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Original Research

Resident Preparation for the American Board of Anesthesiology Objective Standardized Clinical Examination: A Comparison of Virtual Telesimulation With In-person Simulation

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Introduction

The Objective Structured Clinical Examination (OSCE) was conceived in 1975 to assess clinical competence of medical students with objectivity and reproducibility on the basis of well-defined criteria.[1] In 2018, the OSCE was incorporated into the APPLIED examination for certification in anesthesiology by the American Board of Anesthesiology (ABA)[2] with the goal of assessing competencies that may not be adequately evaluated with standardized written and oral examinations. This is similar to certification processes in the United Kingdom,[3] Israel,[4,5] and Canada.[6] Some anesthesiology programs in the United States, including ours, have incorporated OSCE preparation into their training curriculum,[7,8] but many have not, citing limited time, expertise, and funding.[9] Simulated OSCEs can help residents identify knowledge gaps and prepare for a high-stakes examination with formative feedback in a low-stress environment. Previous experience with an anesthesiology OSCE improves performance in simulated scenarios,[10] and our in-person simulated OSCE (SOSCE) program is beneficial in preparing candidates for the APPLIED examination.[7]

During the COVID-19 pandemic, social distancing practices and travel restrictions led the ABA to suspend the oral and OSCE components of the APPLIED examination and subsequently propose a virtual format beginning in the spring of 2021.[11] These concerns similarly limited our ability to conduct in-person simulation education events.[12] Given that the SOSCE is valuable to trainees and that 5.5% of ABA candidates failed the OSCE component of the APPLIED examination in 2018,[13] we considered it a priority to maintain this component of our curriculum. Accordingly, we adapted our SOSCE to a telesimulation format via Zoom (ZOSCE), permitting large groups of examinee participants, faculty proctors, and standardized patients (SPs) to participate remotely. Telesimulation OSCEs have successfully accommodated medical students at off-site rotations[14] and in Qatar during COVID-19 pandemic restrictions.[15] Although current conditions mandate this alternative format for educational activities, in the absence of these restrictions, a telesimulation OSCE may still be desirable for candidates who lack access to simulation centers or have time, travel, or financial limitations. In a 2016 survey, most anesthesiology residency program directors agreed that it was the program's responsibility to prepare residents for certification and that practicing OSCEs was important.[9] Most did not have an OSCE program, although 75% planned to develop one. A telesimulation-based OSCE may bridge this gap, but evidence is needed to determine whether it is comparable to an in-person SOSCE.

We hypothesized that the ZOSCE would be a useful and informative process in preparing for the APPLIED examination and a valuable formative assessment, similar to our SOSCE, by providing individualized confidential debriefing with a faculty proctor. The telesimulation format may make a practice OSCE more feasible for most residency programs.

Materials and Methods

The Johns Hopkins Institutional Review Board (IRB00110777) approved this study and waived the requirement for informed consent. This manuscript adheres to OSCE reporting guidelines.[16] Our in-person SOSCE program and the simulation educational structure in our residency have been described previously.[7] In brief, our institution is an academic tertiary care hospital in the northeastern United States with an anesthesiology residency program averaging 25 residents per year. Anesthesiology residents have protected didactic days twice monthly that include 2 hours for simulation and hands-on workshop activities. The SOSCE, as part of this simulation curriculum, is held in our simulation center, which has fully equipped private patient examination rooms, audio and video observation, and recording capability. Medical students and junior residents are recruited for the roles of SPs,

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as previously described.[7] Due to social distancing concerns during the COVID-19 pandemic in the spring of 2020, we adapted the SOSCE into a telesimulation format by using Zoom (Zoom Video Communications Inc, San Jose, CA), creating the ZOSCE.

As we had done previously for the SOSCE, we conducted the ZOSCE for all clinical anesthesia residents in their final year of training (CA-3) in 2-hour sessions scheduled over 4 time slots on 2 dates. The 2-hour sessions included prebriefing and debriefing and could accommodate up to 7 participants. Each participant started at 1 of 7 stations and rotated through all of them. Hence, with 4 sessions, we could accommodate as many as 28 CA-3 participants before graduation.

