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Conference Attendance Tracking and Evaluation in the Era of Virtual Conferences

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Rationale and Objectives: The coronavirus pandemic upended in-person radiology education and led to a transition to virtual platforms. We needed a new method to monitor lecture attendance, previously relying on a physical badge system. Our goal was to develop and implement a virtual conference attendance system that is user-friendly, automated, useable in any virtual conference environment, and accurate.

Materials and Methods: We developed a web-based platform to serve as a virtual conference attendance tracking and evaluation platform. Daily, the application synchronizes with our lecture calendar to identify scheduled conferences and generates a unique attendance link for each event. The link is automatically posted in the conference chat and attendees must be logged in by the time it is posted to click the link, prompting single sign-on authentication. We integrated the system with resident schedules to excuse residents when appropriate. Real-time attendance reports are accessible in a user-friendly dashboard with a 5-star lecture review and comment system. We surveyed residents on satisfaction with the application after 1-year of use.

Results: Over the 2020–2021 academic year, we registered 376 conferences with 5,040 virtual swipes from 65 users. Once set up, virtual swipes take seconds to perform with minimal disruption to the conference. Average satisfaction for the platform was rated as 4.69 on a scale of 1 to 5. All respondents agreed or strongly agreed that use of the platform should be continued for future years, with 85% strongly agreeing.

Conclusion: We developed an online platform for radiology conference attendance logging and evaluation, designed for virtual conferences.

Key Words: Conference; Attendance; Resident education; Virtual conferencing; CORONAVIRUS; COVID-19.

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Abbreviations: ACGME Accreditation Council for Graduate Medical Education, A³CR² American Alliance of Academic Chief Residents in Radiology, AUR Association of University Radiologists, COVID-19 Coronavirus Disease 2019

INTRODUCTION

Resident conferences are a foundational component of radiology resident education. As stipulated by the Accreditation Council for Graduate Medical Education (ACGME), it is incumbent upon each radiology program to provide at least five hours per week of lectures and conferences and document resident conference attendance for all 48 months of the educational program (1).

Institutions typically provide regularly scheduled conferences for resident education with a recent emphasis on interactive and case-based sessions to improve resident engagement

and information retention (2,3). It has been shown that educational activity attendance of residents is correlated with higher in-training and board exam scores (4,5).

The coronavirus pandemic upended radiology education due to social distancing measures and restrictions on social gatherings, which prevented in-person resident conferences. This required institutions to rapidly find innovative methods to maintain resident education often through novel digital methods (6). Successful implementations of virtual education in radiology often emphasized visual tools and micro-learning, providing resources for condensed individualized digital learning (6,7). Many institutions adopted platforms such as Zoom, Microsoft Teams, Google Meet, or Cisco WebEx for hosting virtual conferences (7). We transitioned our resident education platform to Zoom and were faced with the challenge of reliably registering and tracking conference attendance, which exists regardless of the platform chosen.

Historically, our institution used a physical badge swipe system to record lecture attendance. Residents were required

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to swipe in by 15 minutes into the lecture period (e.g. by 7:45 AM for the 7:30–9:00 AM conference) to receive attendance credit. The straightforward physical badge swipe system used in the pre-COVID-19 (Coronavirus Disease 2019) era could not be adapted to the virtual environment. The benefits of the original badge system included ensuring prompt attendance and confirming the identity of the resident. These become a significant challenge in the virtual conference environment which often have limited tools to log attendees, assess timeliness of attendance, and verify the identity of the person, a challenge known as authentication (8). For example, on Zoom users may come in and out of the conference or remain completely anonymous, with names such as “iPhone” or “iPad” enabled by default from mobile devices.

Our goal was to develop, implement, and evaluate a virtual conference attendance tracking and lecture feedback system that is (1) user-friendly, (2) adaptable to any online classroom environment, (3) fully automated, and (4) secure for accurate documentation of an individual’s conference attendance.

MATERIALS AND METHODS

We developed a web-based platform (ScheduleMe <https://www.scheduleme.org>) to serve as a virtual conference attendance tracking, monitoring, and evaluation platform. The user interface for the platform is built using a JavaScript frontend in AngularJS. The scripting language and database management system were programmed with a PHP/MySQL backend.

