INVITED PAPERS

Maximizing virtual meetings and conferences: a review of best practices

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Abstract

Purpose In the current COVID-19 pandemic, it is more important than ever to maximize communication in the scientific and medical community. In the context of academic meetings and conferences, there is the growing need for a set of guidelines secondary to the COVID-19 pandemic, and the growing environmental and economic challenges that large academic and medical conferences face. These Virtual Meetings Best Practices were established in response to the scant evidence and guidance on the topic.

Methods These best practice guidelines were developed from a scoping review of peer-reviewed literature, grey literature and lay literature. MEDLINE and Embase databases were scoped for relevant, non-duplicate articles. For lay articles, Google searches were utilized. The recommendations that comprise this document are a compilation of nonexperimental descriptive studies (e.g. case studies) and expert committee reports, opinions and/or experience of respected authorities, and lay articles.

Results We identified four phases of the meeting cycle: *Pre*-planning considerations, *P*lanning, *A*ccomplishing conference goals through execution, gauging *R*esponse and *E*ngaging the target audience for future cycles (PrePARE). Akin to the Plan, Do, Study, Act Cycle of quality improvement interventions, this document is meant to drive meaningful initial and subsequent interventions in the meetings of the medical and academic community. This covers actions and preparation for registration, scheduling, speakers, attendees, event type, technology, monetization/marketing, dealing with disruptions, post-event deliverables, response and engagement strategies. Enhanced access to integrated, high-quality and efficient virtual meetings will establish a new norm as an effective alternative for innovative health research, education and information dissemination in orthopaedics and beyond.

Conclusions Given the uncertainty of whether large in-person gatherings will be permitted, advisable or responsible later into the summer of 2020 and beyond, these guidelines will aid events being converted and scheduled as virtual-only meetings. As we move forward in the era of increased utility and utilization of virtual conferencing, these guidelines will serve as a benchmark and standard for surgeons in the field.

Keywords COVID-19 pandemic · PrePARE · Registration · Virtual meeting · Virtual conference

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Introduction

Scientific collaborations that emerge from conference meetings can be more novel, cross-disciplinary and more frequently cited than projects between two researchers in the same institution [1]. Virtual conferences can offer more than an alternative to conventional face-to-face events. With the COVID-19 pandemic forcing healthcare associations, and otherwise, to re-evaluate the need for international travel and 'cross-border contamination', the role for virtual conferencing is expanding. Prior to COVID-19, there have been concerns regarding the negative consequences arising from greenhouse gas emissions resulting from traveling to conferences and meetings [2–8]. Technological capabilities are no longer a hindrance and people are now well acquainted with online

environments. Saving time, money and resources are other benefits that come with online conferencing. In fact, these economic benefits can be shared by many of the different stakeholders involved. In addition, due to their inclusive character, virtual meetings can attract international participants for local events. Virtual meetings allow universities and healthcare associations to increase their outreach and international collaborations and position their research on an international stage.

The impetus for the Best Practice Guidelines for Virtual Meetings stemmed from the ongoing COVID-19 pandemic. As many meetings and conferences shift to online platforms in a short period of time, and the future of in-person conferences remains uncertain, this document is timely and needed. It connects the perspectives of a multitude of stakeholders and partners to work towards a coordinated and integrated approach to planning, executing and evaluating virtual meetings across medical and academic institutions. Enhanced access to integrated, high-quality and efficient virtual meetings will establish a new norm as an effective alternative for innovative health research, education and information dissemination in orthopaedics and beyond.

These best practices were established in response to the scant evidence and guidance on the topic. In the context of academic meetings and conferences, there is the growing need for a set of guidelines secondary to the COVID-19 pandemic. In addition, growing environmental and economic challenges that large academic and medical conferences face further justify these guidelines. While moving forward in the era of growing utility and utilization of virtual conferencing, these guidelines will serve as a benchmark and standard for surgeons in the field.

Methods

Scope, purpose and target audience

These best practice recommendations for virtual meetings for surgeons are the result of an extensive review of the literature, grey literature, private and public sector documents, expert consultation and stakeholder surveys. The document provides a synthesis of best practices across the continuum of meeting types. It will serve as a framework for medical and academic communities as they adapt, develop and implement remote and virtual conferencing strategies.

