

Title: Adapting Scientific Conferences to the Realities Imposed by COVID-19

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Introduction:

The COVID-19 pandemic has forced cancellation of hundreds of scientific conferences worldwide, including dozens in the field of radiology. Other conferences have converted to exclusively virtual formats because of risks of travel and interpersonal interactions of usual in-person conferences. Changes in format already extend to events planned through December of 2020 (and beyond), underscoring that recovery will not be fast. The impact of COVID-19 on scientific conferences is only the tip-of-the-iceberg in a world that would have been unrecognizable only a few months ago. Hospitals, universities, and governments still are trying to find a path forward to overcome massive financial losses and large-scale unemployment. Sponsors and participants in scientific conferences confront these same challenges in moving forward.

As of this writing in early June 2020, essentially all societies in imaging and other scientific areas have canceled in-person conferences through the end of 2020. Larger organizations, such as the American Association for Cancer Research (AACR) and American Society of Clinical Oncology, have rapidly converted at least part of their planned content to a virtual format with reduced or free registration for members or even the general public. For the first part of the AACR virtual annual meeting, 61 000 persons registered, although numbers who actually participated in the event likely are fewer. This trend recently extended to the RSNA annual meeting for 2020, which will convert to an entirely virtual format.

Virtual meetings have nearly completely replaced in-person meetings for even modest numbers of participants (10 or more) in professional and personal life. While webinars and video broadcasts of meetings have been part of the scientific landscape for years, the pandemic has enforced a global crash course in video conferencing. Almost everyone in a virtual meeting has experienced the comment, “You are on mute”; watched a pet parade into the field-of-view; and learned how to use a virtual background to conceal dirty laundry or dishes. Against this backdrop, we presented leaders in imaging research, clinical care, and administration throughout the US with a series of questions about the pros and cons of in-person versus virtual scientific conferences. Many respondents have extensive experience planning and leading in-person scientific conferences. We acknowledge two points at the outset. First, while we compiled responses from leaders in the field, we did not collect information in a scientifically rigorous manner. Second, while we have a very clear understanding of in-person conferences, exclusively “virtual” conferences remain at early stages of development. With advances in technologies and adaptations by participants and conference organizers, current strengths and limitations of virtual conferences likely will change as the format evolves.

Based on responses from experts in imaging, we compare in-person versus virtual meetings in the context of effects on scientific communication, meeting participation, networking, as well as impacts on societies and organizations. As we emphasize throughout the text, in-person and virtual meetings are not interchangeable, and the final landing spot for meeting formats hopefully will capture strengths of both formats.

Scientific Communication

Presenting and discussing scientific data and discoveries are central to advancing research and clinical care in radiology and other medical fields. As evidenced already, presentations and the associated recognition can continue with virtual meetings, but important distinctions exist between in-person versus virtual formats. Giving a live presentation in front of one's current or potential future peers invariably generates mixed, sometimes intense emotions - anxiety, excitement, pride, and even joy. Such emotions energize a speaker, and mastering these emotions to deliver a successful, engaging talk builds confidence that extends across other aspects of life. A computer screen, no matter how interactive the piece of software used and the willingness of viewers to be involved in a discussion, simply cannot replace the visceral reality of standing alone at a podium in front of a group. Emotions experienced by speakers also permeate a meeting, generating an "energy" that is hard to capture in a virtual format.

Common advice for speakers includes making eye contact throughout the room to interest the audience, and visual cues, such as smiles, head nodding, and laughter, also help a speaker determine if they are communicating effectively. Audience members also look for these cues and interactions to engage in the presentations. Visual cues and emotions experienced by both speakers and members of an audience affect one fundamental goal of a conference – learning and retaining new information to generate new lab experiments or clinical care plans. Memory retention, as well as perception, learning, and problem solving, are intricately tied to emotion. These processes are maximized by being at a conference in person. Current technologies struggle to reproduce these cues, particularly when a screen displays slides rather than a speaker's face. The net result is that a speaker may feel that they are merely talking to themselves. Feelings of isolation for a speaker become even more noticeable at the end of a presentation. Somehow, seeing the clap or thumbs up symbols on video chat messages does not bring the same elation and gratitude as actual in-person applause.

