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The ABR 2021 Radiation Oncology Remote Examinations: Development, Administration, and Implications for the Future

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Abstract

With the onset of the global coronavirus disease 2019 pandemic in early 2020, it became apparent that routine administration of the ABR Qualifying and Certifying Exams would be disrupted. Initial intent for postponement was later altered to a recognition that replacement of the existing delivery methodologies was essential. Herein, the authors describe the conceptualization, development, administration, and future implications of the new remote examination delivery platforms.

Key Words: American Board of Radiology, remote examination development

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INTRODUCTION

For 21 years, the ABR administered two radiation oncology (RO) examinations each year: the three-part computer-based Qualifying Exam (QE) consisting of medical physics (MP),

radiation and cancer biology (RCB), and clinical oncology (CO), and the oral Certifying Exam (CE). In 2020, the QE parts were scheduled to be administered at commercial test centers on July 9 (MP and RCB) and July 10 (CO). The CE was to be administered May 3 to 5 in Tucson, Arizona.

On March 11, 2020, the World Health Organization announced that an outbreak of severe acute respiratory syndrome coronavirus 2, causing coronavirus disease 2019 (COVID-19), had been declared a global pandemic [1]. Within days, before the devastating human toll the pandemic would take could even be conceptualized, it became evident that the spring and summer examination administrations would not be possible.

Early in the pandemic, the ABR and its 23 American Board of Medical Specialties (ABMS) member board (MB) partners had hoped that postponement of their scheduled examination administrations until later in 2020 might be possible, but as the global impact of the virus continued to expand, that possibility faded, and all of the 24 MBs that administer computer-based examinations and the 14 MBs that continue to administer oral examinations for initial certification that had examinations scheduled for 2020 needed to consider alternatives. Some of the MBs had used the services of commercial test centers such as Pearson VUE

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(Bloomington, Minnesota), whereas several had developed their own testing sites. Given the uncertainties of future health-related travel restrictions, all considered the development of remotely delivered assessment instruments for the foreseeable future [2,3]. Administration of remote computer-based examinations has been carried out successfully by many educational institutions, so models were available, but none of the ABMS MBs had experience with administration of remote oral examinations. To facilitate this transition, the ABMS developed and hosted a monthly collaborative conference of the 14 MBs that continue to administer oral examinations. This information, collective experience, and idea-sharing forum proved to be valuable to all participants. Several MBs opted to use commercially available examination administration products with modest modifications for their needs. In certain instances, this decision to use available products was chosen because available MB staffs were too small to develop new assessment tools within a reasonable time frame. Other MBs determined that available commercial products were not ideally suited to their needs (ABMS, personal communication). After carefully evaluating alternative platforms, the ABR determined that none was appropriate and made a strategic decision to develop the assessment instruments in house.

The goal of remote examination development was to produce reliable and secure assessment instruments while maintaining the best possible user experience. To maintain psychometric consistency, comparability, and validity, instruments were to be designed to be as close as possible to those previously used. Instrument development was to be carried out expeditiously to allow affected residents and candidates to remain as much as possible in synchrony with their previously anticipated certification timeline. The complex process became all consuming for ABR staff members and a large contingent of highly motivated and committed volunteers, and the challenges of the initiative were magnified by the need to work and collaborate remotely [4].

As the pandemic progressed, the ABR was informed that some the commercial test centers would open on a limited basis late in 2020. With input from stakeholder organizations, the ABR decided to offer 2020-eligible candidates an opportunity to take the QE at available centers in December. The same cohort would be offered the opportunity to use the new QE remote platform in April 2021. The December administration was optional.

Herein, we describe the planning, development, and implementation process for the 2021 RO remote examinations. The ABR encountered similar challenges for its three other primary certificate disciplines: diagnostic radiology,

interventional radiology/diagnostic radiology, and MP, the latter two of which, along with RO, continue to administer both oral and computer-based examinations.

QUALIFYING (COMPUTER-BASED) EXAMINATION DEVELOPMENT

Before the pandemic, the ABR had intended to reduce its dependence on commercial test centers for its computer-based examinations [4]. With the ABR's existing internal experience in computer-based examination development and diagnostic radiology examination administration, the primary new tasks for RO became adapting the existing and new item (question) inventory pool to a remotely administered platform and developing a reliable delivery instrument. Available commercial products were considered but not thought to be ideal, so development proceeded in house.

