

Improving the Accuracy of Frontline Clinicians in Detecting COVID-19 on Chest X-Rays Using a Bespoke Virtual Training Platform

Anita Acharya¹, Sarim Ather¹, Jasdeep Bahra¹, Rachel Benamore¹, Julie-Ann Moreland¹, Divyansh Gulati², Lee How², Annie Rose², Mirantheni Huwae³, Sarah Wilson³, Abhishek Banerji⁴, Katerina Manso⁴, Liza Keating⁵, Amy Barrett⁵, Fergus Gleeson¹ & Alex Novak¹.

Oxford University Hospitals NHS Foundation Trust

¹John Radcliffe Hospital, Oxford University Hospitals (OUH) NHS Foundation Trust, Oxford, UK; ²Milton Keynes University Hospital, Milton Keynes University Hospital NHS Foundation Trust, Milton Keynes, UK; ³Wexham Park Hospital, Frimley Health NHS Foundation Trust, Slough, UK; ⁴Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust, Aylesbury, UK; ⁵Royal Berkshire Hospital, Royal Berkshire NHS Foundation Trust, Reading, UK.

Introduction

The incidence of coronavirus disease 2019 (COVID-19) continues to rise rapidly in many regions and the number of COVID-19-like UK Emergency Department (ED) attendances is increasing.^{1,2} Distinguishing COVID-19 from other respiratory illnesses can be challenging for professionals working on the frontline. Chest X-rays (CXRs) are commonly used in acute care settings and the recognition of COVID-19 on chest X-rays is a key diagnostic skill in the ED. Report and Image Quality Control (RAIQC) is an online simulation platform for medical imaging that enables healthcare workers to enhance their chest X-ray reporting skills.³ We hypothesised that simulation training would improve the accuracy of frontline clinicians in interpreting CXRs in suspected cases of COVID-19.

Methods

This was a multicentre study supported by the Thames Valley Emergency Medicine Research Network (TAVERN). 118 clinicians working in Emergency Departments across five large regional hospitals were recruited over a six-month period. Recruits completed online training assessments in COVID-19 chest X-ray interpretation and were assessed on their CXR interpretation accuracy before and after training. The training provided users with access to 90 images across the 3 components that included classic/probable COVID-19 cases, indeterminate cases and non-COVID-19 cases (e.g. pleural effusion, pneumothorax, pulmonary oedema). Permission to use anonymised patient imaging for this study was granted by the OUH Caldicott Guardian.