The 7 stations included 5 on communication and professionalism (discussion of treatment options and informed consent, periprocedural complications, ethical issues, communication with other professionals, and practice-based learning and improvement) and 2 stations on technical skills. From the 3 technical-skill categories listed by the ABA (interpretation of monitors, interpretation of echocardiograms and surface ultrasound of lung, and application of ultrasonography), we created 1 station for interpretation of monitors, echocardiograms, and surface ultrasound of lung and a second on application of ultrasonography that focused on vascular cannulation and peripheral nerve blocks. We chose these stations to prepare our CA-3s for changes to the examination format originally planned for implementation in 2021, recently postponed to 2022.[17] The existing stems and assessment tools for each scenario from the SOSCE were used[7] with minor modifications (see Appendix 1). For instance, instead of performing a physical examination, participants were instructed to verbally describe how they would perform the examination and ask SPs to describe any relevant findings. In the application of ultrasonography station, rather than requiring participants to obtain and interpret ultrasound images on a live model, we demonstrated a series of still images and asked participants to identify labeled structures and answer clinically relevant questions about anatomical relationships or potential complications from vascular cannulation or nerve blocks. Given that time was no longer devoted to image acquisition, we expanded the number of anatomical sites tested and the number of questions that were asked verbally by the SP who used "share screen" to display the images. For interpretation of monitors, echocardiograms, and surface lung ultrasound, the SP similarly shared still and moving ultrasound and echocardiogram images or videos as well as simulated patient-monitor clips of vital signs generated with virtual patient monitor Laerdal simulation software (Laerdal Medical, Stavanger, Norway).

Proctors were members of our residency education leadership familiar with milestone and core competency assessment and were given the assessment tool ahead of time for review. In addition, they were given (or developed) the audiovisual materials for the 2 technical-skills stations with answer key. The SPs met with the facilitator or one of the proctors prior to the ZOSCE for coaching in their role. They were given relevant materials such as review articles on the clinical aspects of their topic (eg, postdural puncture headache[18] or Nil Per Os guidelines[19] prior to elective surgery), as well as a list of motivational acting tips and questions and concerns they could express during the interview. Two CA-3 participants had previously acted as SPs in the in-person SOSCE but were only aware of the specifics of 1 of 7 stations. This may have affected their performance as examinees, but because this was a formative evaluation, we did not feel this was a significant conflict.

All CA-3 participants, faculty proctors, and SPs received a Zoom invitation for an appointed time from the facilitator. The facilitator opened the main meeting room and provided a 10-minute prebrief that included an overview of the ZOSCE format and timing, a description of the use of breakout rooms to create private rotating stations and method for broadcasting time prompts, suggestions for screen layout for optimal viewing, and method of requesting assistance in the event of technical difficulties. Each participant was paired with a faculty proctor for the duration of the examination, and the 2 were assigned to their own breakout room, to which they returned for each component of the examination. The facilitator then placed an SP in each breakout room. Per ABA guidelines, residents were allotted 12 minutes at each of the 7 stations. During the first 4 minutes, each participant reviewed the ZOSCE scenario stem via their SP's "share screen". After 4 minutes, screen sharing was stopped and the SP enabled video, simulating the participant entering the room for an 8-minute encounter. After 6 minutes had passed, the facilitator gave a 2-minute warning that the breakout rooms would close and all participants would automatically be returned to the main meeting. The CA-3 participant/faculty proctor pairs were returned to their previous individual breakout rooms, and the facilitator assigned each a different SP by shifting each 1 position in the rotation. Logistically, it was easier to move 1 SP at a time rather than moving the proctor and CA-3 participant. Figure 1 shows a graphical representation of this scheme.

The proctor observed the performance of the CA-3 participant in real time and graded each objective in the assessment tool on a 0–2 scale (0 = *no credit*, 1 = *partial credit*, 2 = *full credit*). At the end of the 7-station ZOSCE, all participants returned to the main meeting. A transesophageal echocardiography (TEE)–certified cardiac anesthesiology faculty member replayed the echocardiogram videos and debriefed interpretation of echocardiograms. Then the facilitator replayed the vital sign monitor loops and debriefed interpretation of monitors. Finally, each CA-3 participant/faculty proctor pair entered a private breakout room for the last time, and the proctor provided feedback on the remaining stations. Although the specific scores were not shared with CA-3 participants, proctors reviewed the assessment tool and shared comments on positive aspects of their performance and those needing improvement from each of the stations. As was previously done in the SOSCE, the facilitator compiled deidentified feedback from proctors and SPs on each station into a written "Pearls and Pitfalls" document that was emailed to all CA-3 participants following the event for their reference. The CA-3 participants, faculty proctors, and SPs

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filled out a Likert-style evaluation specific to the ZOSCE experience. The CA-3 participants also filled out an evaluation with questions similar to those asked in the SOSCE evaluation survey and had the opportunity to provide free-text comments, allowing us to make a direct comparison with the previous in-person format.