The IT development team ultimately decided to develop a software platform in house and operate it in parallel with commercial security software. At each step of development, the user experience was tested by staff members and volunteers, addressing clarity, ability to manipulate images, ease of functionality, and progression through the examination(s). The security software enabled observation of examinees and locking of host computers to prevent examinees from downloading or saving examination items. To further maintain the security of individual QE items, the team decided to administer the examinations in blocks of 30 items each. Examinees would be able work through each block, skipping and returning to items or reviewing the block as necessary. When satisfied with their performance on a block, the test taker would submit their answers for that block, at which time the block would be locked. They could return to the block later to review but not alter responses. The examinee was then free to take a break, within the overall parameters of examination time limits, and then, upon return, continue to the next block.

The ABR was concerned that the wide variability of available hardware might produce different examinee experiences, so a set of minimum technical requirements was provided. Enduring web-based instructional materials were provided for examinees, and a help desk was to be staffed throughout the administration process to assist examination takers. Before accessing the examination instrument, registrants were advised to complete a technical check to ensure that their hardware was consistent with examination requirements. Once the technical check was completed, registrants were cautioned against changing hardware devices or locations, to reduce the potential for connectivity problems. This was especially a concern for individuals who intended to take the examinations at academic or clinical facilities

because of the wide variety of institutional firewalls frequently encountered.

CERTIFYING (ORAL) EXAMINATION DEVELOPMENT

Creation of the remote RO CE presented an entirely different set of challenges. After carefully evaluating alternative platforms, the ABR determined that none was appropriate and made a strategic decision to develop the assessment instrument in house.

Early in the process it was evident that developing a remote oral CE platform would occupy almost all ABR staff members and many volunteers. Creating an entirely new remote oral examination administration instrument would involve numerous decisions and development steps: developing software for examination delivery amenable to use by examiners, candidates, and ABR support staff members; scheduling examination sessions; training examiners, candidates, and support staff members; increasing the available case item pool; reviewing examiner scoring and category and panel performance; and communicating with external stakeholders. Staff and volunteer teams were created to focus on specific tasks, the most time sensitive and intensive being the development of the software instrument.

Internal IT staff members worked with outside consultants to develop user interface and security tools to prevent recording or downloading audio or video, scan the examinee environment, and monitor progress through the examination. Commercial software options were explored, and it was determined that the platforms best suited to the examination requirements were a combination of web-based and security software, running in parallel. Software was developed in-house for examination scheduling, administration, and scoring. Decisions regarding hardware specifications were made in parallel with software development.

Throughout the planning process, there were concerns about the potential for connectivity failure between participants, causing disruption in satisfactory examination delivery. To reduce the potential impact of this eventuality, significant operational redundancy was built into the system. Each candidate would be “accompanied” throughout the examination by an ABR navigator who would be responsible for the logistics of the 30-min check-in process and monitor progress throughout the examination. Each candidate would have two examiners per category: a primary and secondary. The primary examiner would be responsible for examination delivery and scoring, but if they lost connection for more than several minutes, the navigator would turn the examination period over to the secondary examiner, who had been viewing and scoring in parallel from the outset of the period. The secondary examiner would complete the examination and provide the finalized

period score. If any technical problem prevented satisfactory completion of a category session, a 30-min “recovery” session was to be available at the end of each day’s schedule.

After modeling the potential for rolling schedules on the basis of two or four time zone–related sessions, it was determined that the logistical challenges with these options were significant, and the decision was made to deliver examinations simultaneously across all time zones. At the completion of the examination sessions, the eight teams of clinical category examiners met as a group via web conference to review candidate performance and scoring. The category meetings were followed by panel meetings consisting of the eight category examiners, who collectively reviewed and finalized candidate performance evaluations.

Because the remote platforms were unfamiliar to examiners and candidates, the ABR’s communications team opted for significant redundancy in the development and provision of training materials. Web-based orientation sessions were recorded and available to participants for review at any time after initial presentation. Training manuals were developed and forwarded to participants as well as being available online. Technical checks were used for additional coaching for those with questions, and all participants were provided with fact sheets. The ABR help desk was available throughout the examination delivery sessions for questions or problems beyond those solved by the navigators.