Virtual meetings change the nature of dialogue and question and answer sessions after a presentation. In-person meetings typically have an open microphone for limited numbers of attendees to ask questions. While allowing a direct dialogue between speaker and attendee, this format may discourage introverted and/or more junior people from asking a question. The open question session format often results in a "questioner" delivering a mini-talk rather than an actual question without proactive intervention from a moderator. Early experience with virtual conferences shows new challenges for speakers, attendees, and moderators. For sessions with large (hundreds) of participants, the sheer volume of questions listed on the chat session can be overwhelming and distracting to participants. Some sites have blocked all participants from viewing all comments. The online chat function of videoconferencing software opens opportunities for more comments and discussion. However, some participants may feel free to type unsavory comments that they would not verbalize, which may be amplified further by the ability to ask questions or make comments anonymously. Session moderators will need assistance to efficiently sort through lists of questions to identify appropriate ones to ask the speaker.

Meeting Participation

Not only do scientific conferences represent the established standard for exchanging scientific information and updating one's skills, but also traveling to an in-person conference is a recognized perk for trainees and professionals at all stages of careers. Not surprisingly, scientific conferences in winter months commonly occur at ski resorts or warm-weather, ocean-front cities. For persons at all career stages, meetings help establish "street credibility" in the competitive world of academics. Presenting review or refresher courses and moderating sessions fuel promotions for faculty, and face recognition and visibility help faculty recruit trainees and/or advance to new positions. Attending a meeting to present research rewards efforts of trainees and enables them to engage the broader community in their chosen field. Many of us remember our first conference

as an important milestone in career development, and PhD programs frequently include presentation at a national meeting as a requirement for graduation. For trainees who receive merit awards for presentations and research, this recognition can pave the way to a prestigious post-doctoral, fellowship, or faculty positions. Establishing name and face recognition, plus the ability to immediately interact with peers, are advantages of in-person meetings that are much harder to replicate virtually.

In-person conferences allow persons to step away (at least to some degree) from demands of teaching, institutional committee meetings, and clinical care. For those who attend a conference alone (ie without significant others and children), an in-person meeting may be the only real chunk of protected time to devote solely to professional work and development. It remains to be determined to what extent institutions will protect “conference attendance time” if a person does not physically leave the usual work environment. Attendees also may be less willing to commit to a full day of viewing a computer screen for a virtual conference without the aforementioned perks and buffer times of interacting with colleagues casually, enjoying food and culture in a place that’s not your home, and more. Even for in-person conferences, members of the audience may divide attention between a speaker and a mobile device. Limited experience suggests divided attention amplifies when listening to a virtual presentation. Lacking direct eye contact with a speaker or peer pressure from other members of a larger group, the temptation to multi-task increases – with a presentation slipping into the background of one’s attention. Potential distractions increase more when listening at home, where home responsibilities, childcare needs, impatient pets, and even competition with other family members for internet bandwidth, occur commonly.

Alternatively, established faculty members who have a hard time saying ‘no’ to speaking invitations may find some solace in the shift to virtual meetings. Such individuals sometimes experience a different kind of burn-out that comes from being on the road too much. Excessive time away can be a significant source of stress on one’s family and often leads to a mountain of work in the office that awaits one’s return. Conversely, time spent at meetings is sometimes consumed with the need to manage issues at the home office, limiting the value of attending in person. To these individuals, virtual meetings are a welcome respite from the exhaustion that comes from excessive travel.

Vendors are another key constituency of large conferences. For many senior faculty, meetings with vendors to learn about new technologies and equipment are a major reason to attend a conference. Similarly, large conferences define a central event on the business calendar. Companies plan budgets and marketing strategies months in advance; identify key persons for sales pitches; and generate new leads for follow up. Pausing or even possibly ending in-person conferences will limit growth of established companies and threaten viability of new companies trying to enter the marketplace. While companies may advertise as part of virtual meetings, the impact of advertising on a website and financial return for sponsoring societies and organizations remains uncertain.