Because sessions had varying numbers of objectives, we calculated percentages for performance scores by dividing participants' total number of points by the maximum possible points for a given station. We then used these percentage scores in the analyses and reporting. Performance data for the study group were compared with the SOSCE historical cohort from 2017 and 2018 using an independent-samples *t* test.[7]

We used a Likert-style survey with 2 main sections to evaluate the ZOSCE. In the first section, participants were asked questions about their satisfaction specifically with the ZOSCE format. Answers used a 10-point scale from 1 (*strongly disagree*) to 10 (*strongly agree*), consistent with a previous survey instrument used to assess satisfaction with telesimulation.[12] The second section included questions similar to those in the SOSCE evaluation survey related to the utility of this experience for OSCE preparation. The responses to these questions used a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*), consistent with the instrument used to assess satisfaction with the SOSCE.[7] The survey also included a free-text item for participants to provide any additional feedback regarding this experience.

We analyzed the Likert-style survey responses using the nonparametric Mann-Whitney *U* test because the Shapiro-Wilk test was significant and assumptions for parametric tests were not met. Negatively worded items were reversed before the analyses and reporting. Before reporting the combined survey results for the 2 sessions that occurred in 2 separate weeks, we compared the results of the sessions for any differences. Effect size was calculated using the Cohen d for the *t* test for performance and for the Mann-Whitney *U* test for comparisons between the study group and historical controls.

All statistical analyses were carried out with SPSS Statistics for Mac, version 25.0 (IBM Corp, Armonk, NY), with significance level set at $P < .05$. In the "Results" section we report some examples of free-text comments to illustrate the nature of these responses. Missing data are the result of objectives not being answered on a paper-based assessment tool or interactions between the faculty proctor and CA-3 or CA-3 and SP being disrupted by technological difficulties. We included all available data and used pairwise deletion for the missing data.

Results

Of 23 eligible CA-3 residents, 22 (11 in the first session and 11 in the second) participated in the ZOSCEs across 2 separate dates spaced 2 weeks apart, with the first session held in late May 2020 and the second session in early June 2020. Resident performance data were collected from all 22 participants, and they all completed the survey evaluations of the ZOSCE.

Performance Data for the ZOSCE

The mean performance scores ranged from 82.2% (technical skills–ultrasound) to 94.9% (informed consent). The minimum score was 38% (practice-based learning and improvement), and the maximum score was 100% (achieved in all 7 scenarios). The ZOSCE scores were significantly lower than those for the historical cohort in the communications with professionals (88.3% vs 94.4%, $P = .007$) and technical skills–ultrasound (97.2% vs 82.2%, $P < .001$) components (Table 1). The most commonly missed objectives are listed in Table 2. The 3 most commonly missed items were the same as those in the historical cohort and were stated objectives listed in the ABA content.

Examinee Satisfaction With the ZOSCE Format

The survey questions revealed no differences between the 2 ZOSCE sessions. Table 3 shows the summary statistics for participant satisfaction with this educational modality. Overall, residents rated the learning experience positively, with median responses that ranged from 8–10 (*strongly agree*). Participants reported that that this was a reasonable substitution for a live SP encounter in the simulation center (median = 9) and that this was a valuable use of their time (median = 10). Some of the participants (n = 10) also chose to leave open-ended feedback regarding their impressions and the values of this educational offering. Some examples follow:

"Overall I think this was a good alternative to in-person OSCE. I struggled with some of scenarios, specifically the vital signs scenarios with the long stems."

"Wonderful use of time!"

"Great and valuable session. Thank you all for your time and commitment to helping us feel more prepared."

"Thank you all for taking the time, it was seamless. Great instructions and organization and also content; it was very educational."

"It was an awesome experience. Great execution, I was very impressed. Left feeling I know the format and content of the exam. Thank you!"

Comparison With Historical Cohort

Participants agreed that the ZOSCE was helpful in preparing for the actual OSCEs and provided responses similar to those of the historical cohort who participated in SOSCE in person. The only significant difference was related to the performances of the SPs. The ZOSCE group reported this aspect to be less convincing ($P = .019$; Table 4). There was no difference in participants reporting feeling uncomfortable being tested in front of their peers ($P = .315$; Table 4).

Discussion

Performance on the telesimulation-based ZOSCE was similar to that on the in-person SOSCE. Satisfaction with the ZOSCE format was high, and participants rated the quality and value similarly to the SOSCE with minor exceptions. The participants, proctors, SPs, and facilitator were in separate locations with minimal impact on the learning experience. Thus, it is feasible to offer a simulated OSCE over a virtual meeting platform with no in-person interaction. Residency programs that want to initiate a simulated OSCE program may find it more practical to do so virtually because it resolves many of the

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cited obstacles and permits collaboration between institutions and pooling of resources.[9] Although it is unclear whether a virtual OSCE is translatable to formal summative examination processes, the ABA has proposed the transition to a virtual format for the APPLIED examination as a result of the COVID-19 pandemic. Our data may help inform this process. We encourage others to entertain this possibility and assess its feasibility as well.