At every step of the development process and for each of the examination elements, ABR staff members and volunteers not directly involved in the specific steps were asked to critique the work product, and where appropriate and possible, modifications were made. Members of the RO Initial Certification Advisory Committee, representing the Association of Residents in Radiation Oncology, Association of Directors of Radiation Oncology Programs, and Society of Chairs of Radiation Oncology Programs, were included in some reviews. Before deployment, a full-day dry run of the CE was carried out in February 2021, with staff members and volunteers serving as examiners, candidates, and navigators. An after-action debriefing of this activity led to additional platform modifications [4].

EXAMINATION ADMINISTRATION

The ultimate metric of any new remote assessment instrument is the ability of participants to navigate and complete the process satisfactorily and with psychometric reliability, discrimination, and validity of participant performance. After its planned internal CE dry run, the development team scheduled a pilot examination for March 26 and 27, 2021. Intended as a final “soft launch” before a large candidate cohort was examined in May, the pilot was offered as an option to eligible first-time examination takers. If candidates

selected for the sessions failed the examination, they would have no record of the failure and would be eligible to take the examination again at an administration of their choosing within their 6-year initial certification eligibility cycle. Those who passed the examination would have completed their requirements for initial certification. Of 176 eligible candidates who registered for the pilot, 22 were randomly selected. Employing regular examiners and the new platform, the full eight-category examination was administered to 21 candidates (1 eligible candidate raised several concerns regarding potential examiner-candidate conflicts and was excused from the examination and rescheduled for the May administration). After the pilot, debriefing revealed several areas of potential modification, many of which were completed before the May 16-19 administration. For the March pilot and May examination, all candidates were able to complete their examinations as intended. When minor technical problems were encountered, almost all were corrected immediately by the navigator or help desk. Use of the end-of-day, 30-min “recovery” period was required for only 3 candidates, who were then able to complete their examinations.

Remote administration of the three QE parts in April 2021 was equally successful: 160 candidates took both the MP and RCB examinations, 10 took MP only, 15 took RCB only, and 168 took CO. All candidates were able to complete their examinations as scheduled, encountering only minor, correctable problems, such as momentary Internet loss or audio instability.

Following previous computer-based and oral examination administrations, participants were surveyed regarding their observations of the administrations and, in the case of examinees, their opinions of content. These optional surveys were collected before posting examination results to avoid potential bias in responses. After the March CE pilot, the April QE, and the May CE, similar surveys were distributed. In addition to the usual content-related questions for examinees, the 2021 surveys elicited specific feedback regarding satisfaction with the individual’s examination preparation and administration process. After the pilot and May CEs, all examiners were also surveyed, with queries limited to preparation and administration satisfaction. Most survey items were scored using a five-point Likert-type scale, although there were some yes-or-no questions and options to add free-text comments. Because the surveys were optional and the total number of responses was small, responses were not evaluated for statistical significance. Instead, the responses were viewed as a snapshot of respondent opinions. The April QE cohort represented a diverse population, including individuals who were taking the examination parts for the first time and others who had seen a relatively similar platform previously at commercial test centers. Additionally, as noted previously, there were

effectively five different groups: MP and RCB on the same day, MP only, RCB only, CO only, and MP/RCB and CO on subsequent days. For this reason, the survey responses from all QE takers were evaluated together and reported in that manner.

The CO QE part elicited 72 responses and the MP and RCB parts 73. The technical check was used by 98% of participants, but only 75% thought it was helpful. The ABR was uncertain whether this discrepancy related to room for improvement in the instrument or simply respondent familiarity with the instrument because it was similar to those many had been exposed to previously. The examination venue was the participant’s home in 62% and training site in 30%. Wi-Fi connections were used by 64%. Windows-based systems were used by 64%. Only 35% of respondents accessed the ABR help desk on the day of their examinations; 70% of those found the encounters helpful. The security software was easily accessed (92%). Allocated examination time was found to be sufficient by 96%, and a similar percentage found the examination interface easy to use.

The March pilot examination represented the first “real-world” test of the remote oral examination platform. Thus, the ABR was especially interested in examiner and candidate observations about the platform. Twenty of 21 candidates and 26 of 37 examiners responded to the survey. The technical check had been completed by 95% of candidates and 100% of the examiners, all of whom found it useful. In total, 95% of candidates and 92% of examiners found the examination interface easy to use, and only 18% of candidates and 11% of examiners communicated with the ABR help desk on examination day. The issues they encountered were satisfactorily resolved, and 80% of candidates and examiners who used the help desk found the interaction helpful. The navigator experience was positive in 95% of responses.

