Objective-structured clinical examination in cardiovascular system for the assessment of internal medicine postgraduates amidst the Covid-19 pandemic

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ABSTRACT

Background. The Covid-19 pandemic has posed a challenge to organizing a safe clinical assessment for postgraduate degree candidates completing the residency programmes in various specialties. Although minimizing the risk of Covid-19 transmission is a priority, fulfilling the objectives of the assessment is equally important.

Methods. We conducted this study in the Department of Internal Medicine at our institute. Instead of physically examining patients, case scenarios that included history, clinical and investigational data of the cardiovascular system (CVS) were presented to the candidates. Performance was scored by both the conventional and the CVS objective-structured clinical examination (CVS-OSCE) method and compared.

Results. Clinical assessment examination of 27 candidates for the degree of Doctor of Medicine showed that the median cumulative score gained in narrating and analysing various differential diagnoses was lower compared to the mean cumulative score gained in arriving at a single correct diagnosis (50% [interquartile range—IQR 39%–64%] *v.* 79% [IQR 64%–100%], p < 0.01). Most of the candidates agreed that case scenarios were good alternatives to the conventional physical examination amidst the pandemic.

Conclusion. CVS-OSCE-based assessment using structured case scenarios is a feasible and effective alternative for clinical skill assessment in high-stake examinations.

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INTRODUCTION

The Covid-19 pandemic has posed new challenges to medical education.[1] The first case of Covid-19 in India was detected on 30 January 2020. A nationwide lockdown was imposed in March 2020 to curtail the increasing number of Covid-19 cases and to prepare healthcare workers/institutes to deal with the pandemic. The outbreak and lockdowns led to delays in the final assessment

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examination at the completion of the Doctor of Medicine (MD) Internal Medicine (IM) residency programme. While minimizing the Covid-19 transmission within the healthcare establishments is of paramount importance, medical education and research activities also need to be continued. The clinical/practical assessment of trainees amidst the pandemic require strict adherence to infection control practices.

The assessment for the completion of a 3-year residency programme in IM has two parts. The first part is the theory examination, which does not require direct interaction with another person, while the second part is the clinical skill assessment that demands interaction between the student, patients and examiners. The conventional clinical assessment involves eliciting historical data and physical findings of a patient and the presentation of these to examiners, who then score the candidate based on the presentation, and the ability to justify the interpretations and decisions. A cardiovascular system objective-structured clinical examination (CVS-OSCE) allows for a structured and comprehensive evaluation of different aspects of clinical skills while maintaining objectivity. We present our experience of organizing the final MD examination amidst the Covid-19 pandemic and analyse the utility and applicability of a CVS-OSCE.

METHODS

We included 27 students who were completing their residency programme in June 2020. The study design and assessment strategy for conducting the clinical skill examination were approved by the institutional ethics committee. The candidates were divided into four groups (7, 7, 7, 6). Only one group was allowed to be at the examination venue at anytime. Within each group, adequate physical distancing was maintained between individual candidates. Students were briefed about the expected plan of movement during the examination. The examination was conducted in a large (71.5 m^2) conference room, to avoid any risk of exposure from inpatients or other healthcare workers. All the candidates, examiners and organizers were free of medical symptoms and had not been exposed to high-risk situations near the day of the examination. All persons involved in the process of the examination wore a triple-layered medical mask.[2] Hand sanitizers were used before and after handling papers by both candidates and examiners. Adequate physical distancing (at least 2 m apart) was maintained between the examiners and the candidate at all times.[3]

On arrival, a set of papers that contained a case scenario (Appendix 1) was handed over to the candidate. The case scenario was organized to give sequential clues, i.e. demographic details and chief complaints, detailed history of presenting complaints, family/personal history, general physical examination findings, cardiovascular examination findings and clinical findings of other systems (Appendix 1). After each section, the candidates were asked to analyse and interpret the data. The candidate's ability to narrate the physiological basis

and common causes of specific symptoms and signs were also scored. Further, their ability to narrate the steps of carrying out an appropriate physical examination was assessed. Two examiners (RV and SSL) assessed the candidate independently, and both followed the conventional method of scoring as per the institutional protocol (Appendix 2), while a third person (AG) independently scored the candidate's response to all the questions/aspects of case analysis using CVS-OSCE (Table I). AG was blinded to the scores given by the other two examiners. CVS-OSCE consisted of a total of 30 elements providing a graded score for each element of clinical skills from 0 to 2 (maximum total score was 60). The scores by two examiners assessed by the conventional method were averaged and the mean score was then compared with the CVS-OSCE score. The students were not informed about the independent CVS-OSCE until the completion of the examination. After the clinical skill assessment, the candidates were explained about the CVS-OSCE proforma and asked to give feedback on this newer model and their opinion on conducting examinations using case scenarios, instead of physically interacting and examining the patient. The scores obtained by each student in individual aspects of clinical assessment and their response to the feedback questionnaire were recorded on a 5-point Likert scale. All statistical analysis was done using IBM SPSS Statistics (Version 26) for MacOS. Variables were summarised as either mean and standard deviation or median with interquartile range (IQR).

