# A pilot of a Virtual Objective Clinical Examination in dental education. A response to Covid-19.

## Key Points


## Abstract

**Introduction** The outbreak of COVID-19 necessitated a move to online teaching and assessment. The objective structured clinical examination (OSCE) has been an integral part of dental examinations for several decades. The COVID-19 pandemic stopped face to face examinations around the world. An Online Virtual OSCE (VOSCE) was developed and piloted for dental undergraduate assessment.
**Aim** This initial report outlines the steps required to run an OSCE on-line.
**Discussion** With careful planning the VOSCE is a useful assessment method in difficult times. Feedback from staff and students was favourable.
**Conclusion** Although significant organisation was required the examination process worked well for both students and examiners. Despite limitations in relation to technical dental procedures, the VOSCE could be a viable alternative to face to face clinical examination.



## Key words

Dental students, objective structured clinical examination, clinical assessment, VOSCE, on-line, Covid-19.


## Introduction.

The effects of COVID- 19 on student assessment in Universities have been profound. While a move to online examination is applicable to some courses, where written examinations are the primary means of assessment, this modality is not apposite to all courses at all times. Assessments are required at set times throughout a course, and prior to graduation, to ensure competence of the new graduate[1]. Clinical practical examination is vital in this assessment. The objective structured clinical examination (OSCE) was introduced to medical and dental education over 40 years ago[2,3] and is considered to be an appropriate tool, both formative and summative, for identifying students at risk of poor performance clinically[4]. This assessment modality is an essential part of the examination process in many Dental Schools.

Clinical assessment in pandemic lockdown presented an unprecedented challenge in 2020. While continuation with a conventional 'live' OSCE was possible in some countries, albeit with a special protocol[5], the measures implemented by the UK government made any form of gathering of more than 2 people illegal[6].

VOSCE or virtual OSCE have been described in the past. This term has referred, predominantly to the use of video recording of the examination process for marking, calibration and training purposes[7-11]. VOSCE, under several names (eOSCE, videoconferencing, teleOSCE, WebOSCE, EQClinic) has been described in the literature since the early 2000s[10,12-16] as a method of

performing OSCEs using internet technology in medicine. The predominant reason for this technological approach was the scattered nature of the students requiring assessment, either those on secondment to another institution[12] or in a remote and rural setting[14], although it has been suggested that the saving in time and faculty members was the major benefit[15]. While VOSCE was generally well accepted by most students and staff and gave consistent results, comparable with conventional examination[12,15,16], it has not become a commonly used modality and has not been described for use in dental undergraduate assessment. Cost, difficulty in transferring questions to a digital format, extra examiner training and cultural acceptability are amongst the reasons cited for limited adoption of this technological approach[17,18].

To allow students to complete their final examinations in our University it was necessary to devise and implement a VOSCE to assess the sameprofessional regulator, General Dental Council, UK(GDC),, Intended Learning Outcomes as a conventional 'live' OSCE [19].

This paper describes the steps required to create a 10 station VOSCE using the Zoom[20] platform. It consistently reflected the 'live' situation. All preparation, calibration, and assessment were completed on-line. In addition, feedback from staff, students and external examiners involved in the examination, was sought, to gauge the acceptability of the process to both groups.

## Pre VOSCE planning and preparation

### Subjects

Three undergraduate students, one male and two female who had not, otherwise, been able to satisfy the course requirements, were offered the opportunity to undertake a VOSCE.

Initial orientation and preparation of these candidates for examination, using this new medium, was conducted on Zoom[20]. These individual meetings allowed evaluation of each student's Wi-Fi connectivity and IT device requirements.

All students were asked to complete an academic integrity statement, in addition to giving consent to the VOSCE being recorded for Quality Assurance purposes.

### Examination preparation

Ten questions from the BDS FINALS OSCE examination bank were selected, all of which had been used previously and shown to perform consistently when used in a 'live' OSCE. The questions were adapted to reflect the fact that manual clinical procedures could not be assessed. Standard setting was carried out online using a Modified Angoff method[21]. Password protected packs were sent to the examiners for consideration and at a subsequent on-line (Zoom[20]) meeting each question was considered individually before arriving at the cut score pass mark.

A PowerPoint[22] presentation of each question, including instructions to candidates and any artefacts (radiographs, photographs, special investigation results) was created.

Each assessment item was originally devised as a six-minute station, incorporating one minute, reading time, which takes place outside the station, and 5 minutes to complete the task inside the station.