The Swipe Link and Swiping in to Conference

The application synchronizes daily with the lecture calendar where the conference schedule is kept up-to-date by

residents and faculty responsible for maintaining the lecture schedule (Fig 1a). The application identifies the lecture events unique to each day as well as the speaker contained in the event details. A link is generated in the format of: <https://www.scheduleme.org/conf.php?code=Yzh3d0tw>

The string after “code=” represents a cryptographic hashing that is specific to each lecture, and mathematically ensures uniqueness when generated.

A bot in the Zoom chat automatically posts the swipe link at the 15-minute mark of the lecture period, requiring attendees to be logged into the conference by that time to click the link and virtually swipe in for attendance (Fig 1b–c). Those who arrive after that time would not receive the link in chat, as Zoom users cannot see chat messages that were sent prior to their arrival. Clicking the link will prompt authentication using Firebase, a platform that allows identity verification by a variety of third-party and single sign-on clients such as Microsoft 365 or Google (Fig 1d–e). If the user has already signed in to this platform, their identity will be automatically verified.

Lecture Evaluation

After swiping in, the webpage allows residents to track and evaluate lectures they have attended. We designed the lecture evaluation system using a simplified 5-star review and comment system similar to that used by online retailers (Fig 1f). Users can provide anonymous comments to the lecturer at any time, allowing for both real-time and asynchronous feedback.

Conference-Clinical Schedule Integration

We integrated the resident conference system with our custom-built clinical scheduling platform that contains the

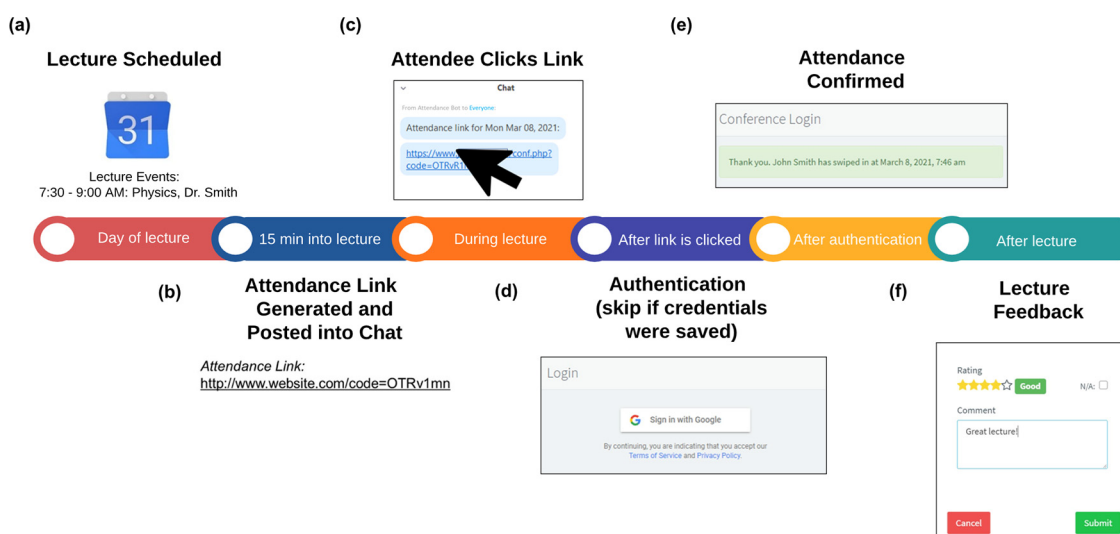


Figure 1. Overview of the conference attendance tracking and evaluation system. (a) The lecture schedule is maintained on an external Google calendar and daily lecture events are extracted from the calendar. (b) A unique attendance link is generated and is automatically posted by a bot into the conference chat. (c) Attendees click on the link and are presented with a (d) single sign-on authentication screen, before their attendance is logged (e). (f) Afterwards, attendees can evaluate the lecture with a simplified 5-star review and comment process similar to that used by online retailers. (Color version of figure is available online.)

resident rotation schedule. In doing so, we implemented a rule-based system to automatically determine whether a resident is required to attend conference; for example, residents are excused when on vacation or procedural services such as interventional radiology. The application also automatically excuses residents who are out for a single day during a rotation such as for a sick day as well as residents who are pulled to cover a service for a single day. Advanced features include specifying attendance restrictions by year of training for each conference and manually excusing specific residents.