Identification of key topics and core reference guidelines

Initially, the scope and content of the project were defined by evaluating existing literature on virtual healthcare and academic meetings and conferences [9,

10]. This scoping review allowed conceptualization of the methods and sections of these best practices below.

Criteria were established to guide the selection of best practice recommendations for the virtual meeting guidelines. It was determined that, to be considered for inclusion, recommendations had to meet the following criteria:

- Be supported by the literature available and/or be considered essential to delivering best practice
- Be integral to driving important change to current healthcare conferencing practices
- Reflect the full continuum of virtual meetings moving forward

Synthesis of best practice recommendations

These best practice guidelines were developed from a scoping review of peer-reviewed literature, grey literature and lay literature. Given the recent systematic review on the topic by Spilker et al. from the education realm of peer-reviewed research, we heavily utilized the referenced documents therein [11]. The systematic review did not review MEDLINE or Embase databases; therefore, these two databases were scoped for relevant, non-duplicate articles. Additional articles reviewed are referenced here [12–26]. For lay articles, Google was searched on April 11, 2020. Boolean operators were used, and three separate searches were carried out which are listed below. Results were reviewed for the first 5 pages of each search strategy, with search settings displaying 10 results per page with the location set as Canada. Advertisements and reviews of conferencing technologies were excluded from the results of the search. No click-throughs were undertaken; thus, only the first web page encountered was indexed. Articles were indexed for themes that contributed to the development and verbalisation of the recommendations herein.

Key findings

The recommendations that comprise this document are a compilation of nonexperimental descriptive studies (e.g. case studies) and expert committee reports, opinions and/or experience of respected authorities and lay articles. We identified four phases of the meeting cycle: *Pre*-planning considerations, *P*lanning, *A*ccomplishing conference goals through execution, gauging *R*esponse and *E*ngaging the target audience for future cycles (PrePARE; Fig. 1). Akin to the Plan, Do, Study, Act Cycle of quality improvement interventions, this document is meant to drive meaningful initial and subsequent interventions in the
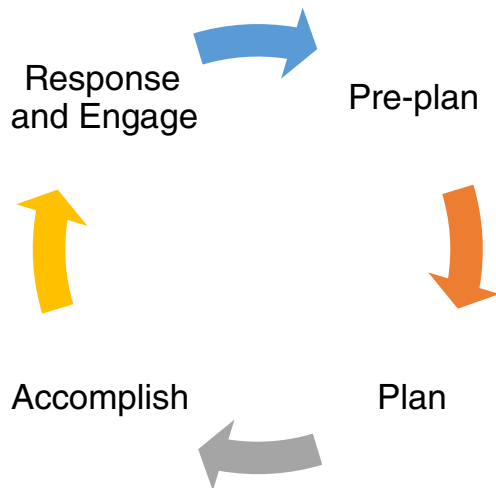
Fig. 1 The four phases of the conference/meeting cycling

meetings of the medical and academic community. A checklist for planning virtual conferences can be found in Appendix 1.

Pre-planning considerations

The pre-planning phase of a virtual meeting is arguably the most important and deliberate phase of the meeting cycle. This phase represents the initial foundation that is laid out for the virtual meeting that is to be planned and executed. This foundation consists of defining the audience, which is likely similar to previous face-to-face meetings held by medical or academic associations.

Pre-planning recommendations:

- Define the organizing committee early, with multiple stakeholder groups represented.
- Define target audience based on objective measures, especially based on various association memberships.
- Assign a committee member as an Accessibility Chair to establish and oversee best practices of accessibility at the given virtual meeting for the given target audience. Auditory, visual, economic and technological accessibility should all be considered.
- The early definition of the type of meeting is integral to its success, with focus on achieving translation of desired knowledge and engaging the target audience. Meeting types include conventional, full virtual, hybrid and asynchronous (Table 1).

- An asynchronous meeting structure is a fallback option for meetings without the social resources, capital or time to transition to a virtual layout.

