



Ushering in the Age of Endemic

**THE 11TH INTERNATIONAL INNOVATION,
INVENTION & DESIGN COMPETITION
INDES 2022**

EXTENDED ABSTRACTS BOOK



e ISSN 2756-8733



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Perpustakaan Negara Malaysia

Cataloguing in Publication Data

No e-ISSN: e-ISSN 2756-8733



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Typesetting : Wan Nurul Fatimah binti Wan Ismail

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The 11th International Innovation, Invention and Design Competition 2022

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INNOVATIVE METHOD OF CROSS INFECTION MINIMIZATION USING NOVEL THROUGH-GLASS TECHNIQUE IN PORTABLE CHEST RADIOGRAPHY

Mohd Hafizi Mahmud, Faikah Zakaria, Hairenanorashikin Sharip,
Noor Shafini Mohamad, Wan Farah Wahida Che Zakaria, Nur Aiman Baharuddin

Centre for Medical Imaging Studies, Faculty of Health Sciences,
Universiti Teknologi MARA Selangor, Puncak Alam Campus,

Email: mhafizi@uitm.edu.my

ABSTRACT

Portable chest radiography is a standard radiological procedure routinely used for bedside patients. COVID-19 pandemic has presented several challenges, including cross infection between the healthcare personnel and patients and a shortage of personal protective equipment (PPE). Hence, healthcare personnel-patient contact should be minimised as best as possible. This project is aimed to evaluate the image acceptability of portable chest radiography using through-glass technique as an innovative method in radiological procedure. On the hospital bed, a 35 cm x 43 cm imaging plate was arranged against the anthropomorphic thorax phantom, and the portable x-ray machine was positioned at a 200 cm source-image-distance (SID). The phantom was exposed using the standard and through-glass techniques with two exposure parameters of anterior-posterior (AP) chest radiography (80 kVp, 5 mAs and 90 kVp, 5 mAs). The radiographs were blindly reviewed by two senior radiographers based on the standard diagnostic image acceptability criteria. An inter-rater reliability using Cohen's kappa analysis was performed to determine the consistency among the evaluators. A statistically significant with moderate agreement between the two evaluators was observed for the chest radiographs from both sets of exposure parameters (kappa value, $k = 0.6$, $p < 0.05$). Portable chest radiography using through-glass technique showed equivalent image quality of the standard chest radiography technique and complied with the diagnostic image acceptability. This novel technique has a potential clinical application to minimise cross-infection risk during the radiological procedure.

Keyword: *COVID-19, portable chest radiography, through-glass technique*

1. INTRODUCTION

Chest radiography is one of the most valuable diagnostic imaging procedures during the COVID-19 pandemic and effective for evaluating the disease's progression (Wasilewski et al., 2020). A recent advancement in portable chest radiography using through-glass technique has enhanced the work efficiency for patients in isolation wards who have infectious diseases such as COVID-19 or tuberculosis (Moirano et al., 2020), while also preserving personal protective equipment (PPE), minimising the risk of infection between staff and patients, decontaminating resources, and restricting the exposure of healthcare workers to COVID-19. Hence, this project is aimed to evaluate the image acceptability of portable chest radiography using through-glass technique as an innovative method in radiological procedure.

2. METHODOLOGY

A GE Healthcare conventional portable radiography unit was positioned outside the nurse recovery bay with an open (standard technique) and closed (through-glass technique) glass sliding door. The anthropomorphic thorax phantom was set up on the hospital bed as a standard anterior-posterior (AP) projection of chest X-ray (CXR). The phantom was exposed using the standard and through-glass techniques, utilising a 35 cm x 43 cm imaging plate, 200 cm source-image-distance (SID) (Brady et al., 2020; Rai et al., 2021) and two exposure parameters (80 kVp, 5 mAs and 90 kVp, 5 mAs). The radiographs were blindly reviewed by the two senior radiographers with a minimum of 5 years working experience using the standard diagnostic image acceptability criteria (McQuillen-Martensen, 2018). An inter-rater reliability using Cohen's kappa analysis was performed to determine the consistency among the evaluators.

3. FINDINGS

The result demonstrated a statistically significant with moderate agreement between both evaluators (kappa value, $k = 0.6$, $p < 0.05$) for the chest radiographs acquired with both exposure parameters using the standard and through-glass techniques.

4. CONCLUSION

Portable chest radiography acquired using through glass technique showed equivalent image quality of the standard chest x-ray technique and complies with the diagnostic image acceptability. This novel technique is potentially to be applied in the clinical setting to minimise cross-infection risk during the radiological procedure.

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Surat kami : 700-KPK (PRP.UP.1/20/1)

Tarikh : 20 Januari 2023

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