Dashboard and Analytics

Residents can access logs of their conference attendance for individual lectures on the same page they submit lecture evaluations (Fig 2). Real-time statistics are provided to individual users, informing them of their required number of attended lectures and percentage attended, broken down by month. Residents are kept updated with a monthly email report containing personalized statistics and residency milestone targets (Fig 3).

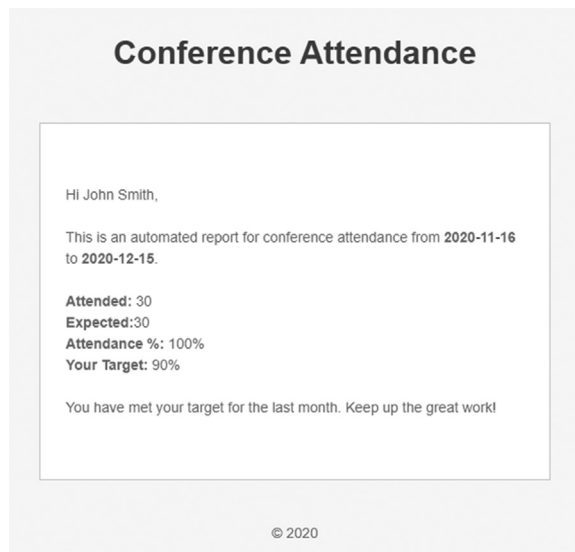


Figure 3. A sample monthly statistics report emailed to each resident outlining the number of conferences attended, attendance percent, and target percentage.