TABLE I. Cardiovascular system objective-structured clinical examination (CVS-OSCE) proforma used for the assessment of clinical competency in cardiovascular diseases using case scenarios

Item	Score 2	Score 1	Score 0
Chief complaints and detailed history of present illness			
Interpret chief complaints to localize the system involved			
Extract relevant positive/negative history to rule in/rule out various common causes			
Use demographics such as age/gender/place in clinical decision-making			
Explain the mechanism of a symptom			
Past/family/personal/treatment history			
Interpret given past/family/personal/treatment history and use the same in arriving at an appropriate diagnosis			
Extract relevant positive/negative history to rule in/rule out various common possible causes			
Conclude after history-taking			
Could reach the most appropriate diagnosis			
Gives close differentials with justification for and against them			
General physical examination			
Integrate given important clinical findings to reach at a conclusion			
Extract important positive/negative findings to help arrive at the right diagnosis or rule out a close differential diagnosis			
Narrate possible other clinical findings commonly seen in the arrived diagnosis			
Demonstrate or narrate the systematic method of carrying out a given method of examination			
Cardiovascular system examination			
Integrate given important clinical findings for arriving at a conclusion			
Extract important positive/negative findings to help arrive at the right diagnosis or rule out a close differential diagnosis			
Narrate possible other clinical findings commonly seen in the arrived diagnosis			
Demonstrate or narrate the systematic method of carrying out a given method of examination			
Examination of other systems			
Integrate given important clinical findings in arriving at a conclusion			
Extract important positive/negative findings to help arrive at the right diagnosis or rule out a close differential diagnosis			
Investigation			
Mention relevant important investigations			
Justify the use of these investigations			
Electrocardiogram (ECG)			
Systematic description of the given ECG			
Pick important findings to correlate with the clinical diagnosis			
Chest radiograph			
Systematic description of the given radiograph			
Pick important findings to correlate with the clinical diagnosis			
Diagnosis			
Able to reach the correct diagnosis			
Justifies clinical findings and investigations in arriving at the diagnosis			
Able to make close possible differentials			
Management of the patient			
Appropriate medical management in a stable patient			
Appropriate medical management in complications related to the disease			
Relevant surgical options			
Total score			

Differences between the variables were analysed using paired-samples t-test. A Spearman rank order correlation test was done to assess the relationship between scores obtained by the conventional and the CVS-OSCE methods.

RESULTS

The mean score of 27 candidates in various categories of the clinical examination are summarized in Table II. The scores gained in narrating and analysing various differential diagnoses was lower compared to the mean cumulative score gained in arriving at a single correct diagnosis (50%; IQR 39%–64% $v.$ 79%; IQR 64%–100%; p<0.01). The total score obtained by the CVS-OSCE was significantly higher compared to the conventional scoring system (35 [IQR 31–46.5] $v.$ 34 [IQR 32–7], p<0.01). Further, there was a statistically significant and strong correlation between two scores with r_s=0.705, p<0.01, where r_s is the Spearman correlation coefficient. The responses to the survey carried out after the examination are summarized in Table III.

The examination was carried out safely without any of the study participants showing any symptoms or signs of Covid-19 infection during a 1-month follow-up.

DISCUSSION

In this study, we used structured case scenarios as a substitute for the final assessment of the MD-IM residency programme. We also tested and compared the CVS-OSCE with the conventional method of scoring.

In April 2020, the National Medical Commission gave directions for the conduct of examinations of final-year postgraduate trainees to maintain the continuous availability of specialists to deal with the ever-increasing number of Covid-19 patients.[4] It also advised various institutes to adopt alternative methods of assessment, which can reliably test the clinical skills of the candidates.[5] However, there was a lack of clear guidelines on how to conduct these high-stake examinations to assess both knowledge and clinical skills of the candidates.