Participant performance in the ZOSCE was similar to that in our previous study, with some exceptions. In the communication with other professionals scenario, fewer than one-quarter volunteered to consult a colleague, though it is not clear how a virtual format made this more difficult. Five of the most commonly missed objectives were in the ultrasound section (Table 2). We focused on image identification rather than image acquisition because inability to interact physically with the human model posed a substantial challenge. Many participants were unable to answer all of the questions, perhaps because of the increased number of questions, poor image resolution on the virtual platform, or difficulty identifying structures on a still image as opposed to a dynamic one in which the participant could scan to optimize their view.

Commonly missed objectives were consistent with those of the historical cohort, such as assuring patient confidentiality in the ethics section and discussing the anticipated course and outcome in periprocedural complications. Many participants failed to perform a physical examination in the periprocedural complications scenario, although doing so may have been challenging to demonstrate in a virtual format.

Responses to the survey evaluation items that addressed concerns with the transition to a virtual format did not differ between the 2 sessions. Participants strongly agreed that the activity was a good use of their time, the instructions were well defined, and they could hear the other participants clearly. However, responses indicated that they felt more distracted by technology, things going on in their viewing room, or the functionality of technical components such as video clips. These issues were queried because we were concerned with limitations of using a virtual meeting platform to facilitate interactions for the ZOSCE. One comment noted difficulty with Internet connectivity. Although distance learning in primary and secondary schools in the United States has sharply emphasized the disparity among students' access to computers and Internet connectivity,[20] we were surprised to find that this was an issue for graduate professionals and faculty. Some individuals reported that family devices were allocated to school-aged children for distance learning during the workday, that outdated devices did not support the most recent version of Zoom, or that they experienced disrupted electrical power and Internet connectivity. During technical disruptions, the facilitator (C.M.) was available to fill in as a faculty proctor or any SP after distributing participants to breakout rooms but could only fill 1 gap at a time. If a CA-3 participant experienced technical failure or if multiple failures occurred simultaneously, data were lost due to the coordinated and time-limited nature of the activity.

Survey evaluation items that were identical to those from previous years elicited similar responses, with the exception of "standardized patients' performances were convincing" (P = .019). Although participants still agreed with this statement overall, the difference may be attributable to the virtual format. The SPs created their own environment (or chose a virtual background) rather than relying on a simulation space designed for patient encounters, though we did coach our SPs on optimizing realism. For example, the SP presenting a postdural puncture headache dimmed the lights and lay supine, and the impatient surgeon paced across the room and intermittently leaned into the camera to give the illusion of a confrontational stance. Despite these tricks, a virtual meeting format is undeniably less authentic than in-person simulation. The seriousness and intensity of an examination environment was somewhat tainted by the need to place all individuals in the large meeting format between each session; many participants were tempted to comment, but we were reluctant to mute participants in case real technical issues needed to be addressed.

This study had several limitations. All data are from a single institution, and it was a small descriptive study with no control group. Rather, comparisons were made with a historical cohort. We did not conduct a formal process for survey development and validation, but we adapted previously published instruments.[7,12] The ZOSCE as a formative assessment tool identified knowledge gaps in individuals and our curriculum, but it did not provide a method for addressing these deficiencies. We simulated what we believe is an authentic OSCE in a virtual format, but when we designed the ZOSCE, we did not know when or how the ABA would resume APPLIED examination testing. Since that time, the ABA has resumed testing using a virtual format. We were unable to assess physical task performance in a virtual format and modified these objectives to focus on interpretation of images provided, which is similar to the current approach by the ABA. In contrast to our previous study,[7] it is not yet possible to obtain formal feedback from participants on the authenticity of the ZOSCE when compared with the actual examination, but anecdotal reports support the accuracy of our virtual representation. In addition, several candidates who had participated in our in-person SOSCE and had their examination delayed have expressed interest in participating in the ZOSCE to practice the nuances of a virtual testing format.