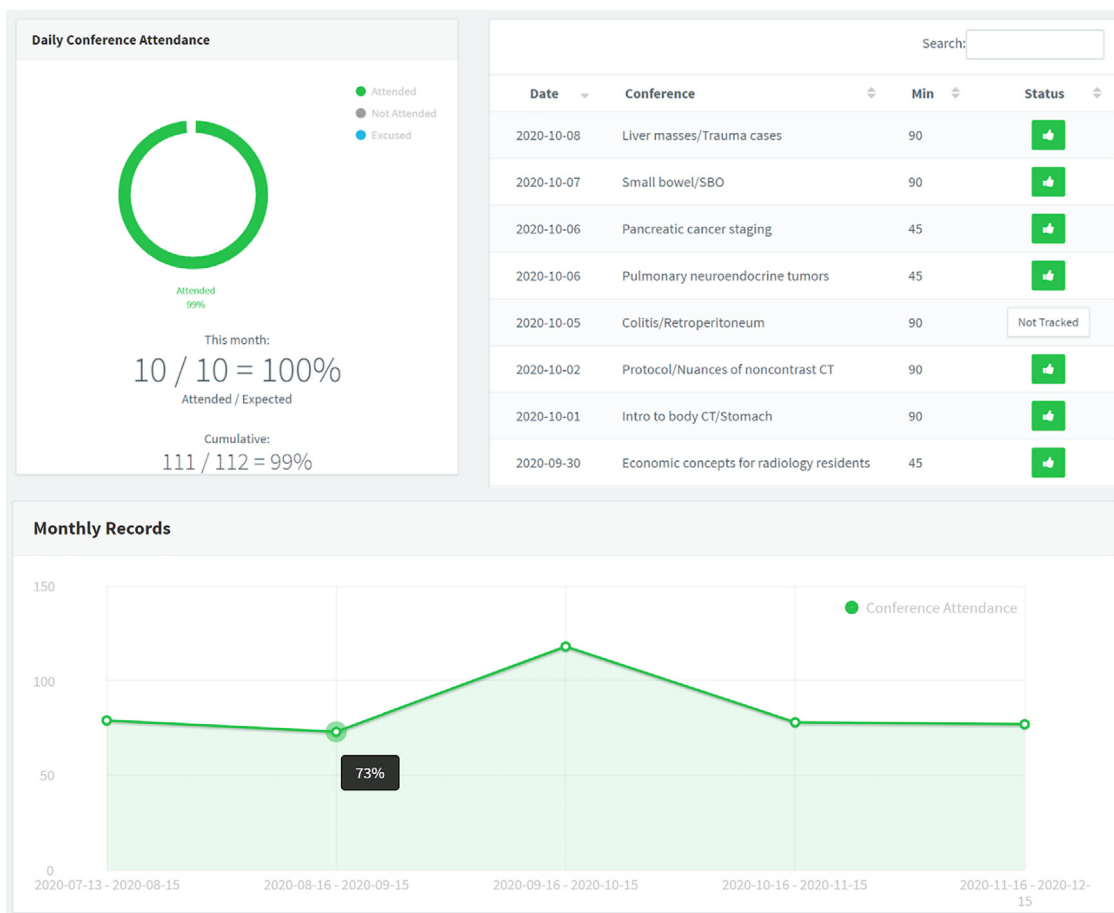


Figure 2. Dashboard displaying conference attendance for an individual user with reports of monthly, cumulative, and individual conference attendance. The dashboard is automatically updated as soon as the resident swipes in and is available for review both by the resident as well as program directors. (Color version of figure is available online.)

Date	Conference	Attendees	Rating
2021-10-06	Body MRI - Dr. Doe	27 <input type="text"/>	★★★★☆ 4.40
2021-10-06	Nucs Case Conference - Dr. Smith	25 <input type="text"/>	★★★★★ 5.00
2021-10-05	Journal Club	23 <input type="text"/>	★★★★☆ 4.25
2021-10-05	Neuro Case Conference	24 <input type="text"/>	★★★★★ 5.00

Figure 4. Analytics page for administrators to view conferences, number of attendees and average reviews as well as to access the reviews summary pages. (Color version of figure is available online.)

Residency leadership, such as the chief residents and program directors, have administrative access and can review attendance logs for individual residents, including monthly reports. Available lecture analytics consist of the number of attendees, breakdown by class, and anonymous reviews and comments (Fig 4 & 5). Lecture faculty automatically receive an email containing aggregate reviews and evaluations for their lecture.

IMPLEMENTATION AND EVALUATION

We developed and implemented the application for the full 2020–2021 academic year at our institution during the peak of the COVID-19 pandemic. At the conclusion of the year, all residents who used the application were invited to voluntarily participate in an anonymous survey and share their experience. An IRB exemption was filed and acknowledged

prior to this user survey. Survey questions consisted of: (1) Overall satisfaction with the conference application, (2) Ease of using the application and desire to continue using it, and (3) Rating the quality of several aspects of the conference system using a 5-element Likert scale. Residents also rated the importance of specific elements for a conference tracking platform in general.

RESULTS

We successfully implemented this system during the 2020–2021 academic year, registering 376 conferences and 5,040 virtual swipes from 65 authenticated accounts (approximately 45 residents and 20 guest attendees).

Once set up, the one-click virtual swipe took less than a second to perform and minimized disruption to the ongoing conference. The system and review system were fully

