SMJ Singapore Medical Journal

Implementing a modified neurology OSCE during the COVID-19 pandemic: an implementation science perspective

Pei Xuan Koh[1], MBBS, MRCP, Kevin Tan[1], MBBS, MRCP,
Yee Cheun Chan[2], MBBS, MRCP, Derek TL Soon[2], MBBChir, MRCP,
Siew Ju See[1], MBBS, MRCP, Nigel CK Tan[1], MBBS, FRCP

[1]Department of Neurology, National Neuroscience Institute, [2]Department of Neurology, National University Hospital, Singapore

Correspondence: Dr Pei Xuan Koh, Consultant, Department of Neurology, National Neuroscience Institute, 11 Jalan Tan Tock Seng, Singapore 308433. koh.pei.xuan@singhealth.com.sg

Singapore Med J 2022, 1–12
https://doi.org/10.11622/smedj.2022057
Published ahead of print: 2 June 2022

INTRODUCTION

The COVID-19 pandemic has caused significant disruption to healthcare as well as medical education.[1] As the pandemic continues, infection control measures will continue to impact the delivery of medical education in teaching and assessment.

Assessment is an integral part of medical education. During the COVID-19 pandemic, assessments require modifications[2-4] to comply with infection control measures while maintaining their utility.[5] The Neurology Senior Residency Program in Singapore was presented with the challenge of redesigning and implementing a postgraduate objective structured clinical examination (OSCE) during the COVID-19 pandemic.

Implementation science (IS) is an emerging field that examines implementation methodology and facilitates the uptake of evidence-based practices into routine practice.[6,7] The IS perspective may be useful for implementation of educational initiatives. We describe the implementation and evaluation of a modified neurology OSCE using an IS framework—the Consolidated Framework for Implementation Research (CFIR).[6]

METHODS

Our implementation goal was to (a) conduct a modified OSCE (M-OSCE) with appropriate safety and infection control measures for all involved individuals (candidates, examiners, administrative staff and simulated patients), and (b) assess the acceptability of the M-OSCE. We describe context, modifications, implementation and outcome measures.

Context

Becoming an accredited neurologist in Singapore involves three years of junior residency training in internal medicine, followed by three years of senior residency training in neurology. Neurology senior residency training is hosted by two sponsoring institutions; there were thirty-

two inflight senior residents (SR) at the time of writing. There are two residency programs in Singapore, each led by a program director (PD); oversight for training is provided by the Singapore Neurology Residency Advisory Committee (RAC) and the Ministry of Health (MOH), Singapore. The RAC comprises senior neurologists with leadership roles in clinical and education domains who have an interest and/or formal postgraduate training in education. Each residency program has a program of assessment which incorporates formative workplace-based assessments and summative assessments. Graduating from the program requires a resident to pass three key assessment components: (1) review of the SR's portfolio (2) multiple-choice question (MCQ) Specialty Certificate Examination (SCE) conducted by the Royal Colleges of Physicians, United Kingdom and (3) locally-conducted OSCE.

The OSCE is organized and conducted by the RAC's examination committee (ExComm), led by the Examination Chair (EC) and the Chief Examiner (CE). The OSCE has been conducted annually since 2015; all SRs take the examination. While passing the OSCE is not required to progress to the 2nd or 3rd year, candidates are required to pass the OSCE in their final year before being allowed to graduate from the program. Candidates rotate through a series of eight 15-minute stations; total testing time is two hours. Candidates are tested on neurological examination techniques and neuro-localization skills on real patients; clinical reasoning and interpretation of neurological investigations are also tested in case-based scenarios. Stations are blueprinted; cut scores are determined by the modified Angoff method. Previous years' OSCEs have demonstrated good reliability (Cronbach's alpha = 0.72).