Future investigations will address how the ZOSCE format compares with the SOCSE in terms of authenticity and usefulness for examination preparation. Whereas we plan to continue OSCE preparation for our residents in whatever format (in-person, virtual or hybrid) we estimate will be closest to what participants will experience in the APPLIED examination, the virtual format may have merit beyond temporary limitations imposed by the pandemic. Although our method does not require use of a physical simulation environment, it does require substantial technological and faculty resources, possibly limiting generalizability. However, the virtual format may permit more flexible scheduling of such an event during nonclinical time and collaboration between institutions that does not require participants to travel. In addition, it may be

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a useful tool for graduates who have moved but want a refresher course closer to taking the examination.

In conclusion, a telesimulation-based practice ZOSCE was well received by trainees and did not appear inferior to our previously published in-person SOSCE at providing a formative experience for residents preparing for the APPLIED examination. Future studies will address how to improve on limitations of telesimulation and will examine the feasibility of using virtual formats for summative OSCEs.

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Abstract

Background: The Objective Structured Clinical Examination (OSCE) is part of the American Board of Anesthesiology (ABA) certification process. A simulated OSCE can aid examination preparation, but the COVID-19 pandemic prevented in-person simulation training. Therefore, we adapted our in-person simulated OSCE (SOSCE) as a Zoom-based telesimulation OSCE (ZOSCE), permitting examinees to participate remotely. Comparing this process with historical in-person SOSCE cohorts, we hypothesized that this telesimulation-based format would still be well received by the trainees as a substitute when it was not possible to provide in-person practice and formative assessment. Subsequently, the ABA proposed a virtual-format OSCE.

Methods: We conducted our 7-station ZOSCE according to the ABA content outline for all graduating third-year clinical anesthesia residents (CA-3) in 2020. From a main meeting room, the facilitator paired each CA-3 with a faculty proctor, assigned them to their own breakout room for each station, and rotated standardized patients in. The faculty proctor observed the CA-3's performance in real time using an assessment tool with objectives graded on a 0–2 scale. At the conclusion of the ZOSCE, proctors reviewed the assessment tool with the CA-3 and provided personalized global feedback. Assessment tool scores were used to calculate performance data for the study group that were compared with a SOSCE historical cohort from 2017 and 2018. All parties completed a Likert-style evaluation specific to the ZOSCE.

Results: A total of 22 CA-3 residents participated. Mean performance scores ranged from 82.2%–94.9% (minimum = 38%, maximum = 100%). Compared with the historical SOSCE cohort, ZOSCE scores for 5 of 7 stations were not different, but scores in communication with professionals ($P = .007$) and ultrasound ($P < .001$) stations were lower. Overall, CA-3 participants rated the learning experience positively and felt it was a reasonable substitution for in-person simulation, with responses similar to those of a historical in-person SOSCE cohort.

Conclusions: A telesimulation-based practice ZOSCE for formative examination preparation for the ABA OSCE resulted in similar institutional scoring for most stations compared with in-person SOSCE, but some stations may be better practiced in person or require modifications. The virtual format may permit flexible scheduling during nonclinical times or for learners in remote locations. These findings have implications for future formative exercises and the formal summative examination process.

Keywords: Simulation, telesimulation, virtual, OSCE, APPLIED ABA Exam, formative evaluation, COVID-19