The OSCE was first introduced in 1975 as a model for student's assessment.[6] Since then, it has been adopted as the mode of choice for assessment of competency in clinical skills in many countries and few educational boards of India.[7–10] OSCE improves objectivity while covering a wider range of aspects of clinical skills. The structured assessment also provides feedback about the teaching programme and measures student's and teacher's effort in quality education. In this study, the objective assessment revealed that the student's ability to provide a differential diagnosis was poorer compared to the ability to arrive at a single best diagnosis (p<0.01). This brings to light a crucial aspect of their learning, as the ability to give various alternatives requires a deeper knowledge than arriving at a

TABLE II. Scores in various aspects of the objective-structured clinical examination (OSCE)

Assessment parameter	Maximum score	Mean (SD) score	Mean (SD) score (%)	Median (IQR) score	Median (IQR) score (%)
Chief complaints and presenting history score	8	5.3 (1.6)	66.2 (19.5)	5 (4–7)	62.5 (50–87.5)
Past/personal/family history score	4	2.8 (1.1)	70.4 (26.9)	3 (2.5–3.5)	75 (62.5–87.5)
Diagnosis after history score	4	2.7 (0.8)	68.5 (20.3)	3 (2.5–3)	75 (62.5–75)
General physical examination score	8	5.3 (1.6)	65.7 (20.1)	5 (4–6.5)	62.5 (50–81.25)
Cardiovascular system examination score	8	5.1 (1.5)	63.9 (18.8)	5 (4–6)	62.5 (50–75)
Diagnosis after history and examination score	4	2.5 (0.9)	62 (22.3)	2 (2–3)	5 0 (50–75)
Investigation score	12	7.4 (1.8)	61.7 (15.4)	7 (6–9)	58.3 (50–75)
Diagnosis after investigation score	6	4.0 (1.3)	67.3 (20.9)	4 (3–5)	66.7 (50–83.3)
Management score	6	3.7 (1.1)	61.1 (19.0)	4 (3–4)	66.7 (50–66.7)
Cumulative score for arriving at a specific diagnosis	14	11 (2.5)	78.6 (17.8)	11 (9–14)	79 (64–100)
Cumulative score for differentials	14	7.4 (2.8)	53 (20)	7 (5.5–9)	50 (39–64)
Total score by OSCE	60	38.8 (9.5)	65 (16)	35 (31–46.5)	58 (52–78)
Total score by the conventional method	60	34.7 (4.3)	58 (7.0)	34 (32–37)	57 (53–62)

SD standard deviation   IQR interquartile range

TABLE III. Feedback obtained from the students regarding the cardiovascular system objective-structured clinical examination (CVS-OSCE) proforma and the effect of the Covid-19 pandemic on their learning

Item	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
Time allocated was adequate	17 (63)	10 (37)	0	0	0
This structure covers most of the discussion on a given topic	15 (56)	10 (37)	2 (7)	0	0
The structured assessment helps to make up for lost scores	10 (37)	12 (44)	5 (19)	0	0
This structure gives adequate importance to all necessary domains	11 (41)	13 (48)	1 (4)	2 (7)	0
More emphasis should be given to investigation and management as in contemporary practice	3 (11)	11 (41)	8 (30)	5 (19)	0
The structured assessment helps in deeper learning	9 (33)	12 (44)	6 (22)	0	0
OSCE assesses a candidate's competency better than the conventional method	3 (11)	14 (52)	6 (22)	4 (15)	0
Case scenarios were a good alternative to the conventional patient examination physically amid the worsening pandemic	18 (67)	7 (26)	1 (4)	1 (4)	0
Covid-19 pandemic affected our learning/clinical skill training	13 (48)	9 (33)	1 (4)	4 (15)	0
The present case scenarios might have helped us gain a better score	7 (26)	15 (56)	4 (15)	0	1 (4)

single best diagnosis from the given typical history. Making a close differential diagnosis reflects a methodical way of thinking and has been shown to reduce diagnostic error in clinical practice.[11] This fact needs to stimulate educators to discourage the 'one-diagnosis-only' practice among students.[12] The response of the students reflected the negative impact the Covid-19 pandemic on their training and showed that they were satisfied by the alternative tool of case scenarios. They also opined positively regarding the OSCE assessment for CVS.