While in-person conferences may allow attendees to focus predominantly or exclusively on professional goals, other obligations in life may prevent people from traveling. Child-care, elder-care, or other caretaking responsibilities present formidable, sometimes insurmountable obstacles to in-person attendance. These responsibilities typically fall disproportionately on women, hindering advancement in fields historically dominated by men. Larger conferences have begun to offer childcare, which is an important step toward overcoming this problem. Similarly, attendance at in-person meetings remains challenging for persons with disabilities and other chronic medical illnesses. Financial resources also can constrain attendance at in-person meetings, a limitation that likely will become more prevalent as institutions confront major deficits.

Virtual meetings can circumvent some of these problems and offer benefits. Though precluding participating in live question and answer sessions, virtual attendees can view sessions and exhibits at times of their choosing for conferences that record presentations. This option gives flexibility in scheduling and avoids the need to rapidly adapt to new time zones. Attendees may view presentations that occurred simultaneously, eliminating the need to choose only one, and replay sections of particular interest. However, live-session virtual conferences still will need to coordinate timing of presentations with some persons presenting in the middle of the night local time and overcome potential technology challenges on a much larger, potentially global scale. Virtual meetings reduce overall cost of attendance, personal barriers to participation, and greenhouse gas emissions from flights and ground transportation. Potentially, virtual formats could expand community outreach by allowing K-12 students, undergraduates, and medical students to see science in action, to interest them in joining a field. Virtual meetings may result in increased membership and many virtual meetings are currently free for registrants. The virtual format opens nearly limitless opportunities for dissemination of research. Many major societies have already recognized these benefits of virtual meetings and enacted hybrid in-person and virtual meetings even before the COVID-19 pandemic eliminated the in-person component. Experience with a hybrid format positions such groups well to envision and shape the future of large conferences to formats readily digested by virtual participants. Economic constraints may push smaller conferences to exclusively virtual formats even in the period beyond restrictions on travel and size of in-person gatherings.

Networking

Respondents nearly uniformly agreed that the greatest advantages of in-person over virtual conferences come from events not formally listed on the meeting agenda: social interactions and networking. Large national and international conferences frequently offer once-yearly opportunities to reconnect with colleagues, students, and mentors. Planned times to get together for coffee, meals, or a chat after (or during) a session solidify these relationships and foster loyalty to the sponsoring organization. Even though the same range of technologies that make virtual conferences and meetings possible would enable us to reconnect with colleagues at almost any time, we rarely have taken time to reach out through a video (or even) phone call and instead rely on emails or texts. Although still lacking the “in-person” feeling and energy, one-to-one or small group calls reclaim some visual cues and expressions lost in larger scale formats. Just as current social distancing requirements during COVID-19 have produced a huge spike in number and duration of personal phone calls (exceeding 800 million per day on some carriers), professional interactions will continue to require video meetings for at least the intermediate term.

While valuing the opportunity for interactions with established colleagues, in-person conferences, particularly in smaller formats, provide the setting to begin new, sometimes life-long relationships. Waiting to meet a speaker after a session, discussing results at a poster session, or even randomly conversing with persons waiting in a line for food can lead to new research collaborations, job options, and leadership positions. Many of us have benefitted from the opportunity to introduce oneself or be introduced to a colleague at a conference. Virtual meetings lack the key element of spontaneity and serendipity that leads to new relationships. Yet, meeting a new person at an in-person event favors attendees who are outgoing and remain confident in a new environment. At a large conference, one can readily walk through the conference while avoiding eye contact and conversation with strangers. Despite limitations of existing virtual chat and networking sessions, even the current state of technology can at least partially level the playing field for introverts and help them connect with other attendees.

Attendees at all levels appreciate and value social interactions and events at conferences, but networking opportunities likely are more critical for trainees and those at early stages in career development. Despite admonitions that success comes from hard work, talent, and determination, career advancement often results from “bumping into” someone at the right place and time. Chance interactions become virtually non-existent with the current state of virtual meetings. Given economic consequences of COVID-19 on most institutions and companies world-wide, venues that increase the likelihood for chance interactions that ultimately lead to jobs now take on even greater importance throughout professional life.