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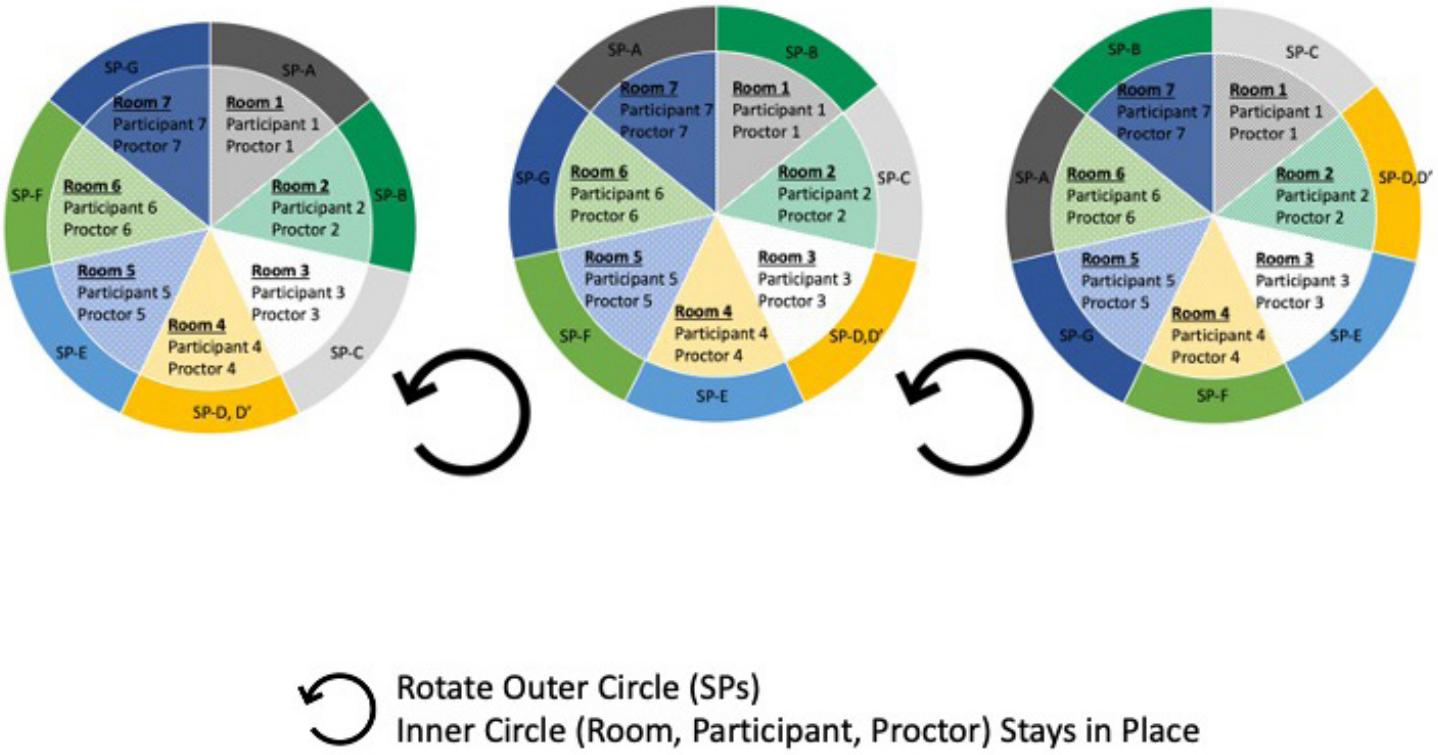
Figure

Figure 1. *Schematic showing the distribution of the facilitator, faculty proctors, third-year anesthesiology resident (CA-3) participants, and standardized patients (SPs) in breakout rooms during the 7 scenarios of the ZOSCE. All participants were in the main meeting room for prebrief, group debrief, and brief pauses between stations to redistribute participants. Private debrief was also held in breakout rooms with no SPs present. Wedges represent individual virtual rooms on Zoom. Color shading indicates the shifting location of the SPs among different breakout rooms.*



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Tables

Table 1. *Comparison of Anesthesiology Residents' Performance on ZOSCE (2020) With Performance on SOSCE in 2 Previous Years (2017 and 2018) by Scenario*[a]

Scenario	N	Mean, %	SD, %	*t*	*P*[b]	Cohen d[c]
Practice-based learning and improvement				1.18	.242	0.29
2017 and 2018	50	93.1	12.7			
2020	21	89.0	15.3			
Informed consent				−0.49	.624	0.13
2017 and 2018	50	93.7	10.2			
2020	22	94.9	8.3			
Periprocedural complications				−0.11	.915	0.03
2017 and 2018	50	87.7	9.5			
2020	22	88.0	13.9			
Ethics				0.72	.476	0.18
2017 and 2018	50	91.7	12.0			
2020	21	89.3	14.5			
Communication with professionals				2.76	.007	**0.65**
2017 and 2018	50	94.4	7.1			
2020	22	88.3	11.3			
Technical skills (ultrasound)				4.97	<.001	**1.42**
2017 and 2018	50	97.2	6.3			
2020	22	82.2	13.5			
Technical skills (echocardiogram and interpretation of monitors)				−0.04	.969	0.01
2017 and 2018	43	82.6	17.9			
2020	21	82.7	16.0			

[a] Performance scores were calculated as the percentage of maximum possible points based on the scoring sheet for each scenario.

[b] *P* values were calculated by independent *t* test.

[c] Boldface indicates statistical significance.

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Table 2. *Most Frequently Missed Tasks (by >25% of the Residents) in the ZOSCE by Scenario*

Scenario/Task	N (%)[a]
Periprocedural complications (N = 22)	
Performs focused physical evaluation	7 (32)
Discusses most common course and outcome of postdural puncture headache	6 (27)
Ethics (N = 21)	
Assures patient conversation is kept confidential	6 (29)
Communication with professionals (N = 21)	
Proposes options (delay case, list as urgent, discuss with patient)	6 (27)
Offers to consult a colleague	13 (59)
Technical skills–ultrasound (N = 22)	
Did the resident identify the green star (subclavian artery)?	7 (32)
Did the resident identify the purple star (first rib)?	11 (50)
Did the resident name the nerve requiring a supplemental block if tourniquet is used (intercostobrachial)?	10 (45)
Did the resident identify the purple arrow muscle superficial/lateral (biceps femoris)?	11 (50)
Did the resident identify the white *X* (median nerve)?	6 (27)
Technical skills–echocardiogram and interpretation of monitors (N = 21)	
What is the most likely diagnosis that resulted in the changes observed?	9 (43)

[a] Number who received 0 points for the task.