To compensate for the new format of the questions and the possibility of IT disruption the original time allotted was doubled in accordance with University of Glasgow policy[23]. While extra time may be considered an advantage, this is not always the case in an oral examination. Consequently, the student was given the option to stop once the normal, five minutes had elapsed.

The content of the examination was reviewed, and quality assured, by external examiners.

Questions were paired into similar subject areas, for example paediatrics and orthodontics. This facilitated the creation of examination teams. Each examination team was assigned to a breakout room on the Zoom[20] platform with 2 stations to assess within this room.

Fifteen experienced examiners were selected, two examiners for each pair of questions with one reserve examiner for each breakout room. The increased number of reserves was considered necessary due to the possibility of IT problems and an increased chance of illness during the Covid-19 pandemic. A principal examiner for each pair of questions was identified. Where the station required a simulated patient (SP), one examiner interacted with the student in this role.

**Familiarisation sessions for Staff and Students**

Two practice sessions were conducted one for the staff and one for students

Breakout rooms were set up and examiners assigned to the rooms. This ensured examiners were familiar with the layout and visual display of the Zoom[20] breakout rooms and aimed to improve examiner technical capability in screen sharing and recording. Time spent in the virtual breakout room gave examiners the opportunity to discuss how the station would run and decide how they would interact with the student, if the station required it.

Simulated movement of the staff through the VOSCE virtual breakout rooms, allowed precognition of any logistical challenges and collation of examiner feedback on the PowerPoint[22] packs. It also familiarised examiners with logistical movement of students and demonstrated how the timing system would work. **Figure 1** demonstrates how a station appears in a Zoom[20] breakout room.

A three-question practice VOSCE was devised for the students to undertake in preparation for the BDS5 FINALS VOSCE and utilised questions the students had answered in a previous assessment. This acclimatised and familiarised the students with the VOSCE logistics and visual appearance of the stations, while not causing them the concern of actual exam conditions.

## VOSCE logistics (A technical note on set up and execution of a VOSCE)

**1 Create meeting** - Host schedules the Zoom[20] meeting and distributes link to students and staff in advance.

Ask all examiners and students to ensure the correct name is displayed on their Zoom[20] account.

**2 Security** - Enable waiting room feature when setting meeting.

**3 Enable emergency contact** - The host sends an email to all with an emergency telephone number to use if there is a serious IT issue.

**4 Set up virtual breakout rooms** - Select manual assignment of participants - create enough virtual rooms for questions, an external examiner room, and at least one student meeting room. **(Figure 2)**

**5 Assign Co-hosts** - This allows the participant to navigate through breakout rooms independently without having to be moved by the Host.

It is vital that the host remains active at all times as they are in control of the whole examination.

**6 Briefing examiners** – An adapted version of the standard pre OSCE exam briefing is delivered prior to assignment to breakout rooms.

**7 Student briefing -** The students are given written instruction of what to expect in the exam and instructed how to customise their screen view in the breakout room.

**8 Mark sheets** – These are sent electronically, in examiner packs, prior to the examination. If remote print facilities are unavailable, paper copies could be posted by recorded delivery prior to the VOSCE.

All questions were dual marked independently and post examination a separate 'master copy' of the agreed mark produced. Collection of mark sheets was conducted electronically.

**<u>In the virtual breakout room</u>**

**1** The Principal examiner opens the PowerPoint on their own device.

**2** The host allows the principal examiner in each virtual breakout room to record.

**3** The principal examiner selects 'Record, share screen and gallery view.' The PowerPoint[22] pack is then displayed within the breakout room.

**4** The principal examiner is in control of the PowerPoint[22] slides. The student asks for the slides to be moved forward or back at their own speed. At any time, the student can ask to see any slide again.

**5** The lead invigilator conducts a 'walk through' of stations to ensure the examiners are displaying the correct questions, and that they are recording. The students are then allocated to their starting breakout room. The lead invigilator carries out a final 'walk through' to ensure

the students are ready. A message is broadcast by the Host to 'start the exam - 2 minutes reading time' (**Figure 3** summarises the on-line messages). Timing of the exam begins.

**6** When 'Reading time over' message is displayed Examiner one examines and examiner two acts as the SP, if required. At 7 minutes (5 minutes inside the station), a written message appears on screen, '7 minutes gone' and the lead invigilator travels through the rooms with a verbal cue '7 minutes gone'.

**7** At 11 minutes a '1-minute warning' screen message appears. One minute later the 2-minute reading time appears, and the student moves from the first to the second question within the breakout room. The examiner for question one assumes the role of SP for question two. Question two is displayed instantly by examiner two.