The May examinations were administered by 68 examiners to 192 candidates, with the postexamination survey completed by 67 examiners (98.5%) and 117 candidates (60.9%). The technical check was completed by 98% of candidates and examiners, almost all of whom found it useful for preparation. Ninety-three percent of candidates and 95% of examiners found the examination interface easy to use, and only 22% of candidates and 26% of examiners contacted the help desk on examination day.

The second administration of the three QE parts was offered on August 2 and 3 to candidates who were first eligible for the examinations in 2021. One hundred seven individuals took MP and RCB, 46 took MP only, 45 took RCB only, and 106 took CO. All examinees were able to complete the sessions; 46 required limited assistance from the help desk.

Thirty-one candidates experienced multiple disconnections during the MP session because of an international cloud provider disruption unrelated to the examination or security

platforms [5]. All were able to continue the examination, but 6 ultimately failed. Each was notified, along with their program director, and informed that because of the disruption, the examination would be considered a “nonevent” and would not be included on their ABR record. These candidates will be able to retake the QE MP part in July 2022, or a later date, as they prefer.

Between September 11 and 14, the CE was administered for the third time. Two hundred one candidates were examined in all eight clinical categories, and 16 conditioned candidates were examined in one or two categories. Although all candidates were able to complete their examinations on their scheduled days, technical problems requiring more than 5 min to solve were encountered by 4 candidates. These candidates completed their examination sessions in the 30-min recovery periods at the end of the day. Postexamination surveys for both the QE and CE were consistent with the earlier administrations, with generally excellent acceptance of the platform and experience.

IMPLICATIONS FOR THE FUTURE

Although ABR staff members, volunteers, and examinees were generally pleased with the performance of the remote QE and CE platforms, all 2021 administrations were essentially considered trials. As noted, after each administration, the participant surveys and internal after-action debriefing sessions identified areas of improvement, such as easier use of image controls and potential for discontinuance of the security platform. The technical check (previously imprecisely called a practice examination) will have added instructional time. To provide further candidate comfort with navigation through various item types, sample items of each type used have been placed on the ABR website. Candidates will be able to use these real, but currently retired, items to develop facility with examination controls. For the CE, the examiner scoring interface will be designed to be more easily visible, and changing cases by examiners will be simplified. The absence of connectivity failures on the spring 2021 examinations suggested that secondary examiners were no longer required, and their presence was eliminated for the September administration without adverse impact. Consideration is also being given to breaks and “locks” after 20 items for the QE parts, rather than the previously used 30 items, to minimize the adverse impact on candidates with episodic connection issues and to provide additional examinee break time.

CONCLUSIONS

Under unusually difficult and stressful circumstances given the unpredictability of COVID-19 and the complexity of

developing a secure and thoughtfully designed examination experience, ABR staff members and volunteers were able to create and successfully administer remote computer-based qualifying and oral certifying examinations in 13 and 12 months, respectively. Representatives of the Association of Residents in Radiation Oncology have requested that the ABR consider routine administration of a second series of certifying examinations each year, and this second administration has currently been scheduled for 2022. The possibility of a “hybrid” location for examiners, with some centrally located (presumably in Tucson) and others examining remotely, is also under consideration.

The COVID-19 pandemic had a profound impact on postgraduate medical education, from residency and fellowship application through assessment for initial certification [6]. In some instances, the adaptations implemented by affected organizations to accommodate trainee needs have been viewed as temporary fixes, whereas others are being viewed as improvements and potentially permanent modifications. The ABR recognizes that remote examination administration results in greater flexibility in management of important life events, and significant savings in time and expense to candidates, and does not currently anticipate a future scenario in which examinees would be required to travel to commercial test centers or a centralized venue, although that decision rests on continued satisfactory administration, security, and reliability of the remote examination platforms.

TAKE-HOME POINTS

- The global COVID-19 pandemic rendered routine development and administration of ABR initial certification examinations impossible.
- During a global pandemic, with travel and congregation of examination developers, examiners, and candidates impractical, rapid development of remote administration instruments was essential.
- The goal of remote examination development was to produce reliable and secure assessment instruments while maintaining the best possible user experience.
- To maintain psychometric consistency, comparability, and validity, instruments were to be designed to be as close as possible to those previously used. Instrument development was to be carried out expeditiously to allow affected residents and candidates to remain as much as possible in synchrony with their previously anticipated certification timeline.

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