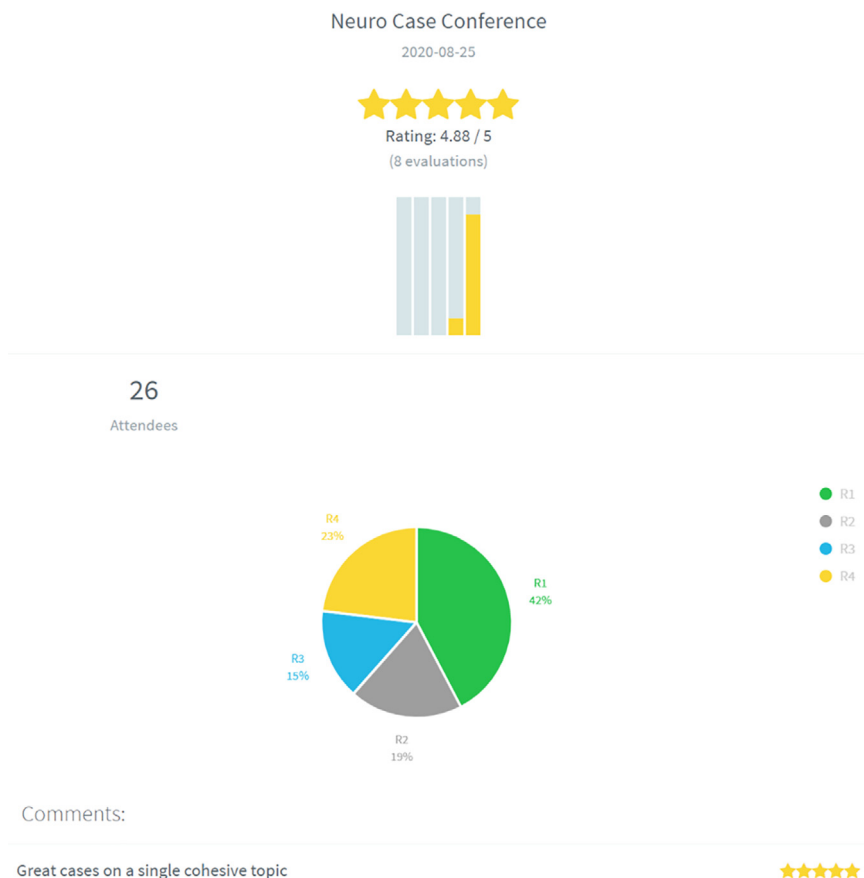


Figure 5. Sample lecture report displaying the 5-star rating from resident evaluations, attendee breakdown by class, and comments submitted during evaluation. (Color version of figure is available online.)

functional on computer and mobile platforms alike, operated automatically, and required minimal administrative management.

Thirteen responses (30% response rate) were received for the resident survey out of the 43 eligible residents. Average satisfaction for the platform was rated as 4.69 on a scale of 1 to 5, with 1 = very unsatisfied and 5 = very satisfied (Fig 6a). Eighty-five percent (11/13) agreed or strongly agreed that it was easy to monitor their attendance and all respondents (13/13) agreed or strongly agreed that it was easy to complete their evaluations on the platform (Fig 6b). All (13/13) responded favorably that use of the platform should be continued for future years, with 85% (11/13) strongly agreeing (Fig 6c).

When rated on specific aspects of the platform, highest ratings were obtained for the ease of virtually swiping into conference (100% 13/13 rated as good or excellent) and security of the platform (92% 12/13 rated as good or excellent) (Fig 6c). The more important functions of a conference platform were swiping into conference (13/13 rated as important or very important) and viewing conference attendance benchmarks (12/13 important or very important). Less important functions were the conference rating (9/13) and feedback (10/13) systems (Fig 6d).

DISCUSSION

We illustrate a process for monitoring lecture attendance that is effective in the era of virtual conferences and the unexpected challenges associated with remote learning. Our application is readily adaptable to up-to-date educational requirements and changing guidelines.

Prior to the implementation of the system, accurate attendance monitoring and lecture feedback with the physical badge swipe system was also a challenge. This was particularly due to the complexity of resident schedules, varying years of training, and large size of our residency. At the 2021 Association of University Radiologists (AUR) Annual Meeting, several of the problem-solving sessions with the American Alliance of Academic Chief Residents in Radiology (A³CR2) highlighted similar challenges faced at other institutions. Many of these challenges were magnified in the virtual environment, with programs reporting difficulty maintaining and monitoring conference attendance. Programs reported periodic spot-checks, QR codes, raw conference logs, and in some cases resident self-report to log conference attendance. No standard way of conference attendance monitoring and feedback was used, though it was clear this was a commonly faced challenge.

The implementation of this system allows adherence to the ACGME Diagnostic Radiology requirement that the core didactic curriculum must be documented, and that resident conference attendance should be documented for the entirety of the educational program (1). Furthermore, the system allows for anonymous feedback which meets requirements that “all teaching faculty members should have their

educational efforts evaluated by the residents” which must be “written, anonymous, and confidential” (1). There are additional regulations for a specific number of conference hours with “a minimum of 80 hours of classroom and laboratory training in basic radionuclide handling techniques” (1) per the ACGME and “a minimum of 60 hours of documented medical education in mammography” per the Food and Drug Administration Quality Mammography Standards (9). These can be easily monitored and adhered to using the application.

This lecture monitoring system was designed with security and convenience in mind, utilizing an established Firebase authentication protocol (secured by third party log-in systems) to verify the user’s identity. The cryptographically generated links secure the system against attempts at reusing links and requires residents to be logged into the virtual conference to receive the unique swipe-in link. By only requiring residents to perform a single click to log attendance, we thereby minimize interruption to the lecture experience.

