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Implementation of an AI tool in x-ray reading. Is it beneficial?

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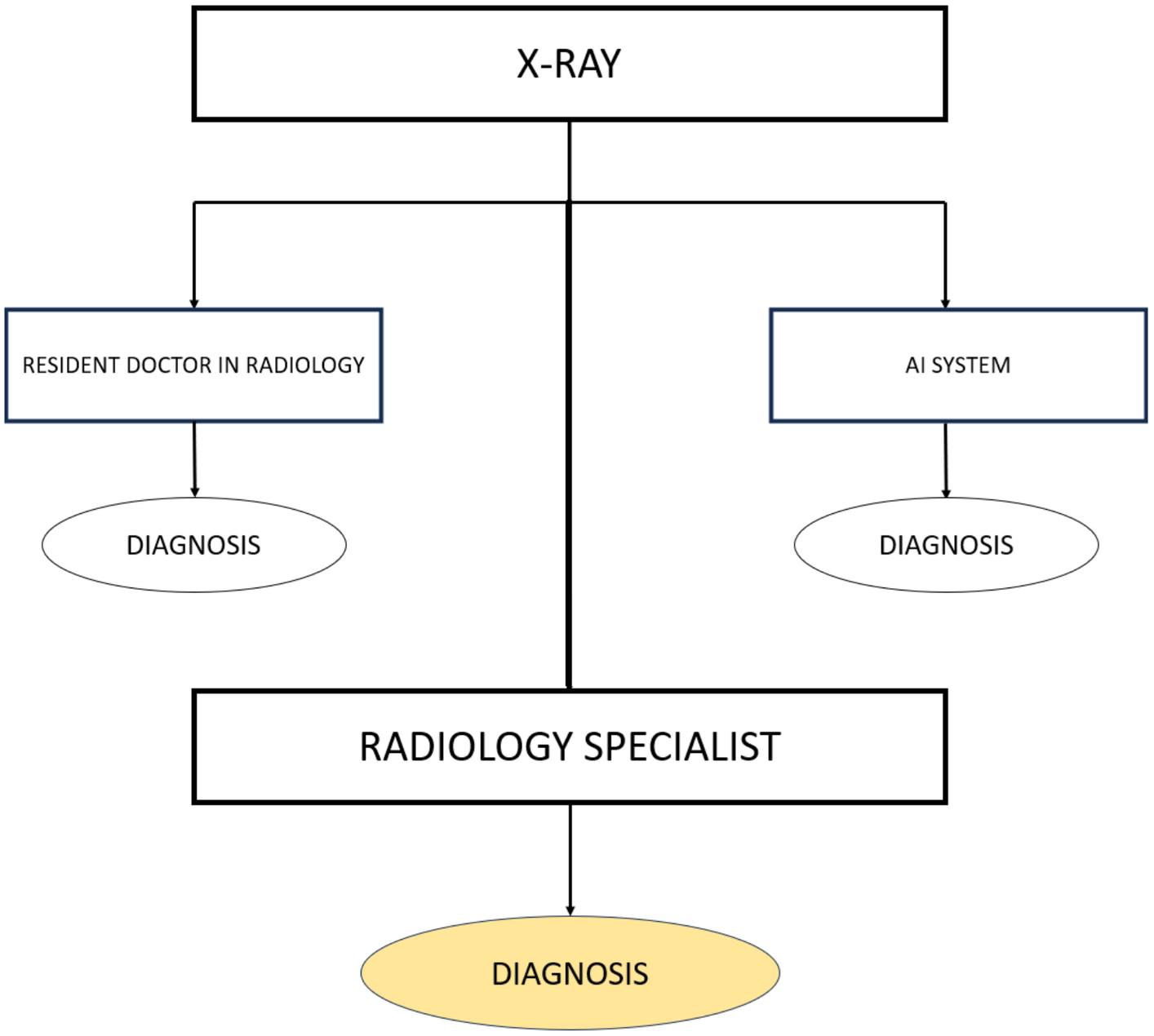
1. Background-Aim

The use of Artificial Intelligence (AI) as a diagnostic tool in radiology is a controversial subject the last years and the recent advances made in AI technology raises the question whether AI based diagnostic aid can play a real part in medicine. We decided to evaluate an AI diagnostic tool for chest x-rays (CXRs) and bone x-rays (BXRs) provided to our hospital both quantitively and qualitatively.

2. Materials & Methods

We asked a resident trained for 2 months in x-rays to interpret 200 CXRs and 100 BXRs for the detection of abnormalities, and particularly pneumothorax, alveolar syndrome, pleural effusion, mediastinal mass and lung nodule, regarding CXRs, and bone fracture and dislocation, regarding BXRs. Concurrently, the AI system interpreted the same CXRs and BXRs for the same abnormalities and provided us with a diagnosis. In the end we compared the results to the diagnosis of a radiology specialist, who we used as the ground truth.

2. Materials & Methods



3. Results

The resident had higher sensitivity, specificity, accuracy, positive predictive value and negative predictive value compared to the AI in all 5 abnormalities for CXRs, with the largest discrepancy being in the detection of lung nodules (resident sensitivity 88.46% vs AI sensitivity 58.62%) and alveolar syndrome (resident sensitivity 90.48% vs AI sensitivity 52.27%), and with the AI having comparable results with the resident in detecting pneumothorax. As for BXRs, the AI system had comparable results to the resident in every finding.

In terms of quality, although the AI had high negative predictive value in all 5 abnormalities (range 87.57%-100%), we observed that in some cases the AI missed large masses or multiple nodules that could represent malignancies or even metastatic disease. Another tendency we observed was that the AI had more false positive results in cases that it detected a true positive abnormality, compared to normal CXRs. Regarding BXRs, no quantitative difference was observed between the resident and the AI system.

4. Conclusions

The AI diagnostic tool used cannot adequately aid in the diagnosis of chest abnormalities, however this system could improve the diagnostic ability of a new radiology resident and could be used as an educational tool.