Modified OSCE (M-OSCE)

On 7 Feb 2020, MOH issued guidelines on conduct of examinations during the COVID-19 pandemic, emphasizing infection control measures. This prompted the following examination modifications: (a) mandating the use of surgical masks for all individuals involved, (b) twice-

daily temperature recording for all individuals, (c) segregation of SR examination candidates into groups based on their hospital of practice, with separate start/end timings for each group to minimize inter-hospital staff interaction, (d) use of standardized simulated patients (SP) instead of real patients, with rotation of SP with every four candidates to minimize interaction, (e) sanitization of contact surfaces and equipment after each use, (f) use of teleconferencing (Zoom Video Communications) for the M-OSCE; this included briefings as well as candidate-examiner interactions for all stations, and (g) sequestering of examiners in their individual rooms for the duration of the M-OSCE.

Implementation

The ExComm utilized the validated Consolidated Framework for Implementation Research (CFIR)[6] to plan, implement and evaluate the M-OSCE. CFIR is a determinant framework which has previously been applied to the medical field[8]. CFIR was selected as determinant frameworks allowed the ExComm to prospectively identify the factors that might positively or negatively influence M-OSCE implementation. The CFIR has five domains: intervention characteristics, outer setting, inner setting, characteristics of individuals, and implementation process. We summarize the application of CFIR, by domain, to the M-OSCE implementation in Table 1.

Outcomes

At M-OSCE conclusion, an anonymous survey of all SR candidates, examiners and administrative staff involved was performed; ethics approval was obtained (Centralized Institutional Review Board reference 202004-00110). The survey measured perceptions of the safety and acceptability of the examination; responses were scored on a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree. Mean and median scores were calculated

for each question. Scores between examination candidates and non-candidates (examiners and administrative staff) were compared using the Mann-Whitney-U test as scores were not normally distributed. (Table 2).

RESULTS

The M-OSCE was completed in one day as planned, inclusive of technical setup and dismantling. Sixty individuals were involved in the conduct of the exam, comprising eight examiners, five ExComm members, five administrative staff, 32 SR candidates, and 10 SP. None of the 60 individuals involved developed COVID-19 infections in the month after the M-OSCE.

A total of 45 individuals (32 candidates, eight examiners and five administrative staff) participated in the post-OSCE survey. One candidate response was excluded from analysis due to incomplete data, giving an overall response rate of 98%.

Survey participants agreed that the infections control measures made them feel safe (median score 5) and did not negatively impact (median score 2) the conduct of the M-OSCE. Participants felt that technology use was acceptable (median score 4) and as effective as in-person OSCE (median score 4). They were neutral as to whether technology negatively impacted the examination (median score 3). Subgroup analysis did not show significant differences in responses between candidates and non-candidates (Table 2).

While there were brief intermittent technical difficulties (audio echo and visual freeze), there were no major disruptions during the M-OSCE. The respondents felt that the technical glitches did not significantly impact the M-OSCE. Professional standards of the M-OSCE were kept by maintaining the blueprint and format of the OSCE questions, inclusive of a physical examination station. Prior training was performed with the SP to ensure consistent information and examination findings were provided to all candidates.

A dry-run the week before, as well as actual day technical and logistical setup amounted to about 6 hours of additional preparation time compared to previous in-person OSCE, which was acceptable to the organizing team. Overall, the M-OSCE was feasible as it was completed within a day, similar to previous OSCEs.

DISCUSSION

We described the successful planning and implementation of a M-OSCE during a pandemic, using CFIR as an IS framework.[6-8] Our experience illustrates the usefulness of CFIR as an organizing framework for systematically and prospectively identifying determinants that affect implementation, as we successfully applied the CFIR constructs[6] in our implementation. Perceptions of the safety and acceptability of the M-OSCE were favourable, and none of the participants involved developed COVID-19 infection in the one month following the M-OSCE. From the CFIR constructs, we identified several key features which enabled successful implementation. First, a positive culture and favourable implementation climate with aligned goals proved especially helpful. Second, leadership proved critical; the use of educational principles and frameworks provided the RAC, EC and CE with the self-efficacy, knowledge, skills and credibility to implement the M-OSCE. Third, the familiarity of candidates and examiners with the OSCE format, video conference platform, and infection control measures, allowed conversion to M-OSCE with minimal resistance to the change. Fourth, prior experience of the EC and CE in organizing the previous in-person OSCEs helped during the planning and execution of the M-OSCE.