Planning

The planning phase of a virtual meeting is the most cumbersome of the meeting cycle. This phase represents both large and small decisions about the format of the virtual meeting that is to be executed. This planning consists of formulating a comprehensive registration and scheduling process, deciding the types of virtual sessions that will be held within the conference, the technological requirements of the event, and how the event will be funded, monetized and marketed.

Registration recommendations

- Virtual meetings should have individualized robust registration processes for each participant to ensure targeted content, thorough technological planning and proper funding and monetization of the event.
- Participant hardware registration should be considered to provide cybersecurity.

Scheduling recommendations

- When converting a meeting to virtual format, the duration and density should remain consistent, while being informed by the defined target audience and registration data.

- The duration of a conference would be defined as the number of days or weeks that the conference organizers would choose to continue to release novel media, whether it be pre-recorded or live. The density of the meeting refers to the concentration of the release of the media within the duration of the meeting.

- Time zone planning of live plenary sessions of the meeting should be based on registration data to maximize viewership and engagement.
- Mindful scheduling of breaks around mealtimes in various largely populated times zones is key to maintaining engagement.
- Web-based, modifiable and frequently updated meeting scheduling should always be used.

Speaker recommendations

- Use financial capital to attract the best speakers for each event, as the cost will be at a discount relative to an in-person speech.
- A robust and comprehensive speaker support document is recommended to aid in adaptation of speakers' talks into high yield virtually deliverable presentations.

Table 1 Definitions of the various meeting types

Meeting type	Definition
Conventional meetings	A conventional face-to-face conference with additional remote presentations and live broadcasting is currently status quo for most modern medical and academic conferences.
Full virtual meeting	A full virtual meeting is one that is meticulously curated by event organizers and is viewed, and participated in, by attendees remotely with no brick-and-mortar or conventionally planned events.
Hybrid meeting	This model operates as many small conventional sub-conferences locally, and true virtual conferencing from a home or office setting, with all participants viewing and interacting with the same virtual content.
Asynchronous meeting	Focus only on asynchronous published papers and pre-recorded videos and provide interaction through asynchronous question and answer segments. This model eliminates an essential element of a conference: the real-time social interaction among participants.

- Focus on speaker and panelist preparedness, from a delivery and technological perspective.
- Ensure speakers have access to high-quality hardware, software and Internet connectivity.
- Organizer should prepare a standardized slideshow template for speakers. This will allow branding with a consistent and professional appeal.
- A sample speaker preparation document is provided in Appendix 2.

Attendee recommendations

- Explicit hardware, software and connectivity recommendations for attendees should be delineated early in the planning and registration process.
- A concise attendee deliverable is recommended to set expectations and norms of virtual participation.
- A sample attendee recommendations document is provided in Appendix 3.

Event type recommendations

- Given documented engagement issues within virtual conferencing circumstances, it is recommended that virtual meetings bias towards small group sessions of no more than 30 people.
- Mix of live and recorded content can be utilized to allow for scheduling and decreased facilitator and organizer burden.
- Allocate time and resources for both random and intended virtual social networking events throughout the conference to maintain participant satisfaction. As well, programme for dedicated mentorship sessions.
- The past experience of meeting organizers should inform the choice of events included in their meetings; Table 2 shows recommended session types and their considerations.

Technology recommendations

- Synchronous video conferencing is most effective if augmented by other forms of virtual collaboration, such as data and document sharing or real-time chat functions.
- Refer to Appendix 4 for a concise list of available technologies for virtual meetings and their respective 'pros' and 'cons' with regard to meeting size, cost and meeting logistics.
- Test technology and connectivity of speakers, moderators and facilitators in a 'dry-run' setting multiple times in advance.
- Technological support programme must be robust and scaled based on number of participants. This includes support documents that a readily available, and live assistance.
- Audio-visual production budgeting should be spent first on events with the highest participant visibility.