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***Table 3**. Results for Survey Responses by Test Session and Overall*[a]

Survey Item	May (n = 11)		June (n = 11)		Overall (N = 22)		*P*[b]
	Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median	
The instructions for participating in this activity were clear	9.6 (0.7)	10	9.3 (0. 9)	10	9.4 (0.8)	10	.621
I could hear the other participants clearly	9.5 (1.0)	10	9.1 (1.1)	10	9.3 (1.1)	10	.325
I could see the simulation room and activities clearly	9.4 (1.5)	10	8.5 (1.7)	9	8.9 (1.7)	10	.125
I had difficulty engaging in the activity[c]	8.3 (2.3)	9	7.1 (3.0)	8	7.7 (2.7)	9	.220
The other participants' responses were similar to what I would expect from an interaction in person	8.5 (2.1)	9	8.3 (1.7)	8	8.4 (1.9)	8	.562
Some of the technical components (images, video clips) did not function properly[c]	8.3 (2.5)	9	6. 7 (3.3)	9	7.4 (3.0)	9	.172
My internet connection hindered my ability to participate effectively[c]	9.2 (1.5)	10	7.6 (3.3)	9	8.4 (2.7)	9	.138
The Zoom system was not reliable (failed video or audio)[c]	9.0 (1.8)	10	7.3 (3.3)	9	8.1 (2.8)	9	.155
The confidentiality of my interactions felt protected	8.4 (2.3)	10	8.8 (1.3)	9	8.6 (1.8)	9	.974
I felt engaged in this activity	9.1 (1.5)	10	9.2 (1.0)	10	9.1 (1.3)	10	.814
I had difficulty understanding the flow of this activity[c]	7.7 (3.2)	9	7.8 (2.8)	9	7.7 (2.9)	9	.823
The timing cues and warnings were easy to understand	7.4 (3.6)	9	8.8 (1.3)	9	8.1 (2.7)	9	.651
I felt distracted by technology or things going on in my viewing room[c]	7.6 (2.7)	9	6. 7 (3.5)	8	7.1 (3.1)	8	.594
Given the opportunity, I would choose to engage in a telesimulation activity like this again	8.2 (1.8)	8	7.2 (3.9)	10	7.7 (3.0)	8	.974
Compared with a live standardized patient encounter in the simulation center, this was a reasonable substitution	8.1 (2.4)	9	8.5 (1.8)	10	8.3 (2.1)	9	.794
The session was valuable use of my time	9.2 (1.3)	10	9.6 (1.2)	10	9.4 (1.2)	10	.172

[a] Scales ranged from 1 (*strongly disagree*) to 10 (*strongly agree*).

[b] *P* values are based on the Mann-Whitney *U* test.

[c] Indicates an item that was reversed so that a greater value is a more positive response.

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Tables *continued*

Table 4. Comparison of ZOSCE Posttest Survey Responses to SOSCE Historical Cohorts[a]

Survey Item	2020 ZOSCE (N = 22)		2017–18 SOSCE (N = 45)		*P*[b]	Cohen d[c]
	Mean (SD)	Median	Mean (SD)	Median		
This simulation was useful	5.0 (0.2)	5	4.8 (0.8)	5	.956	0.01
This simulation should be included again next year	4.8 (0.6)	5	4.8 (0.8)	5	.525	0.06
After this experience I feel better informed about the ABA OSCE process	4.9 (0.3)	5	4.8 (0.8)	5	.808	0.03
After this experience I feel better prepared for the ABA OSCE exam	4.8 (0.5)	5	4.7 (0.9)	5	.509	0.09
The standardized patients' performances were convincing	4.4 (0.8)	5	4.7 (0.9)	5	.019	**0.42**
It felt uncomfortable to be tested in front of my peers (ie, the SPs)[d]	3.5 (1.4)	4	3. 9 (1.3)	4	.315	0.23

Abbreviations: ABA, American Board of Anesthesiology; OSCE, Objective Structured Clinical Examination; SOSCE, simulated OSCE; SPs, standardized patients; ZOSCE, Zoom OSCE.

[a] The scale ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

[b] *P* values are based on the Mann-Whitney *U* test.