Alternative methods of assessments for such examinations have also been explored by others. Pictures or videos demonstrating relevant examination findings have also been used for candidates to view and interpret.[13] This method is more applicable considering the increased adoption of telemedicine and virtual visits as modes of outpatient care.[14,15] Programmable mannequins have also been used for identification of abnormal findings and demonstration of physical examination skills.[16–18] Other options include conducting the practical assessment, using carefully chosen patients in a controlled environment.[19,20]

Limitations

It was a single-centre experience of 27 candidates, assessed only for CVS. We did not assess the effectiveness and validity of this modality in comparison to the standard method of physical patient examination and assessment, as practised during the pre-Covid-19 era. The present method of assessment, however, does not evaluate the candidate's ability to elucidate physical signs, which is an essential component of patient management.

Our study will help other medical schools to adopt OSCE-based assessment for high-stake examinations. It also illustrates the utility of CVS-OSCE in unmasking the area of deficiency in student's knowledge and skills so that the same can be reinforced in teaching programmes. The adopted proforma provides a prototype for scoring clinical skills in CVS for medical postgraduates. A similar proforma can be adapted for other systems as well.

We postulate that CVS-OSCE using structured case scenarios can become an effective, alternative method for physical examination and clinical assessment.

Conflicts of interest. None declared

REFERENCES

1 Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed* 2020;**91:**157–60.
2 WHO. Advice on the use of masks in the context of COVID-19. Interim Guidance. 5 Jun 2020. Available at *https://apps.who.int/iris/handle/10665/332293* (accessed on 30 Dec 2020).
3 WHO. Overview of public health and social measures in the context of COVID-19: Interim Guidance. 18 May 2020. Available at *https://apps.who.int/iris/handle/10665/332115* (accessed on 30 Dec 2020).
4 MCI advisory regarding final year postgraduate students in view of extraordinary situation due to outbreak of COVID-19 pandemic; 2020. Available at *https://mciindia.org/MCIRest/open/getDocument?path=/Documents/Public/Portal/LatestNews/Advisory%20regarding%20Final%20Year%20PG%20Students.pdf* (accessed on 30 Dec 2020).
5 MCI. Relaxation in conduct of postgraduate examination for broad speciality courses; 2020. Available at *https://mciindia.org/MCIRest/open/getDocument?path=/Documents/Public/Portal/LatestNews/Advisory.pdf* (accessed on 30 Dec 2020).
6 Harden RM, Stevenson M, Downie WW, Wilson G. Assessment of clinical competence using objective structured examination. *Br Med J* 1975;**1:**447–51.
7 Stillman PL, Wang Y, Ouyang Q, Zhang S, Yang Y, Sawyer WD. Teaching and assessing clinical skills: A competency-based programme in China. *Med Educ* 1997;**31:**33–40.
8 Jain SS, DeLisa JA, Eyles MY, Nadler S, Kirshblum S, Smith A. Further experience in development of an objective structured clinical examination for physical medicine and rehabilitation residents. *Am J Phys Med Rehabil* 1998;**77:**306–10.
9 Novack DH, Volk G, Drossman DA, Lipkin M. Medical interviewing and interpersonal skills teaching in US medical schools. Progress, problems, and promise. *JAMA* 1993;**269:**2101–5.
10 DNB Final Practical Examination for December 2019 Session–(Revised OSCE Based Scheme)–No Requirement of Real Patients; 2020. Available at *https://natboard.edu.in/viewNotice.php?NBE=ZGJHenNrZWtPN2ptQXZGZzFyd0p3UT09* (accessed on 30 Dec 2020).
11 Maude J. Differential diagnosis: The key to reducing diagnosis error, measuring diagnosis and a mechanism to reduce healthcare costs. *Diagnosis (Berl)* 2014;**1:**107–9.
12 Ahmed AM. Deficiencies of history taking among medical students. *Saudi Med J* 2002;**23:**991–4.
13 Rajan R, Radhakrishnan DM, Srivastava AK, Vishnu VY, Gupta A, Shariff A, *et al.* Conduct of virtual neurology DM final examination during COVID-19 pandemic. *Ann Indian Acad Neurol* 2020;**23:**429–32.
14 Eberly LA, Khatana SA, Nathan AS, Snider C, Julien HM, Deleener ME, *et al.* Telemedicine outpatient cardiovascular care during the COVID-19 pandemic: Bridging or opening the digital divide? *Circulation* 2020;**142:**510–12.
15 Gorodeski EZ, Goyal P, Cox ZL, Thibodeau JT, Reay RE, Rasmusson K, *et al.* Virtual visits for care of patients with heart failure in the era of COVID-19: A statement from the Heart Failure Society of America. *J Card Fail* 2020;**26:**448–56.
16 Brown C, Morse J, Nesvadba D, Meldrum A. Twelve tips for introducing simulation based assessment in the objective structured clinical examination. *Med Teach* 2021;**43:**380–3.
17 Tsai TC, Harasym PH, Nijssen-Jordan C, Jennett P, Powell G. The quality of a simulation examination using a high-fidelity child manikin. *Med Educ* 2003;**37** (1 Suppl)**:**72–8.
18 Srinivasan M, Hwang JC, West D, Yellowlees PM. Assessment of clinical skills using simulator technologies. *Acad Psychiatry* 2006;**30:**505–15.
19 Boursicot K, Kemp S, Ong TH, Wijaya L, Goh SH, Freeman K, *et al.* Conducting a high-stakes OSCE in a COVID-19 environment (version 1). *MedEdPublish* 2020;9:54. doi.org/10.15694/mep.2020.000054.1
20 Choi B, Jegatheeswaran L, Minocha A, Alhilani M, Nakhoul M, Mutengesa E. The impact of the COVID-19 pandemic on final year medical students in the United Kingdom: A national survey. *BMC Med Educ* 2020;**20:**1–1.