Societies and Organizations

Annual conferences serve as a focal point of each year for most scientific societies and organizations. Annual conferences call attention to scientific, outreach, and education accomplishments and services sponsored by a society for its members and the broader community. Essential administrative and governance activities and committees in societies convene at a conference to handle ongoing business issues and plan for the future. The usual “changing of the guard” or passing of the baton, as it were, that occurs at annual meetings, is made much more challenging and in many ways less gratifying without in-person interactions. Thanking and acknowledging the outgoing leadership’s insights, progress, and efforts may serve as a pinnacle moment for these leaders. For the incoming leaders, it is equally important to be recognized and welcomed. Emotions associated with leadership transitions and career-recognition award are hard to replicate in a virtual format.

Many smaller societies also may convene administrative and committee meetings for persons attending a larger conference in the same field, such as the RSNA annual meeting, for example. These administrative functions have and, for the short term, will continue virtually with many of the same challenges already described for scientific presentations. Well-run conferences build loyalty among attendees, presenters, and even vendors, motivating people to return each year and maintain membership. Conferences also help recruit new members, particularly from persons attending for the first time who leave impressed with the event.

For many organizations, an annual meeting is one of, if not the major source of revenue. Conversion to a virtual format changes the financial model for a scientific society or organization. All organizations must adapt to the upheaval in revenue streams, and some groups may struggle to continue without substantial restructuring of commitments.

What the Future Holds

As in seemingly all aspects of COVID-19, more questions than answers exist at present. In the upcoming year, financial losses have caused many universities and radiology practice groups to limit or even eliminate funds available for travel or even membership in a society. The magnitude of financial losses varies considerably among institutions and practices based on the local impact of COVID-19. Restoration of institutional funds for travel and professional fees likely will be contingent upon a return to financial stability. Currently, the National Institutes of Health and other federal funding agencies allocate grant funds for travel and expenses at scientific meetings. With probable constraints on funding, will agencies limit these expenses, or will investigators still be willing to spend resources for in-person conferences? Once some societies have shifted to a hybrid format or completely virtual format, will they ever return to the in-person format? And what factors will determine if it is worth the activation energy of re-negotiating hotel and venue contracts and other details involved in successful in-person scientific meetings? Financial losses incurred by companies also may reduce participation in all but major conferences. Stopping in-person meetings would have a negative ripple effect on local economies as well; for example, the RSNA annual meeting brought in an estimated \$130 million yearly to Chicago’s economy in 2019. To

recapture some of this money, societies may have a window-of-opportunity to negotiate more favorable contracts with convention centers and hotels.

COVID-19 has shifted science and all of life to digital, rather than in-person, interactions. This likely will never reverse completely. As sponsoring societies increase virtual components of conferences, some attendees may opt to remain with this format because of cost, ease, or other personal reasons. Even with a return of in-person conference formats at some point in the future, rebuilding in-person attendance will take focused efforts on the part of meeting organizers. Societies may have to make tough decisions about how to re-structure their meetings to decrease the cost footprint and perhaps space requirements of decreased in-person attendees. Another possibility is a compensatory rise in membership dues for some societies as in-person meeting attendance numbers fall.

Respondents to our questionnaire agreed that a complete paradigm shift to virtual conferences would result in loss of a cornerstone of growth in biomedical research and inspiration to trainees. Virtual conferences risk losing the allure and intangibles of conferences - the pride of trainees wearing badges with the word 'Oral Presenter', large groups of students passively (or actively) confirming the gravitas of a certain rising faculty member, and the maintenance of the professional and personal relationships that are so necessary to effective scientific teamwork and sustenance in our careers. The impact of COVID-19 necessitates caution moving forward, perhaps with reductions in overall numbers of meetings and a discussion of specific meetings that may occur less frequently. Hybrid meetings combining in-person and virtual formats offer options to capture benefits of each format. The exact form of future in-person meetings takes remains yet unknown. Space requirements for social distancing may necessitate larger meeting rooms for fewer participants at both scientific sessions and receptions. Until an effective therapy or vaccine against COVID-19 becomes available, the threat of recurrent outbreaks still looms. Past experience also suggests future outbreaks with other zoonotic coronaviruses are likely, so our new plans for conferences also must account for this possibility. As we continue to navigate COVID-19 and its ramifications, we must identify prudent, risk-appropriate ways to restore in-person interactions – for the benefit of science and clinical medicine, but, more importantly, our health as human beings.

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