**8** The process continues until 24 minutes have elapsed in the virtual breakout room.

**9** Once 24 minutes have elapsed the Host re assigns each student to the next virtual breakout room. In real time this results in the Student disappearing from the room they are in and reappearing in the next room, a process that takes approximately ten seconds.

**10** Communication - The broadcast feature is a one-way transmission from the host to participants and can be seen by everyone. A participant cannot respond to a Broadcast message. The CHAT feature only allows communication with participants in that room and **does not** transmit outside that room.

**11** The 'Ask for help' Zoom feature can be used to alert the host that a specific breakout room requires assistance. The host must then ASSIGN themselves to that virtual breakout room to assist. Setting up alternate means of communication by mobile phone, SMS text or email is recommended.

**12** Host overview - It is recommended that the host prints out the list of timings and student movements in advance. This allows a further check that each student is in the correct breakout room at the correct time.

## Outcomes of Pilot

For the majority of staff and students the VOSCE progressed in exactly the same manner as a conventional OSCE. The students progressed through the stations finishing each one within the allotted time. They completed each question within the 5 minutes of active station time and did not require the additional time built into the stations. However, a larger sample might better identify a requirement for this extra time. There was significant IT disruption with part of the exam for one student. The extra time built into the questions was not enough to facilitate resolution and it was necessary to run the stations again once a new Wi-Fi hub connection had been established. With a new internet connection, the examination progressed smoothly with no further interruptions.

Following both the practice and actual VOSCE examiners and students provided feedback on the VOSCE to the exam team. This was conducted by e-mail and informal verbal feedback on Zoom.
None of the staff or students had used Zoom[20] before the COVID pandemic. All of the staff and students agreed that the VOSCE felt natural and had been a good substitute for the OSCE given the circumstances. One student voiced a preference for this format. Both groups felt it allowed the students to give an accurate reflection of their abilities and they were not disadvantaged by the new format. The training and practice sessions were considered vital in removing anxiety about the use of new technology. Additionally, the pre-VOSCE briefings were very useful in alleviating anxiety and answering logistical questions. Staff felt marking in the virtual environment was no more difficult than in the 'live' situation and that being an actor/examiner was possible and easier than they had imagined. The inability to assess purely practical skills was voiced; although it was noted that it was appropriate for assessing the ILOs required by the examination. Overall, the staff, students and external examiners felt that they would be comfortable to use the system again.

## Discussion

Development of a VOSCE was essential to complete final year during the COVID-19 lockdown this year. Without an equivalent to our 10 station OSCE a number of our students could not have satisfied our course requirements and graduated.

Selecting and adapting existing questions to the VOSCE format was not especially difficult or time consuming. Assessment of purely practical skills was not possible, although longitudinal evaluation of practical skill is probably better assessed by robust, continuous, longitudinal evaluation and competency assessments[24]. However, the other goals of an OSCE examination could be assessed. Of the 'blueprint of skills' described by Manogue and Brown[3]: only technique was problematic. This was highlighted in the feedback received. From this perspective the skills that can be assessed online: diagnosis, interpretation and treatment planning coupled with communication skills are probably the most appropriate in this format.

Actors were not used as SPs in this examination. Professional actors are normally used in the 'live' OSCE. It was felt that adding actors into what was already a new experience for staff would add another layer of complexity to the procedure. An additional 10 internet connections, or actor illness, could have contributed to unnecessary stress in a high-stakes assessment on a new platform. The use of examiners as actors had no detrimental effect on the students. Students felt at ease interacting with the examiner. Pre VOSCE, staff opined that the lack of actors would make the examination more difficult for the students: interacting with a known staff member would prevent the student from relating appropriately. This was not reflected in the post VOSCE staff or student feedback.

It would be feasible to defer control of question slides to students. However, this needs to be actioned each time a new student enters a new breakout room and would cause delay.

Additionally, within some questions, examiner discretion is required regarding artefact display.

On-line standard setting worked well and was simple to set up: overall it proved quicker than conventional standard setting. As the standard setters had access to the questions for more time, they were able to be more stringent in their evaluation of the questions and were more forthcoming with questions and modifications.

The practice sessions with the students, as confirmed by their feedback, was essential. The session, with OSCE questions the students had faced before, meant that the only variable was the format. This allowed the students to gauge the differences inherent in the VOSCE. Following the practice session, they were confident with the procedural aspects of the assessment.