Appendix 1
Case scenario prototype

PRESENTING ILLNESS

A 32-year-old woman presented with dyspnoea on exertion (New York Heart Association-II) for the past 14 years. It got worse for the past 5 months and is associated with intermittent palpitation for the past 5 months.
Possibilities and discussion

HISTORY OF PRESENTING ILLNESS

The patient was well until 18 years of age when she started experiencing dyspnoea on exertion, which was insidious in onset and gradually progressive. It used to relieve with rest and there was a history of occasional episodes of paroxysmal nocturnal dyspnoea and orthopnoea. Now, she can walk for only 250 m at a stretch.

She had intermittent episodes of palpitations at rest, which used to occur spontaneously for the past 5 months. There was no history of similar episodes of palpitation in the past.

There was no history of syncope, chest pain, chronic cough, haemoptysis, fever or any history of pedal oedema or right upper quadrant pain abdomen.
Possibilities and discussion

HISTORY PRIOR TO THIS EPISODE

She had a history of hospitalization with fever and arthralgia at 6 years of age. There was no history of rashes or involuntary movements.

There was no history of squatting.

There was no history of tuberculosis in the past.

She was not a known case of diabetes mellitus or hypertension.

She gave birth to a healthy child at 25 years of age, following an uneventful pregnancy.

FAMILY HISTORY

There is no similar illness in the family.

DRUG HISTORY

She receives an intramuscular injection every 3-weekly since the onset of illness along with a few other oral drugs.
   ## Possibilities and discussion

GENERAL PHYSICAL EXAMINATION

She is thin built and poorly nourished.
   Blood pressure was 112/72 mmHg in the right arm, in sitting posture.
   Pulse is 92/minute, low volume, irregular, with no radio-radial or radio-femoral delay
   Jugular venous pulsation is 5 cm above the angle of Louis at 45° angle, 'a' wave absent; x, v and y waves are present.
   There is no pedal oedema or jaundice.
   ## Possibilities and discussion

CARDIOVASCULAR EXAMINATION

There is no precordial bulge.
   Cardiac apex is in the left fifth intercostal space, 1 cm medial to the mid-clavicular line, localized and ill sustained. Second heart sound is palpable. A diastolic thrill is palpable in the mitral area, best in the left lateral position and during full expiration. S1 is loud, S2 is normally split, P2 is loud and there is a presence of an opening snap just after S2. There is a grade IV, low-pitched mid-diastolic rumbling murmur which is best heard at the apex, with the bell of stethoscope in left lateral position at height of expiration. There is no click, rub or other murmurs.
   ## Possibilities and discussion

OTHER SYSTEM EXAMINATION

The trachea is in the centre.
   The chest is symmetrical with equal expansion.
   Transverse chest:anteroposterior diameter=7:5.
   There are no crepitations/wheeze.
   The abdomen is soft and non-tender.
   There is no hepatosplenomegaly.
   Higher mental functions as assessed by mini-mental state examination are normal.
   Cranial nerve examination is normal.
   Gait is normal.
   Motor and sensory examinations are normal.
   ## Possibilities and discussion

CHEST RADIOGRAPH

##Discussion

ELECTROCARDIOGRAPH

##Discussion

Appendix 2
Conventional assessment scoring proforma

Item	The score obtained by the candidate	Maximum score allotted
History		30
Physical examination		30
Diagnosis		10
Differential diagnosis		10
Investigations		5
Treatment		5
Discussion		5
Special credits/discredits		5
Total		100