Technical Systematic Review Protocol

# Introduction

## Rationale

ABC is a medical imaging company that has hired us as consultants to identify and benchmark a variety of AI products, it is known that qXR is a certified AI tuberculosis detection product, it has many competitors that similarly detect TB and have a certification, we therefore want to ascertain the most superior out of these products taking into account their accuracy, sensitivity and specificity.

## Objectives

The aim of this systematic review is to benchmark all the certified AI products with qXR for detecting TB. To this end, the proposed systematic review should be able to answer the following questions:

1. Which AI product has the most accurate diagnosis in detecting TB?
2. Which AI product has the most safe method in detecting TB?
3. Which AI product has the most efficient way in detecting TB?
4. Which AI product is the best in terms of accuracy, sensitivity and specificity?

# Methods

## Eligibility criteria

Study characteristics:

Our participant is qXR, the comparator is other AI products, and the outcome is qXR is the most suitable AI product for our use.

Our comparative study includes the accuracy and UX of different AI products. This ensures that our users find the most suitable and least difficult product to use.

Our study will last 12 weeks. 1-2 weeks to complete the group formation, 3-4 weeks to identify the current article, 5-6 weeks to complete the article screening and prepare for the first deployment, 7-8 weeks for the task allocation of the final report, and learn related techniques and tools, The final report will be completed in 9-10 weeks, and the beautification and improvement of the final report will be carried out in 11-12 weeks

Report characteristics:

The publication date of the report is expected to be December 2022, and the article will be published in English.

1. The selected articles will be in English
2. The selected articles will have the relevant data that is required as explained in the data items section
3. The participants in each study should exceed 120 so as to mitigate biases in the sample size
4. The articles with relevant data should be primary sources
5. Articles must be publicly available

## Information sources

We will use a variety of information sources in gathering articles for our research, these are all trusted sources and include:

* PubMed
* ProQuest
* Client-provided

## Search strategy

We will be acquiring quantitative data from these sources, we will not limit these by study design, date or geographical area, however, we will limit to exclusively English written studies. We will be using various search queries over the aforementioned databases and these are listed below:

* qXR AND CAD4TB comparison
* qXR AND RADIFY comparison
* qXR AND InferRead DR Chest comparison
* qXR AND JLD-02K comparison
* qXR AND INSIGHT CXR comparison
* qXR AND ChestEye comparison
* qXR AND AXIR comparison
* qXR AND VUNO comparison

## Study records

### Data management

All the search results will be recorded in an Excel file and we will extract all the related data to the Excel file including DTA, sensitivity, specificity and possibly AUC. Based on these data, we’ll do the comparison between each certified product with qXR. We’ll also use R to perform the meta-analysis on these data.

### Selection process

Technique: Prsima

In the beginning, the group advisor suggested qXR as the main object of investigation, so we selected some other AI products as comparison objects. Then everyone uses the search query in various databases to extensively search for relevant articles and then reads the keywords, abstracts and results of each article to further filter. Finally, the remaining articles were read in full text to ensure that the articles we selected were in line with our research direction.

### Data collection process

After we have selected the articles that will be reviewed we must gather the relevant data, this is a simple process that will be outlined below:

1. Read through the article and locate the table that summarises performance and gather key data from this.
2. Gather information on the authors and year of study
3. Any additional data needed is gathered by reading the rest of the paper

## Data items

The data we will gather includes:

* Area under curve
* Sensitivity
* Specificity
* Accuracy score when given
* Country where research was undertaken
* Year
* Sample size
* Authors

## Outcomes and prioritisation

The main outcome for our systematic review is to identify DTA studies of each certified AI product compared with qXR and have a deep-analysis using meta-analysis method as a benchmarking method to compare each AI product’s DTA against qXR. Specifically, get the detailed comparison of some measurement metrics including accuracy, sensitivity, specificity and AUC.

## Risk of bias in individual studies

The risks we face can be divided into two categories：

We relied too much on a single comparison article (because there were few relevant articles, so each article was heavily weighted), and these articles did not clearly indicate which version of qXR they were using, leading to inconsistent conclusions.

The author of some articles is an employee of the AI product company, which may lead to artificial bias.

For risk 1, we adopted the internal comparison results of each article, but we did not use quantitative data. (This means that data such as accuracy will not be compared across different articles)

For risk 2, we did not adopt those AI products.

## Data synthesis

Quantitative synthesis is the most applicable summary for the requirements of this review, this process will be completed quite easily as the required data is already in a quantitative capacity in their findings section. The data we gather will be combined in a table of study characteristics which will allow for a simple comparison that will assist in identifying potential biases of research should results be inconsistent, further, any additional information we require can be gathered from reading the articles. No additional analyses will be required. Our primary analysis of this research will be in the form of a meta-analysis, the method through which this will be conducted is summarised on the side, this was informed by an article on conducting meta-analysis (Mikolajewicz & Komarova, 2019). The first step allows us to define our key objectives and further understand the question we must answer. The next step is being covered in this systematic review and will be completed upon screening the information. Thirdly, we will extract the key information as outlined in the study records section of this proposal, this will further allow us to evaluate the studies and the next step allows us to perform any relevant data transformations and define the outcome of our analysis. The fifth step will involve the aforementioned table and the sixth step involves further analysis of our data. The final step in this process will allow us to interpret our findings which we intend to visually display and compare, this will also involve our final recommendations for the chosen product and justification.

## Meta-bias(es)

We plan to address meta-bias by ensuring that all gathered articles are from trusted sources and seem well reviewed, further, any articles directly published from the product owner must be excluded thereby eliminating their potential biases.

## Confidence in cumulative evidence

The main measure to assess the strength of the evidence we acquire will be an assessment of bias, we will ensure any comparison is not overly biassed to one product over another this will be most effective by parsing out studies published by the company that has released the product. We will assess the quality of this research as high or low in the interest of speed in this project.

**References**

Mikolajewicz, N., & Komarova, S. V. (2019, February 15). *Meta-Analytic Methodology for Basic Research: A Practical Guide*. Frontiers. Retrieved September 27, 2022, from https://www.frontiersin.org/articles/10.3389/fphys.2019.00203/full