The CFIR has proven useful for implementation of our postgraduate Neurology M-OSCE. It facilitated early identification of determinants influencing implementation and problem-solving. The use of CFIR for planning health professions education interventions is sparse, with only one study describing assessment tool implementation in midwifery

education.[9] The methodology of implementation is the key focus of our paper as we believe our use of CFIR in neurology education demonstrates its broader applicability and usefulness. Our study is limited by a small sample size for survey data. The positive application of CFIR to a single Neurology educational intervention could be a springboard to further exploration into the use of CFIR in other settings and context. We feel that the CFIR, a meta-theoretical framework, is potentially applicable across the spectrum of implementation research,[10] and might be further applied to other health professions education interventions.

In summary, CFIR has provided a structured, evidence-based IS perspective to planning a postgraduate M-OSCE during a pandemic, with successful implementation and positive perceptions by stakeholders. We hope this demonstrates its utility for educators planning to implement other educational interventions.

REFERENCES

1. Mian A, Khan S. Medical education during pandemics: a UK perspective. BMC Med 2020; 18:100.
2. Sabzwari S. Rethinking assessment in medical education in the time of COVID-19. MedEdPublish 2020; 9:80.
3. Boursicot K, Kemp S, Ong TH, et al. Conducting a high-stakes OSCE in a COVID-19 environment. MedEdPublish 2020; 9:54.
4. Lara S, Foster CW, Hawks M, Montgomery M. Remote assessment of clinical skills during COVID-19: a virtual, high-stakes, summative pediatric objective structured clicnical examination. Acad Pediatr 2020; 20:760-1.
5. Van Der Vleuten CP. The assessment of professional competence: developments, research and practical implications. Adv Health Sci Educ Theory Pract 1996; 1:41-67.

6. Damschroder LJ, Aron DC, Keith RE, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci 2009; 4:50.
7. Nilsen P. Making sense of implementation theories, models and frameworks. Implement Sci 2015; 10:53.
8. White MC, Randall K, Capo-Chichi NFE, et al. Implementation and evaluation of nationwide scale-up of the Surgical Safety Checklist. Br J Surg 2019; 106:e91-e102.
9. Bogren M, Banu A, Parvin S, Chowdhury M, Erlandsson K. Implementation of a context-specific accreditation assessment tool for affirming quality midwifery education in Bangladesh: a qualitative research study. Glob Health Action 2020; 13:1761642.
10. Kirk MA, Kelley C, Yankey N, et al. A systematic review of the use of the Consolidated Framework for Implementation Research. Implement Sci 2016; 11:72.

Table 1: CFIR constructs and application to the Neurology M-OSCE

CFIR constructs	Application of construct to M-OSCE implementation
Domain 1: Intervention characteristics	
Intervention source	Ministry of Health (MOH) and Residency Advisory Committee (RAC).
Adaptability	Undergraduate medical examinations conducted during the COVID-19 pandemic in the same country have successfully adapted the OSCE to comply to infection control guidelines[3].
Complexity	The basic structure of the OSCE used in the annual Neurology examinations could be kept and thus the modifications needed to comply with infection control standards were not complex.
Cost	The additional financial cost was minimal as the originally planned venue for the OSCE was already equipped with computer terminals in each room, and had an in-built public address (PA) system. The additional logistics required included only surgical masks and surface disinfectant/wipes. There were no additional costs for video conference platform, as MOH had paid for Zoom licenses for RAC-organized examinations.
Domain 2: Outer setting	
Patient needs / resources	Patient safety via infection control measures was a key driving force for the successful implementation of the M-OSCE. These measures also safeguarded the health of examiners, SP and administrative staff.
Cosmopolitanism	A proposal detailing the implementation of the M-OSCE was submitted to and approved by MOH prior to the examination.
Peer pressure	Undergraduate OSCE examinations have been modified and implemented successfully in the same country[3]. This exerted positive pressure for planning and implementation of the M-OSCE for Neurology.

External policies and incentives	There was a requirement for compliance to MOH examination guidelines.