Monetization and marketing recommendations

- Monetization of a virtual meeting should be a deliberate and methodical process by meeting organizers informed by previous experience with target audience. Early registration incentives are also recommended.
- Industry sponsorship, participation and 'in-meeting' advertisements should fall in line with pre-set organizational guidelines and follow precedent when applicable.
- Frequent marketing, through multiple avenues, targeted at the previously defined audience is imperative.
- Make it accessible and easy for speaker and participants to 'market' their participation in the meeting.

Accomplish

Accomplishing meeting goals through execution and delivery of the virtual meeting is the stage of the meeting cycle where

Table 2 Types of meeting events and their respective considerations

Session type	Consideration
Plenary sessions	Broadcast video communication channel that reaches a large audience is utilized Supplemental concurrent or post hoc platforms to support topical discussion among participants
Paper/breakout sessions	Run in parallel and can be grouped based on topic or theme Can be run as pre-recorded lectures with discussions after with the keynote speaker, or as synchronous live events that are hosted and moderated
Workshops/small group sessions	Intended to target and facilitate even smaller and more intense group discussions that typically involve a presenter interacting with just a handful of participants Have explicit norms that facilitators and attendees follow, as well they should be limited in size.
Poster and demo sessions	Can be offered in a synchronous, asynchronous or blended fashion
Social events	Arguably the most integral parts of providing a high-fidelity virtual conference Participants value social networks developed from conferences in the academic and medical fields The importance of providing and fostering social networking in the literature cannot be understated.

the planning comes to fruition. The planning stage will lay the groundwork for the execution, but there are a great number of considerations about how the sessions should be executed, and these are covered in this section of the best practice document.

Event recommendations:

- Designate a host and moderator for every session planned to provide consistency and timing for meeting sessions.

- Organizers of the conference are generally responsible for 'hosting' the plenary and large group sessions. Hosting means initiating and then managing the live, synchronous sessions.
- Unlike hosts, moderators do not have technological responsibilities during the session. These participants of the live sessions, like in live conferences, are responsible for driving the live session along a planned theme and discussion.
- A sample moderator preparation document is provided in Appendix 5.

- It is vital to fostering engagement in small group sessions through means such as encouraging video by attendees to increase interactions; allowing for introductions and small talk at the beginning of the session; setting agenda and display an agenda; utilizing technology to build in polls, surveys, virtual whiteboards and trivia showing results in real time; and working humour into the content of the session.

Disruption preparedness recommendations

- Pre-recorded substitution sessions should be scheduled for each large group event as a backup.

- Moderators and hosts must have clear guidelines on how to deal with in event disruptions.
- To limit disruption and hacking of small group events, green rooms, random access codes and administrator monitoring of attendees should be used.

Post-event deliverables

- Speakers and content creators at the meeting should be given the option to provide conference-goers with take-away materials.
- Obtain consent from content creators prior to recording and making those recordings available after the meeting.
- A deliberate predetermined strategy should be used to guide access to post-conference materials.

Response and engage

The response and engagement phase of the conference cycle is important in ensuring the continued growth, development and continuous improvement of the virtual conference for the next cycle.

Response recommendations

- Consent from participants and explicit signals should be provided when data is being gathered.
- Data gathering during the meeting should be as broad and thorough as possible.
- Post-session and post-meeting evaluations by all participants should be concise and not over-burdensome.

Engagement (implementation) strategy

- Data gathering, reporting, analysis and implementation should all be transparent to all stakeholders.
- Consent for data gathering, and possible utilization in research, should be obtained from the outset with ethics approval if necessary.

Conclusions

As concern over COVID-19 sets in, the global community must rethink large gatherings. The novel (2019) coronavirus has reshaped the way we work; it will change conference delivery, a trillion-dollar international industry in which millions of people participate each year across all business and education sectors. Given the uncertainty of whether large in-person gatherings will be permitted, advisable or responsible later into the summer of 2020 and beyond, these guidelines will aid many events being converted and scheduled as virtual-only meetings in the future.

Authors' contributions This work, titled 'Maximizing Virtual Meetings and Conferences: A Review of Best Practices', is the honest and novel work of the six authors. All authors have contributed to all components of the creation of this work. Furthermore, we have all read and approve of this work.

Data availability Formal data from literature search may be requested from the corresponding author.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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