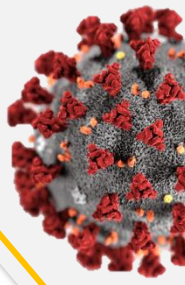
WALK-IN SCREENING BOOTH FOR COVID-19



INTRODUCTION

Keeping medical professionals healthy during the COVID-19 pandemic is essential in slowing the rate of infection. Many governments and healthcare providers are finding this to be a difficult task juggling between the global shortage of personal protective equipment (PPE) supplies and the need to conduct mass screening and testing. It is therefore critical to provide a safe working environment that could limit the exposure of the frontline healthcare workers to the biological hazards.

Among the countries battling with COVID-19, South Korea has successfully contained the spreading of the virus due to its extensive and well-organized testing programme using latest technology to isolate infected people as well as trace and quarantine their contacts. Their drive-through testing concept has been adopted in Putrajaya Health Clinics for faster screening and testing of Covid-19. However, this strategy requires front-liners to operate in full personal protective equipment (PPE) under hot and humid conditions, with frequent change per patient to avoid cross-contamination, as well as requiring some large space, possession of vehicle and good traffic management.

Fairly recently, H Plus Yangji Hospital in Seoul, South Korea has invented a novel technique for coronavirus testing using a walk-in booth[1]. The one-person booth, called SAFETY® (Safe Assessment and Fast Evaluation Technical Booth of Yangji Hospital), is modelled based on a biosafety cabinet used for handling hazardous materials in the laboratory. Its size is around 70 centimeters in width and length and 2 meters in height. A patient steps into the booth for a rapid consultation, separated from the medical worker by a transparent plastic panel. If necessary, physical examination can be performed and samples can be taken by swabbing the patient's nose and throat using arm-length rubber gloves built into the panel. This method reduced the face to face contact with the patient, hence reduced the exposure to the frontline worker. Inside the booth, negative air pressure is maintained to prevent harmful particles from escaping outside, and the communication is allowed through an intercom. The whole process may take about seven minutes and the booth is then disinfected. Since the booth is about the size of a regular telephone booth, it takes less than two minutes to disinfect after use. The booth offers similar accessibility for those who do not drive, and for children and it can be installed in much smaller spaces as compared to drive-through screening booth. The walk-in booth can be equipped with high efficiency particulate air (HEPA) filtration system in either positive or negative pressure mode such as those in Korean Kiyon® test booth.[2]

Using the same concept of technology, several Malaysian-based groups have since developed Covid-19 screening booths for the use in local community clinics or hospitals. Project I3S cubicle® was developed by a group of healthcare professionals from The Malaysian Medical Mythbusters, Awfa Clinic in Kotasas, architects and biomedical engineers from Universiti Teknologi Malaysia (UTM) including the Facebook Community 'Ini Sains Beb'.[3] The unit has 2 separate cubicles for the attending healthcare worker and the patient, with their own HEPA filtration system. Another local innovation called COVID MoBile Test Unit (CoMBat®) was recently developed by a group of doctors and design engineers.[4] The unit was built in a 20 foot contena consisting of 6 patient sampling booths, equipped with a negative pressure system. The third local innovation, Covid19 Screening Booth was proposed by iDeria Sdn.Bhd, a startup company under Universiti Malaysia Perlis.[5] Their concept consists of single booth, double booth and multiple booths concept. Each booth is equipped with UV-C LED light operating, sterilization nozzle to disinfect room and negative pressure system.

EVIDENCE ON EFFECTIVENESS AND SAFETY

There was no retrievable evidence on effectiveness, safety and cost-effectiveness of walk-in screening booth based on systematic search conducted through the scientific databases (via Ovid and Pubmed platforms), general search engines such as Google Scholar and relevant websites (such as FDA).

The above mentioned proposed local products claimed increased **efficiency** in screening with the use of their testing booths as compared to the conventional way of testing in hospital or clinic rooms. They envisaged that there will be a relative reduction in PPE usage and disposal by the health worker resulting in possible cost-saving. Throughout the screening process, a health worker needs to wear at least gloves and plastic apron which need to be changed between patients. Time-saving is also possible as there will be no need for full donning and doffing of PPE for each patient as in conventional testing settings.

This can result in a faster testing process and higher number of testing to be conducted. In conventional testing, it is estimated that 50 tests can be conducted per shift of 8 hours, totalling to 150 tests per day.[4] For CoMBaT®, each test session requires around 25 minutes, including 20 minutes down time for consultation and sanitation time. Therefore for 6 booths, CoMBaT® can allow 115 tests per shift of 8 hours, totalling up to 345 tests per day.[4] For Covid19 Screening Booth, it is estimated that 48 tests can be performed in 8 hours shift and with 1 booth able to test 6 patients per hour, a total of 192 patients per day is estimated for 4 booths.[5] The extra down time can be used for sample labelling and swab taking for the next patient or from different booth, hence less need for manpower.

All proposed screening booths offer conducive testing environment for both healthcare personnel and the patient. The enclosed area is fitted with an air-conditioning unit and communication system. Larger cubicles are built to cater small kids with parents and accommodate wheeled-chair patients or those with disability.[3,4,5]

CoMBaT® offers continual usage of the test unit post pandemic, as a mobile clinic or an isolation area for suspected communicable disease patients awaiting further management. As it can be air-

transported, the unit can be mobilised to district or remote areas.[4]

In terms of the **safety** aspect, all products use a negative air pressure system with HEPA filtration to prevent exposure to virus or other pathogens. The small cubicle could be relatively easy to disinfect due to its size but care must also be taken to allow proper ventilation post-disinfection process. The risk of cross-contamination to other patients can still exist if this process is not performed accordingly. The barrier interface between health worker and patient must not be breached to avoid virus transmission to the frontliner. [3,4,5]

There seems to be a quite range of **costs** estimated in creating and installing the products. The crude estimation of costs for the prototype of Project I3S cubicle, is RM10,000.[3] As for CoMBaT®, the capital cost estimation for one unit is RM100,000.[4] Total cost estimated for Covid19 screening single booth is RM 18,500, RM 28,500 for 2 booths and RM 39,500 for 4 booths. [5] The product cost-saving from minimal use of PPE, taking into account minimum cost for full set PPE per day is around RM100, and testing 192 patients per day, is estimated to be around RM 19,200. [5] All three products are stated to be funded either through donation or a crowdfunding mechanism, thus the cost borne by the government will include the utility and human resource costs.

CONCLUSION

There was no retrievable evidence assessing the effectiveness, safety and cost-effectiveness of walk-in screening booth for Covid-19. The proposed testing booths seem to have the potential for more efficient screening time, possibly cost-saving with reduction in PPE requirement while ensuring minimal physical contact between health frontliners and patients. Safety could be an issue should the barrier interface between health personnel and patient as well as the negative air pressure and disinfection mechanism become compromised. More in-depth cost analysis comparing the 3 products and with current practice could be helpful. More outcome studies examining the impact of these booths in the actual setting are also recommended.

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Disclosure: The authors of this report has no competing interest in this subject and the preparation of this report is totally funded by the Ministry of Health, Malaysia.

Disclaimer: This rapid assessment was prepared to provide urgent evidence-based input during COVID-19 pandemic. The report is prepared based on information available at the time of research and a limited literature. It is not a definitive statement on the safety, effectiveness or cost effectiveness of the health technology covered. Additionally, other relevant scientific findings may have been reported since completion of this report.

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