Domain 3: Inner setting	
Structural characteristics	The Neurology residency training system and the Neurology RAC are mature systems; the OSCE examination has already been conducted since 2015.
Networks and communications	A WhatsApp group allowed informal communication amongst members of the ExComm and administrative staff. This encouraged members to provide suggestions throughout the planning and implementation process. Email groups further facilitated discussion and the dissemination of documents.
Culture	The Neurology community in Singapore is small, and there are strong existing relationships between the neurology residency programs and the RAC. This allowed the ExComm to obtain buy-in for the M-OSCE.
Implementation climate	There was minimal tension for change as all the major stakeholders agreed that the M-OSCE was a necessary implementation. Infection and safe distancing workflows such as campus segregation, mask-wearing, and twice-daily temperature taking were already a norm by the time the M-OSCE was implemented and were familiar to candidates, examiners and administrative staff. The learning climate was positive as the ExComm solicited feedback from faculty during planning and implementation.
Readiness for implementation	The ExComm consisted of experienced faculty and administrative staff who had organized and participated in prior OSCEs, and were committed to organizing a robust M-OSCE. Programs also allowed examiners and senior residents time off to take the examination. The

	goals of the M-OSCE were clearly communicated and acted upon throughout the entire implementation process. All individuals involved were familiar using Zoom Video Communications as they had been using it in the months prior to the M-OSCE; no additional training was needed.
Domain 4: Characteristics of individuals	
Knowledge and beliefs about intervention	Due to broader societal awareness about the importance for infection control measures, all individuals involved understood the need for such measures.
Self-efficacy	The EC had been closely involved in the implementation of a similar undergraduate OSCE exam held two months prior to the M-OSCE and was familiar with the modifications needed. Three key personnel - RAC Chair, EC and CE - were all clinician-educator neurologists with Masters in Health Professions Education qualifications and were well-versed in education frameworks and implementation.
Individual identification with organisation	The commitment to the national goal of implementing a robust, defensible M-OSCE for all SRs in Singapore, as demonstrated by the RAC, ExComm and examiners was a significant enabler for the M-OSCE.
Domain 5: Process of implementation	
Planning	Planning of the M-OSCE began four months prior with question setting by faculty followed by a standard setting meeting conducted virtually. Administrative measures to ensure infection control were also detailed and formalized. To ensure the smooth running on the actual day, all equipment testing and processes were trialled one week before the M-OSCE.

Engaging	The RAC chair, EC and CE (formally appointed internal implementation leaders) obtained advance support from the department chairs and program directors (opinion leaders) to proceed with the M-OSCE. The EC and CE acted as champions for the M-OSCE. Feedback from MOH, and eventual approval of the M-OSCE from MOH helped facilitate implementation.
Executing	A checklist of tasks was drawn up 3 months prior to the M-OSCE, with clear delegation of duties. Detailed timetabling of the events on the actual day was done to ensure its smooth implementation. Briefings for all groups of individuals involved (administrative staff, examiners, candidates, simulated patients) were conducted virtually prior to the start of the examination. Technical set-up and testing of equipment were performed two hours prior to the start of the examination. Additional equipment was available to replace any equipment malfunction. Technical support staff was available on standby throughout the examination.
Reflecting and evaluating	At the conclusion of the M-OSCE, a virtual debrief session was held with the examiners to gather feedback. A survey was also administered to examiners, candidates and administrative staff involved to evaluate perceptions of the M-OSCE.

Table 2: Comparison of M-OSCE survey scores between candidates and non-candidates

	Median score		
	Candidates (n=31)	**Non-candidates (n=13)**	**P value**
Q1. I felt safe as a candidate/examiner/administrative staff with the infection control measures implemented	5.0	5.0	0.407
Q2. The infection control measures negatively impacted the assessment	2.0	2.0	0.129
Q3. The use of technology to facilitate remote discussions (standard setting, briefing, examiner discussion, etc) was as effective as face-to-face methods	4.0	4.0	0.220
Q4. The use of technology to conduct the exam was acceptable for an OSCE	4.0	4.0	0.667
Q5. The use of technology to conduct the exam negatively impacted the assessment	3.0	2.0	0.633