The practice session with the staff was useful in several ways. IT connections could be assessed. Familiarity with Zoom[20] could be ascertained, and appropriate training supplied. It allowed assessment of the translation of OSCE questions to VOSCE: feedback following the practice examiner session was valuable in fine tuning the questions to work well online. Practice of the questions and suitable allocation of the actor/examiner roles was possible prior to the examination and this ultimately helped with the calibration process.

Pre examination concerns surrounding internet connection problems were vindicated. One student who was located overseas had internet connectivity problems during the examination. While the examination had extra time built into every question to allow for intermittent faults (12 minutes for each station rather than 6) this could not deal with a persistent connection failure. In this case utilisation of another wi-fi hub solved the problem. Provision of 4G Wi-Fi hubs to students with poor internet connection may be a way around this difficulty and has been utilised by our University.

Depending upon the reason for internet failure mobile phone, 'WhatsApp'[25] and FaceTime[26] would all allow the examination to continue if required. In view of the potential for IT failure it is essential to have provision to run the examination, or parts of it, again for any students whose wi-fi may fail catastrophically during the examination.

Zoom[20] is an excellent app for web conferencing, and although it is not designed for VOSCE, the use of virtual breakout rooms works well for individual VOSCE stations.

There are, however, some hurdles to overcome. The use of the platform in examinations, is staff intensive, requiring a host and a lead invigilator for each circuit. Additional staff would be required for upscaling to a full class, and there would be training implications, with staff fatigue a possibility. Theincreased time required to deal with moving students simultaneously, as well as additional exam time, as stipulated by the university for online assessment, all added to the logistical requirements. While examining multiple questions in one virtual breakout room aids delivery, by reducing the requirement for student movement: it is important to avoid being over ambitious with the overall number of questions in the examination.

Some modifications to the software enabling it to be more user friendly include improving communication to provide two-way contact between the virtual breakout rooms and the host, increasing the size of text in 'Broadcast' function to aid readability, and improvement of the transcription function. However, elements that worked well, included recording, to facilitate review and marking calibration, and the use of cloud for storage.

## Conclusion

Virtual Objective Structured Clinical Examination is achievable in dentistry and offers a similar robust examination experience for staff and students. It requires meticulous planning but, for any institution where the OSCEis an essential part of assessment, adaptation to an on-line format is possible.

This VOSCE pilot will now be extrapolated to a cohort of 80 students and formally evaluated while COVID-19 social distancing measures remain in place.

## Conflict of Interest

There is no conflict of interest associated with this study. Whilst Zoom gave permission for use of screen images we did not work in partnership with Zoom and received no incentives for using the platform in our assessments.