[c] Boldface indicates statistical significance.

[d] Indicates an item that was reversed so that a greater value is more positive response.

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Appendix

Appendix 1. Scenarios Used in the Zoom Objective Structured Clinical Examination[a]

Scenario 1: Informed Consent, PCA versus PCEA

Mr B is an anxious 67-year-old man with hypertension and chronic obstructive pulmonary disease presenting this morning for a large ventral hernia repair. You have elicited a history and performed a physical exam, deemed him an acceptable-risk candidate for surgery and obtained consent for general anesthesia. The patient asks you about epidural versus IV postoperative pain management. Please explain the risks and benefits of epidural and/or IV PCA for postoperative pain control and, if the patient requests an epidural, obtain informed consent for placement.

Your task is to obtain informed consent from the patient for a method of postoperative pain control.

Scenario 2: Periprocedural Complications, Postpartum Headache

Mrs T is a healthy 35-year-old gravida 2, para 2 woman with gestational diabetes who underwent a forceps-assisted vaginal delivery after prolonged pushing in the labor and delivery room. Her baby weighed 9 lb 5 oz at birth and is doing well in the nursery. For labor analgesia, the patient received a combined spinal epidural. She is 24 hours postdelivery and feeling well except for a severe positional headache that occurs when standing and is relieved when lying down. The patient is very concerned because her headache is impeding her ability to care for her newborn. Review of the anesthetic record reveals no apparent complications during CSE placement. You are called by the nurse before morning rounds to evaluate Mrs T.

Your task is to evaluate a patient with postpartum headache and determine a plan of care to address her concerns.

Scenario 3: Ethics, Jehovah's Witness for Spine Surgery

Ms B is a 28-year-old woman who is scheduled for scoliosis surgery today. You are doing the preanesthesia assessment prior to going to the operating room for surgery. She has a Cobb angle of 33°. The surgery will be a T5-S1 laminectomy and fusion.

She is a physical therapy student in her senior year. Her neurological exam had been stable until last year when she started having a left foot drop that now affects her ability to work. She has no other significant medical history but had a prolonged recovery from a wisdom tooth extraction, with prolonged oozing from the surgical site. Work-up for bleeding disorders was unrevealing. Ms B is a Jehovah's Witness. Following is the clinical information:

EKG: NSR

CXR: lung fields clear. Scoliosis evident.

Labs:

Hb: 13.1, Hct: 33, Platelets: 185, WBC: 4.2

Na: 139, K: 4.1

BUN: 18, Creatinine: 0.9

Glucose: 92

PT: PTT: INR 1.1

Your task is to assess the patient's wishes regarding blood products and establish a safe and mutually agreed-upon plan for intraoperative resuscitation.

Scenario 4: Communication With Professionals

Dr David Keller is an orthopedic surgeon who is posting the following case: a 45-year-old patient requires an ORIF for a closed tibia and fibular fracture that he sustained after falling off of his bike. The patient is hemodynamically stable, GCS 15, has no significant past medical history, and had a full meal approximately 2 hours ago. The surgeon would like to proceed with the surgery now because it is late in the day and she says she has obligations later in the evening. As the anesthesiologist, please explain to the surgeon why this case should not proceed immediately.

Your task is to discuss with the surgeon the risks, benefits, and alternatives to proceeding with this case immediately.

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Appendix *continued*

Scenario 5: Technical Skills–Ultrasound

This OSCE scenario will focus on ultrasonography skills.

Although this is a technical examination, please maintain a physician and patient interaction throughout. You will be asked to identify marked structures and answer questions related to these 4 sites:

1. Jugular
2. Supraclavicular
3. Popliteal
4. Axillary

Scenario 6: Technical Skills–Echocardiograms and Interpretation of Monitors

Your first task is to evaluate lung ultrasound and echocardiogram (TTE and TEE) images and answer the clinically related questions.

Your second task is to evaluate the anesthesia patient monitor and answer the clinically related questions. You will be given 2 clinical vignettes; for each you will have 20 seconds to view the stem and 20 seconds to view baseline vital signs. You will be asked to interpret any changes you see and identify which monitor features support this diagnosis. You will have 60 seconds to answer the questions after each monitor clip concludes.

Scenario 7: Practice-Based Learning and Improvement

One of your nurse colleagues in the PACU is working on a patient-safety project to reduce medication errors on the unit. She has asked if you would meet with her to discuss how to design a multidisciplinary patient safety project to address the topic.

Your task is to address a recent medical error with a concerned nurse manager and determine a plan for improving patient safety.

[a] Appendix presented in original form.