Introduction

The practice of social distancing and a shift towards working remotely across a gamut of professions has resulted from the global coronavirus disease 2019 (COVID-19) pandemic [1]. The capability to remain connected to coworkers despite distance, particularly in a work from home (WFH) scenario, has been facilitated through the use of online meeting applications that allow for video conferencing and other collaborative features such as screen sharing [2]. With collective efforts and learning at a distance, there has been already gained increased attention in the radiology community prior to the COVID-19 pandemic [3]. It is only natural that radiology departments would acclaim by incorporating online conferencing software into daily practice both during the COVID-19 epidemic and, later, in introducing increased collaboration amongst educational institutions and medical practices in different cities and states.

Methods and Objectives:

• A literature search was performed using PubMed, and literature exemplifying utility of videoconferencing technology, both recently and in the past, was reviewed and incorporated into the discussion.
• Various platform features (screen sharing, annotation, recording) were compared and discussed with respect to utility.
• Topics of discussion with respect to radiologic workflow include teamwork, training, and patient care.

Collaboration

Collaboration can occur not only within the local medical community but also with those outside of it like industry specialists, medical researchers, and basic scientists.

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• A virtual peer learning program is also beneficial to radiologists as it costs attendees less than 1 hour/month of administrative time (on average $194/h) [5].
• In one such example, this system allowed radiologists, residents, fellows, and medical students from 14 institutions in 10 states to engage in valuable peer feedback, improvement, and learning.

Major Platforms

Virtual Peer Learning Models

• Virtual peer learning conferences can be beneficial supplements to traditional audit-based peer review.
  o Under the peer review model, radiologists numerically score peer mistakes to monitor individual performance and competency [5].
  o Conversely, in a peer learning model, numerical scoring is not implemented and individual performance is not graded; cases are reviewed categorically in a way to foster collaborative learning from error [5].
• In one survey of perceptions of peer review, only 32% of radiologists felt that the impact of peer review model decreased medical error and 46% of radiologists reported that they participated only because it was mandatory [6].
• A virtual peer learning program implemented exclusively using videoconferencing, may enhance participation amongst radiologists.
• Without exclusive use of videoconferencing, physically present participants engage more than remote participants; a standardized experience promotes equal participation and group sharing amongst team members.
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Patient Care

Virtual Tumor Board

• In one example, a virtual tumor board was implemented using Microsoft Teams and perceptions were surveyed. The virtual multidisciplinary conference was attended by a wide array of physicians and graduate medical trainees, and radiologic images were easily viewed by all participants at the start by using screen share features.
  o The majority of participants (87.9%) preferred a virtual to in-person tumor board.
  o Almost 100% of participants preferred to continue the virtual format even after in-person restrictions would be lifted [9].

Virtual Radiology Rounds

• In another example, Zemheri et al. successfully employed Skype into virtual radiology rounds [10]. Each session consisted of a micro-lecture and review of patient cases by both clinicians and radiologists.
  o In 89% of cases presented virtually, radiologists responded with an increase in confidence in their diagnosis/interpretation.
  o In 56% of cases, radiologists revised their report and interpretation.
• Radiologists reported that clinician input and a closer proximity to the point of care, made accessible by videoconferencing, benefited their interpretation of image.

Training

Residency Training

• Collaborative features allow traditional read-out “hot seat” style case conferences to occur as they would traditionally [11].
  o Annotation features of some platforms can be useful for questions and quizzes. “Screen share” features allow attendees (residents) to view the host’s (faculty member) picture archiving and communication systems (PACS) screen remotely.
• Online conferencing software presents an intriguing potential solution to mitigation of the academic radiology community’s concerns regarding the possible negative impact on resident education by the burgeoning trend of 24 hour radiology attending coverage.
  o The department of radiology from the Medical College of Wisconsin, has reported promising outcomes, as a result of a greater number of cases to which the resident is exposed, in their implementation of Skype into overnight emergency radiology workflow [12].
• Collaborative features can be used to teach residents, students, or clinicians how to use cutting-edge three-dimensional (3D) modeling programs, like Mimics, VGSTUDIO, and Avizo, for rendering and segmenting surface models from CT and MR image data (Fig. 1).
• Conferencing software paired with laptop notebooks can be used to teach basic computer programming techniques as they relate to radiology-focused artificial intelligence application development (Fig. 2).

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Cautionary Considerations + Conclusions

Cautionary Considerations:

• All users, including radiologists, other physicians, and patients, should approach videoconferencing with caution concerning privacy and data sharing.
• With respect to patient data and privacy, the Office for Civil Rights at the U.S. Department of Health and Human Services has modified HIPAA enforcement policies in alignment with the use of telehealth services during the COVID-19 pandemic [13].

Conclusions:

• The practice of radiology is defined by a technologically driven communicative partnership with other healthcare professionals as well as patients, and with the variety of online conferencing software available, there is opportunity to enhance cooperative efforts.
• There is potential to capitalize on the many benefits of these platforms elucidated during mass physical distancing efforts in 2020 with respect to efforts in radiologic workflow, training, and patient care.

Table 1: Feature comparison of major videoconferencing platforms. Chosen platforms (Zoom, Skype, WebEX, GoToMeeting and Microsoft Teams) were listed by G2.com in March to June 2020 as the top 5 of 10 videoconferencing platforms. G2 scored and ranked platforms based on data incorporated from user reviews, online sources, and social network[8]. Notably, the information presented in Table 1 reflects features available as of June 2020.

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Figure 1. Screenshot of a shared session explaining a lung and associated axial (top right), coronal (bottom left), and sagittal (bottom right) slices.