Figure 1A: Accuracy of CXR Reporting

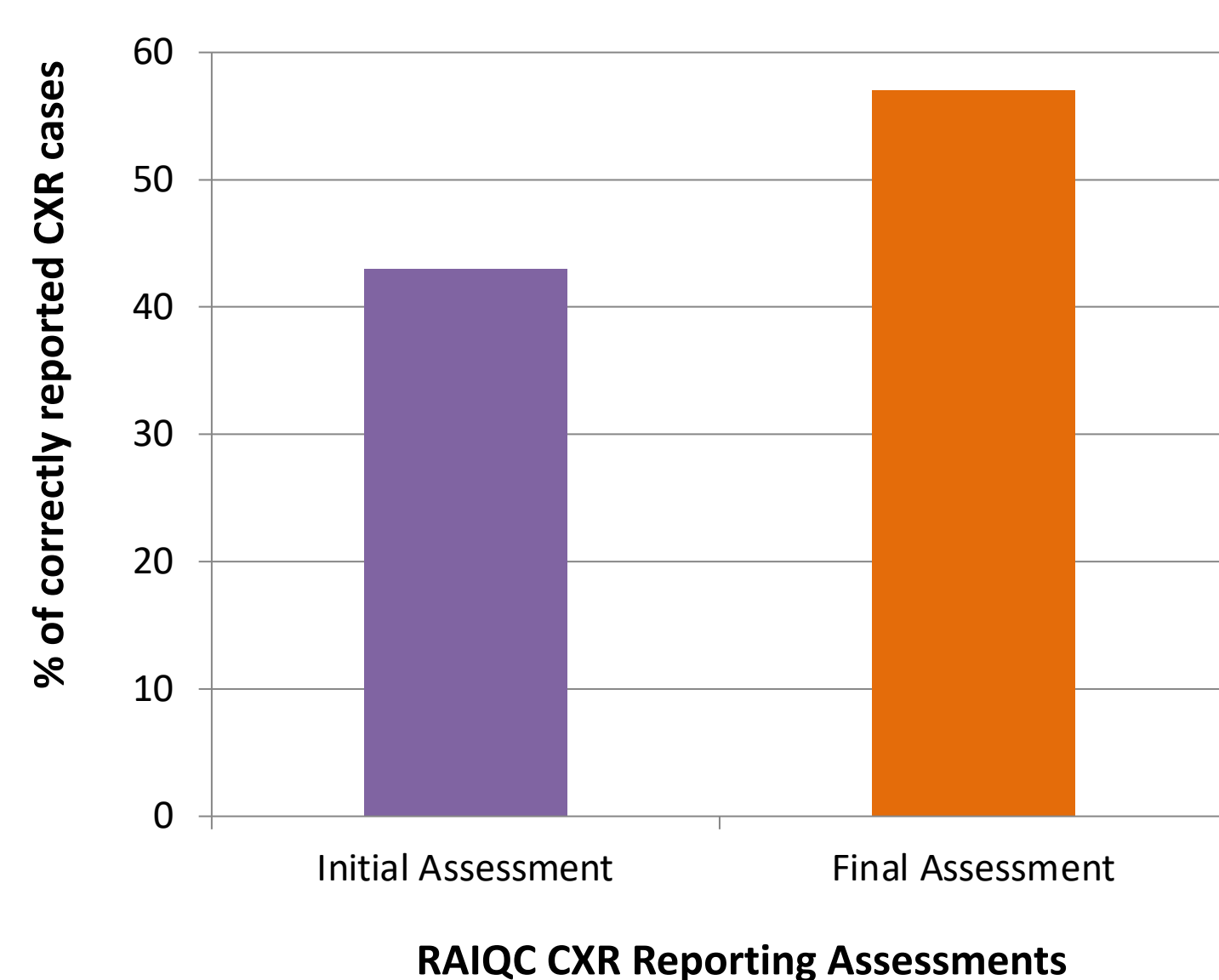


Figure 1B: Accuracy of CXR Reporting (subgroups)