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Figures

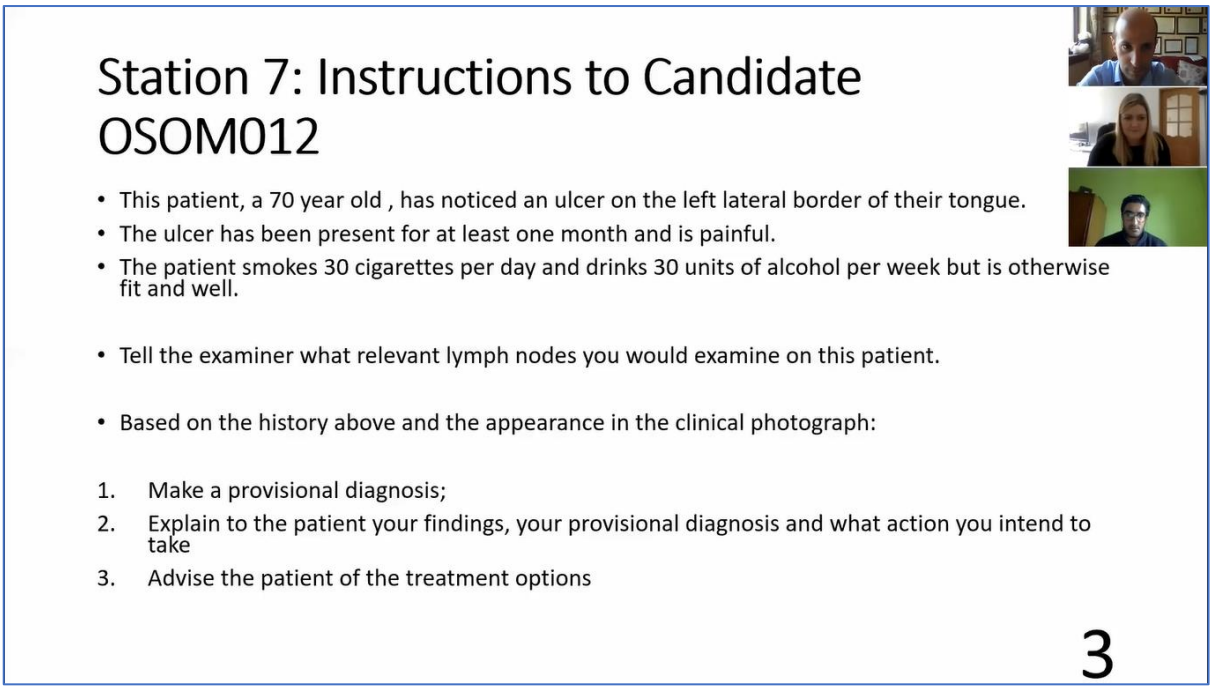


**Figure 1. Sample station and virtual breakout room appearance**

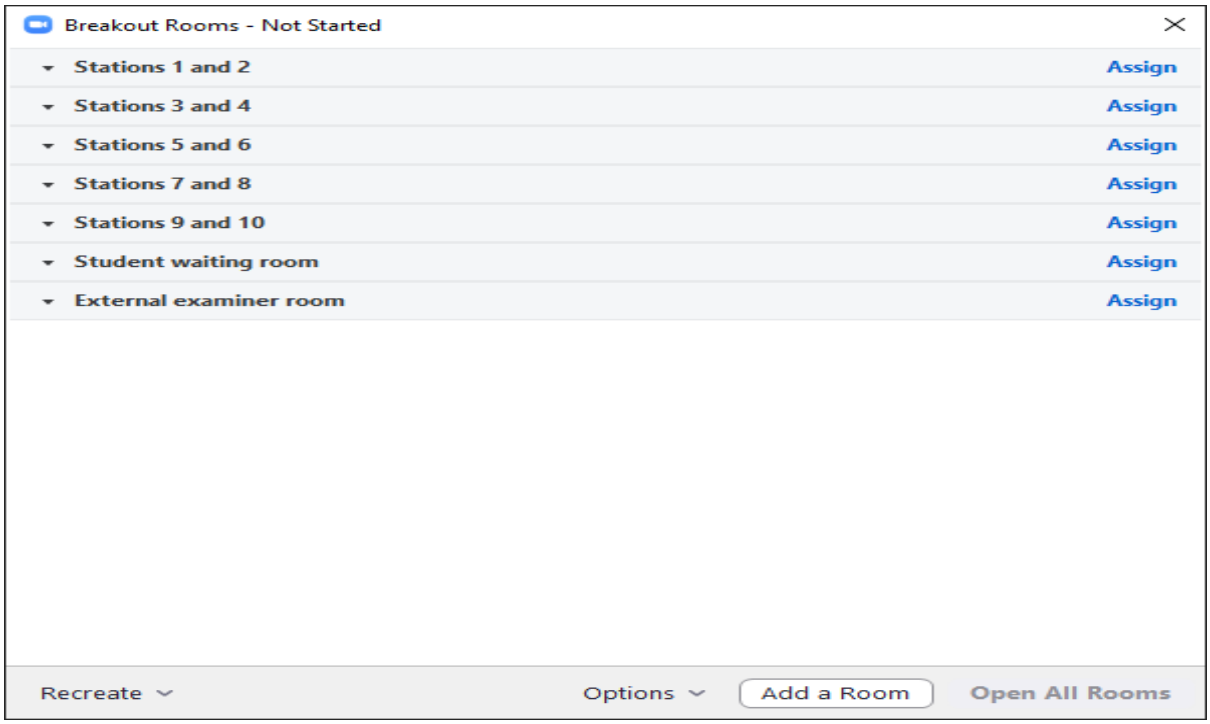


**Figure 2. Virtual breakout room creation and renaming**

| Total time elapsed (min) | Broadcast message |
|---|---|
| 0 | Start 2-minute reading time |
| 2 | 2 minutes reading time over |
| 7 | 7 minutes gone |
| 11 | 1-minute warning (11 minutes gone) |
| 12 | Start 2-minute reading time |
| 14 | 2 minutes reading time over |
| 19 | 7 minutes gone |
| 23 | 1-minute warning (11 minutes gone) |
| 24 | Jump to next room, start 2 minutes reading time |

**Figure 3. Broadcast messages summary**