There remain some limitations to this system design. First, the attendance tracker does not check whether swiped-in residents remain for the entire duration of the lecture. Additionally, this system would not protect against a resident taking the link and sharing it with someone who is not in

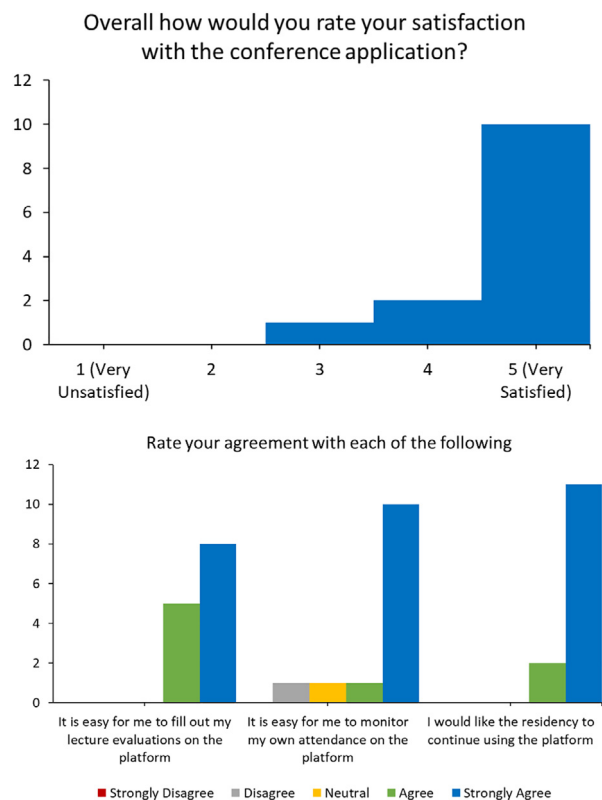


Figure 6. Survey responses on (a) overall satisfaction with the conference tracking platform, (b) ease of use and desire to continue using the platform, (c) rating of the platform on particular features, and (d) importance of various features in a conference tracking platform. (Color version of figure is available online.)

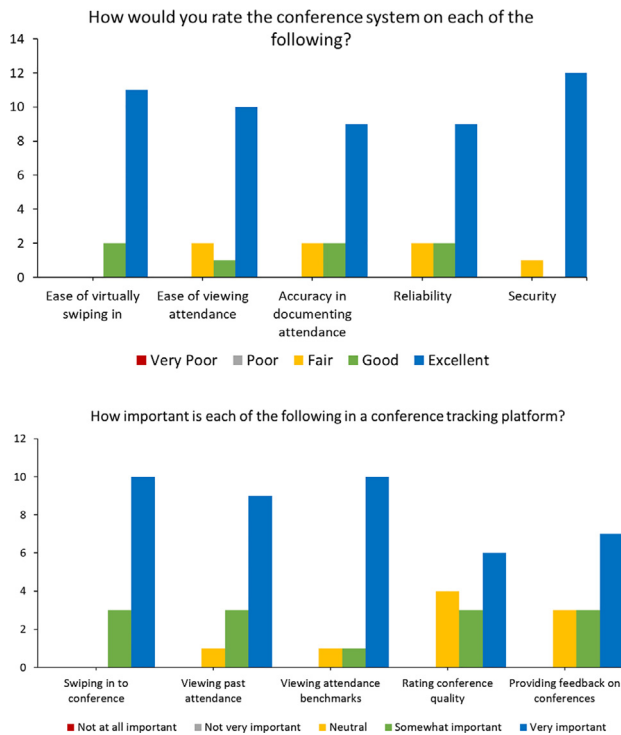


Figure 6. Continued.

attendance. Potential guards against these loopholes include: (1) Randomizing the time when the link is posted in chat, (2) Setting time limits on how quickly the link must be clicked, and (3) Requiring a link to be clicked at the beginning and end of the conference. We later elected to post the swipe-in link at a random time point during each conference to encourage users to be attentive and present during the entire conference. Our survey was also limited due to the low response rate, which can bias results. However, the application has continued to be used by the residency with overall positive feedback.

As the cases of COVID-19 decline and many institutions transition to hybrid or in-person lecture, we have developed an application program interface (API) that supports physical systems such as our pre-COVID-19 badge-swipe system. This will allow users to swipe in for conference using

traditional physical methods like badges in addition to the virtual system, while continuing to use the same system for conference scheduling, tracking, and evaluation. This will allow for seamless conference tracking regardless of lectures remaining virtual, returning to in-person, or any hybrid combination of the two.

We developed an online platform for radiology residents to record conference attendance and submit lecture evaluations, in compliance with ACGME requirements.

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