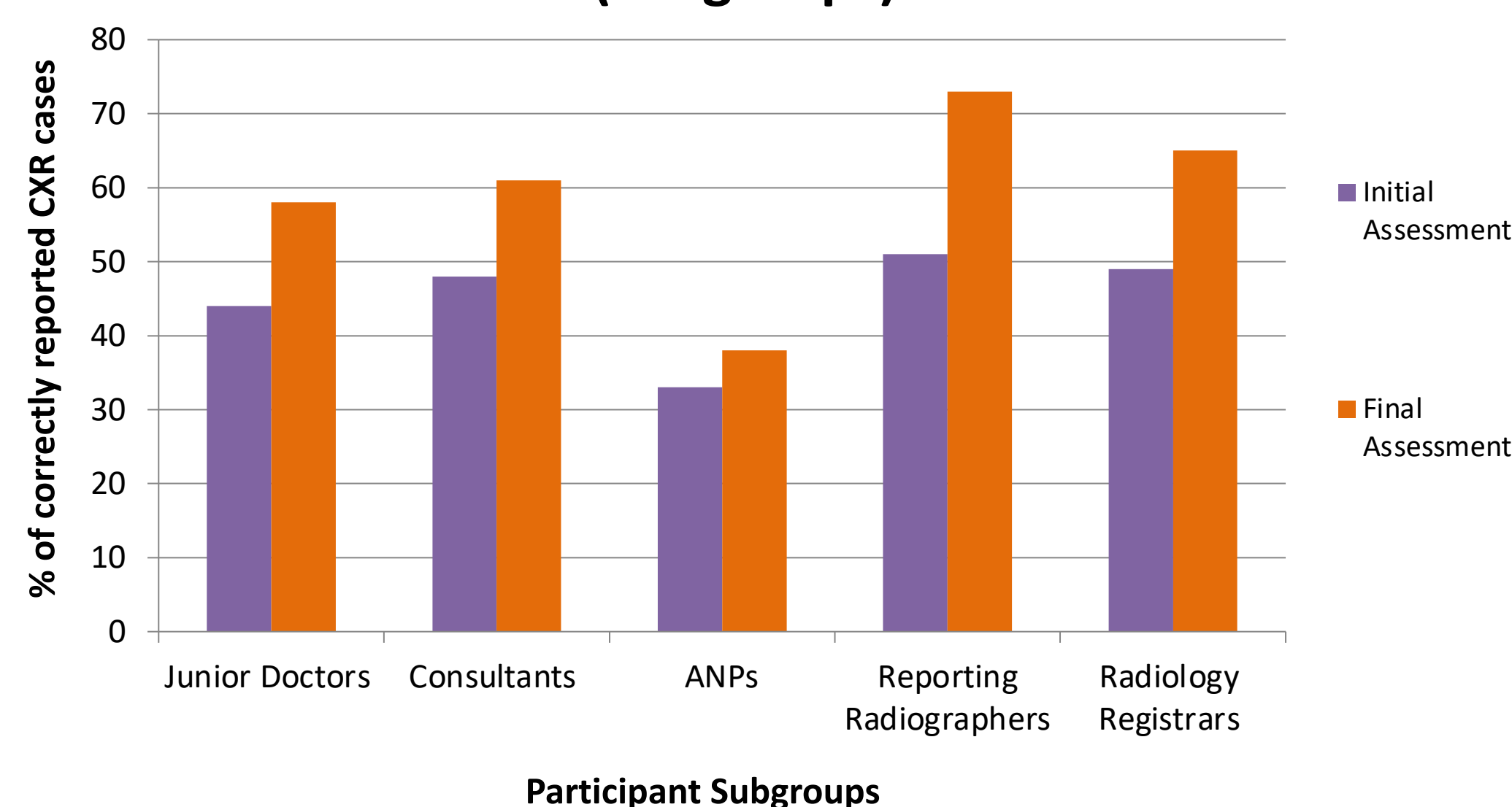


Figure 1C: Accuracy of Classic/Probable COVID-19 CXR Reporting

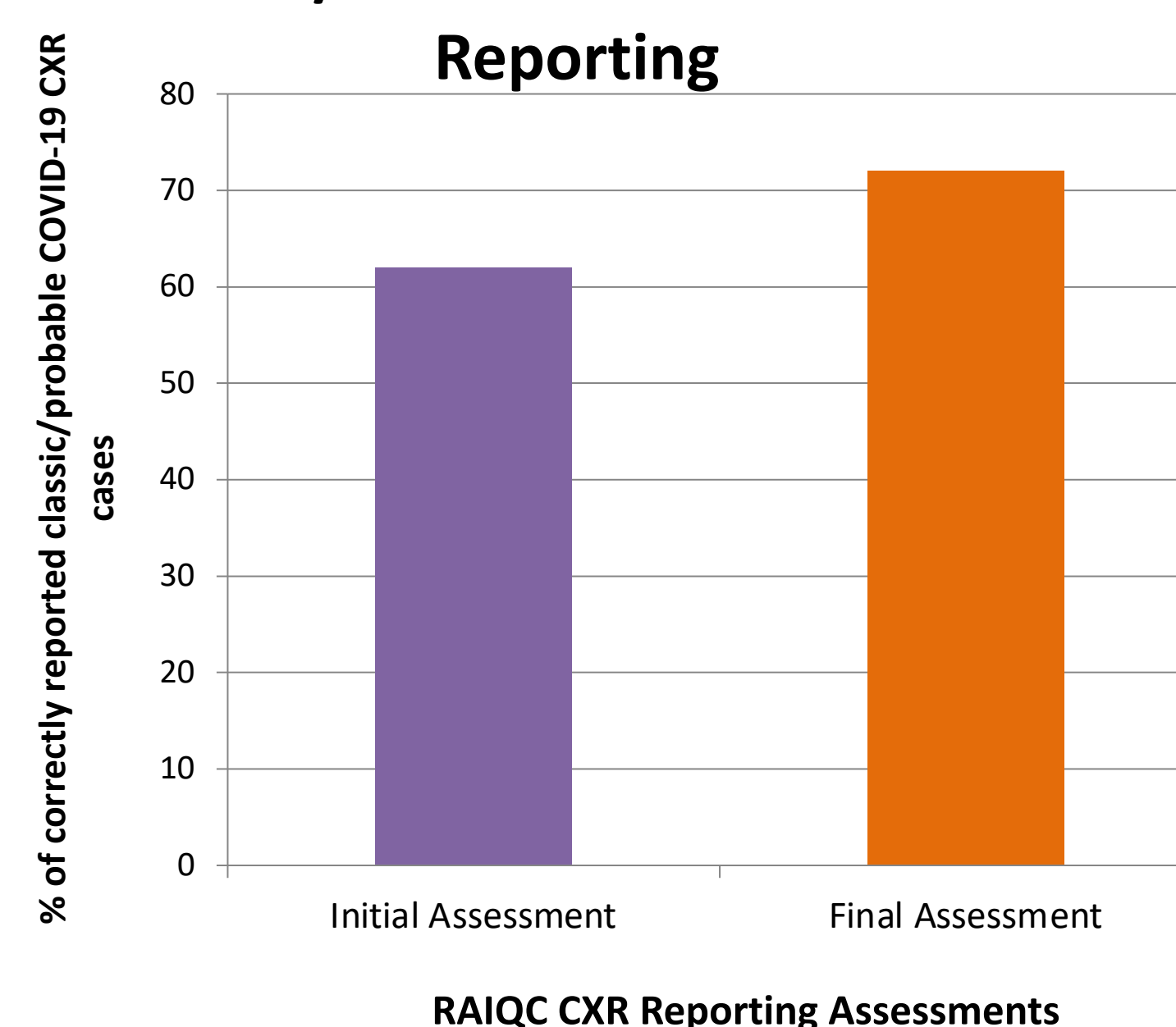


Figure 1D: Speed of CXR Reporting

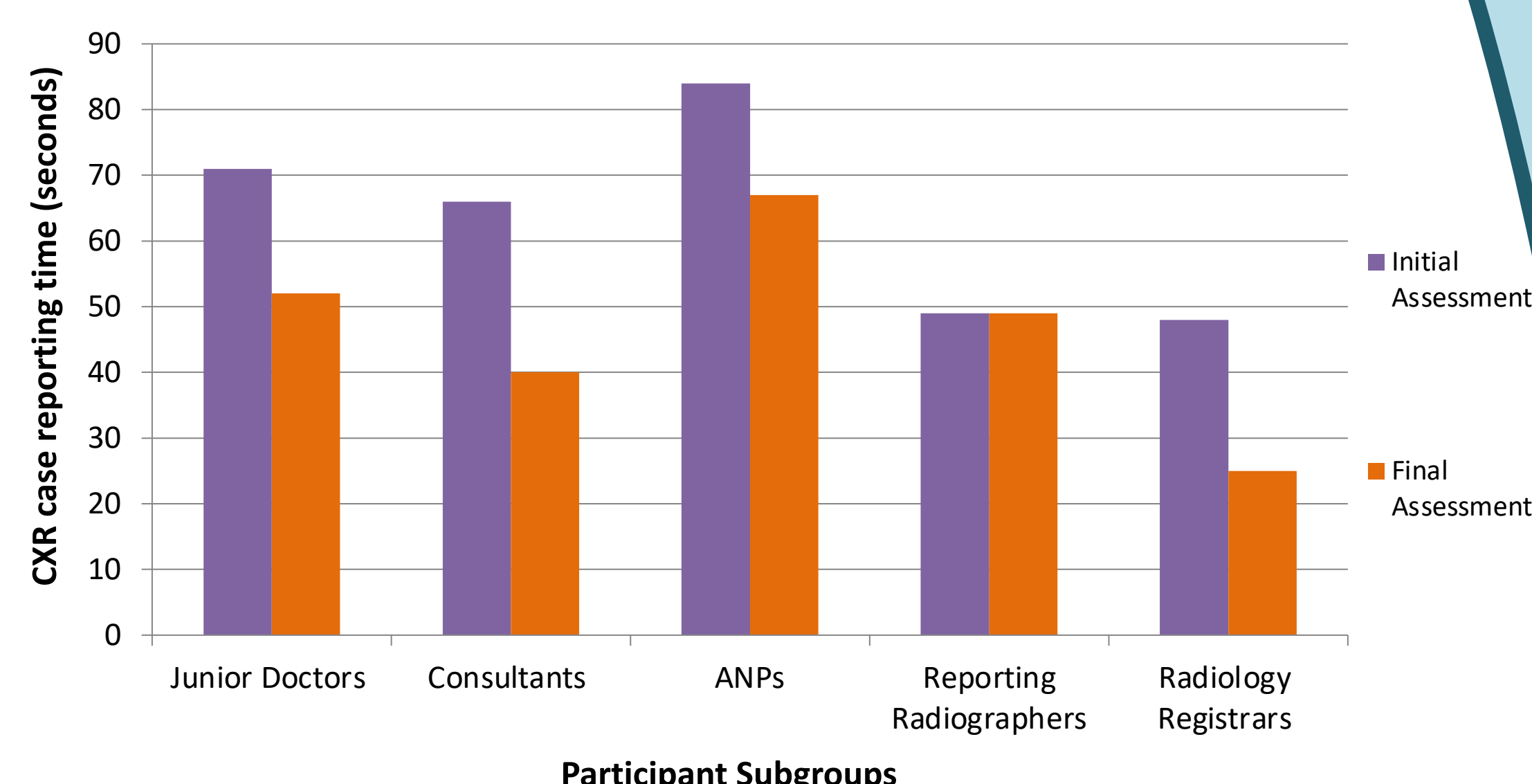


Figure 1A: Accuracy of CXR Reporting – participants in initial assessment (IA) (n=118) and final assessment (FA) (n=60). **Figure 1B: Accuracy of CXR Reporting (subgroups)** – junior doctors IA (n=72), FA (n=40), consultants IA (n=19), FA (n=10), advanced nurse practitioners (ANPs) IA (n=15), FA (n=6), reporting radiographers IA (n=3), FA (n=2), radiology registrars IA (n=5), FA (n=2). **Figure 1C: Accuracy of Classic/Probable COVID-19 CXR Reporting** – participants IA (n=118), FA (n=60). **Figure 1D: Speed of CXR Reporting** - junior doctors IA (n=72), FA (n=40), consultants IA (n=19), FA (n=10), ANPs IA (n=15), FA (n=6), reporting radiographers IA (n=3), FA (n=2), radiology registrars IA (n=5), FA (n=2).

