NLP algorithms robust.

11. Approximately how many days of COVID-19 symptoms can qXR be "sensitive" to advise for RT-PCR testing?

qXR COVID is sensitive in reading even subtle signs of infection, from the day indications are developed in a chest X-ray, which typically is about 3-4 days after infection. However, there are also individuals who are COVID-19 infected with their lungs unaffected during the infection period.

B. Scale-up & implementation

1. What plans are in place to validate the COVID-19 CXR algorithm?

We have few validation studies in the pipeline for use of qXR COVID for triaging of symptomatic and contacts and mass screening in high risk pockets; as well as disease progression monitoring of software vs human reader. We are open to conversations for both independent and joint validations of software.

At the moment, please find our blog on the development of the algorithm and internal validation results of the software here: http://blog.qure.ai/notes/chest-xray-AI-qxr-for-covid-19

2. Where in Mexico are these products being used?

The complete qXR platform including COVID is being used in one of the largest hospital chains in Mexico which has a testing center for COVID-19 and hospitalisation facility.

3. What support systems have you put in place for service and maintenance of these systems particularly in sub-Saharan Africa settings?

Qure softwares can be fully set up, monitored and maintained remotely. We have a team of engineers and automated technical functionalities in place for automatic monitoring and alerting of client activities and will be available for troubleshooting and maintenance. For large project implementations, we will have local support technicians.

4. How much does Qure.ai's algorithm depend on chest x-ray quality, including operator technique, given that there is also a shortage of trained x-ray technicians?

qXR can read X-rays that are optimal quality for human readers. To a great extent qXR can also report on sub-optimal chest X-rays. We have a separate set of algorithms that look at this QC aspect of the images, testing for adequate inspiration, exposure, patient rotations or clipped anatomy.

5. Is there any device where health worker can take x-ray in out reach areas other than mobile vans and huge x-ray machines

There are portable X-ray machines that can be carried in the remote areas for outreach activities. There are hand-held X-ray machines that can be used for door to door X-ray screening by health

workers. qXR works very well across portable, handheld, mobile van based X-rays as well as fixed X-ray units in facilities.

6. Is there interconnectivity with DHIS2?

The technical capability exists, and qXR is currently being integrated with other ICT platforms used in many countries. We can certainly explore the possibility of integration with DHIS2 if there is an opportunity and our engineers will work on integration, and testing of compatibility.

C. Cost & pricing

1. What is the cost of qXR initial purchase per unit and what are the operational costs per machine per year?

qXR pricing is dependent predominantly on the value and impact of the program, the volume and duration of the project. If there is an opportunity or interest, we 'll be happy to discuss the costing- kindly get it touch with us.

2. What would the cost of the AI powered van with tablet x-ray set?

The pricing will depend on the type of X-ray machine you would choose inside the van, the number of vans and duration of project. We'll be happy to provide an indicative budget- kindly get in touch with us.