Results

118 participants completed the initial online RAIQC training assessment. 60 recruits completed all three training components. Before online training, the mean accuracy of frontline healthcare workers in correctly identifying CXR pathologies was 43% (see Figure 1A). The mean accuracy was 57% amongst recruits who completed all three online training components (see Figure 1A). The accuracy of CXR reporting improved across all healthcare worker subgroups following the completion of online training (see Figure 1B). The initial mean accuracy of healthcare professionals in correctly identifying classic/probable COVID-19 on CXRs was 62% (see Figure 1C). The mean accuracy was 72% amongst recruits who completed the full online training programme (see Figure 1C). The speed of CXR reporting amongst junior doctors, consultants, ANPs and radiology registrars improved with online training (see Figure 1D).

Conclusion

Online RAIQC training improves the accuracy of frontline clinicians in detecting COVID-19 on chest X-rays. Healthcare professionals working in other domains may also benefit from access to this online training resource. Further work is required to assess the efficacy of this learning tool in improving COVID-19 CXR detection in real time in the Emergency Department.

References

- World Health Organisation (WHO), COVID-19 Weekly Epidemiological Update, Nov 2020. Available from: <https://www.who.int/publications/m/item/weekly-epidemiological-update---10-november-2020>
- Public Health England (PHE), Emergency Department Syndromic Surveillance System: England Year: 2020 Week: 45, Nov 2020. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/934382/EDSSSBulletin2020wk45.pdf
- Report and Image Quality Control (RAIQC), Nov 2020. Available from: <https://www.raiqc.com>

This project received funding from:



Funders did not have any editorial influence.