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Academic Radiology Departmental Operational Strategy Related to the Coronavirus Disease 2019 (COVID-19) Pandemic

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a current viral pandemic that has been circulating the globe since December 2019. The virus is highly contagious and spreads person-to-person through close contact and respiratory droplets. COVID-19 causes flu-like symptoms but can also result in respiratory and cardiac failure. Treatment is largely supportive, but many patients require extensive use of hospital resources such as ventilators. In areas such as China, Iran, and Italy, health care resources were exhausted quickly, resulting in an inability to care for all COVID-19 patients [1]. Therefore, public health experts recommend "social distancing" as the primary means to reduce community spread of COVID-19 and reduce the burden of health care resource utilization [2]. Social distancing involves physically separating people so that communicable diseases are less likely to spread, as has been demonstrated in previous pandemics [3].

Social distancing policies can be extraordinarily disruptive to hospitals in which patients and staff can both spread viral illnesses. The purpose of this article is to discuss the changes in our department in response to COVID-19.

Radiologists by their consultative and interdisciplinary role may have significant interaction with patients and families, referring providers, technologists, and other ancillary staff. Within our institution, radiology interpretation areas are intentionally located centrally within the hospital to facilitate in-person communication and teaching. The physical layout of interpretation areas along with our culture strongly focused on consultation and collaboration required thoughtful consideration with respect to COVID-19. Without appropriate risk mitigation strategies, radiologists are significantly at risk for either contracting or spreading the virus. To respond to these risks, we created a social distancing plan for our department with a core mission of minimizing radiologist physical contact with referring providers, hospital staff, and each other.

CLINICAL NEED AND STAFFING CHANGES

The first step was to assess the clinical need for on-site radiologists. We experienced a significant decline in imaging volume once COVID-19 cases began to grow locally. In addition, given the possibility of a large influx of COVID-19 patients requiring intensive resources, a decision was made by our institution to cancel elective procedures as part of an effort to encourage social distancing between patients and health care workers. The Massachusetts Department of Public Health also issued an order to statewide hospital leadership on March 15, 2020, to postpone or cancel any nonessential, elective invasive procedures (including interventional procedures) until the local state of emergency was lifted [4]. The ACR supported Centers for Disease Control recommendations and encouraged rescheduling nonurgent care, which

> *includes non-urgent imaging and fluoroscopy procedures, including but not limited to: screening mammography, lung cancer screening, non-urgent computed tomography (CT), ultrasound, plain film X-ray exams, and other non-emergent or elective radiologic and radiologically guided exams and procedures. Radiologists should work with their referring physicians to review and reschedule such exams* [5].

In response, our radiology department created a plan that was implemented with assistance from hospital leadership.

Each subspecialty radiology division was given direction to develop staffing plans to meet clinical needs, which were reviewed and approved by departmental leadership. Additionally,

1546-1440/20/$36.00 ■ https://doi.org/10.1016/j.jacr.2020.04.004

divisions created plans for which clinical needs would require on-site versus remote coverage. This allowed for a reserve of radiologists at home who were less likely to have had COVID-19 exposure. Staff who self-designated themselves as meeting Centers for Disease Control criteria for high risk were given assignments that did not require physical presence within the hospital. In addition, all radiologists who were not assigned to clinical rotations (academic, research, nonessential administrative time) were asked to remain at home and be available as needed as backup. All meetings were moved to a virtual platform, and our faculty were given video conference accounts so they could continue their clinical and research collaborations.

REDEPLOYING WORKSTATIONS ON CAMPUS

Second, in an effort to decompress our reading rooms, we assessed available locations across our health system to deploy radiologists for clinical work. This included spaces that had existing unused PACS workstations and those that could potentially have workstations. The goal was to have 6 feet of distance between radiologists, as recommended by the Centers for Disease Control [6]. This goal proved to be difficult in existing clinical spaces, and therefore we redistributed workstations to administrative and research areas. We also extended our search to include affiliated community hospitals. In our case, we needed to rapidly accelerate a timeline of IT upgrades at the community hospitals, and close collaboration with radiology IT leadership was essential.

REMOTE INTERPRETATION

Historically, our institution does not typically use home workstations as we have 24-7 on-site coverage, and our culture emphasizes face-to-face connection with referring physicians. Therefore, there was limited capacity to rapidly transition the majority of clinical work to remote only. However, our IT department was immediately mobilized to set up a number of plug-and-play home workstations that were distributed to radiologists who traditionally performed high volumes of clinical work across the various divisions. In parallel, we worked with radiology IT leadership to create a limited interpretation cloud-based platform which integrated our standard PACS, work-list management software, electronic medical record, and dictation software. Although these tools work on most CPUs, a plan has been developed to purchase high-resolution monitors for residents, fellows, and attending physicians who are needed for remote interpretation of plain radiographs; lower-resolution monitors sufficient for interpretation of cross-sectional imaging examinations are being purchased for the remaining radiologists.

ENHANCING VIRTUAL CARE

Before the COVID-19 pandemic, our institution had been making significant financial and infrastructure investments to support population health management efforts. A major focus has been virtual care, leveraging IT platforms to allow for more seamless and integrated care coordination in both the patient–provider and provider–provider domains.

For the past several years, our Division of Interventional Radiology has been a departmental leader in leveraging e-consultations (asynchronous provider-to-provider communications) to improve workflow and allow more optimal care coordination for nonemergent interventional procedures [7]. The imperative for increased utilization of e-consultations amid the COVID-19 pandemic is clear, particularly as it relates to enhanced remote review of examination appropriateness (including timeliness) and feasibility, as ways to optimize care coordination and decrease potentially unnecessary interactions with patients or other care providers.

Reimbursement for virtual visits was in flux in our state before the COVID-19 crisis; however, Massachusetts ultimately mandated that insurers reimburse for virtual visits during the COVID-19 pandemic [8]. Virtual visits are now being developed for our interventional radiologists so they may continue their interventional radiology clinics.

ENHANCING INFECTION CONTROL PROCEDURES

COVID-19 can be transmitted through contact with contaminated surfaces. Therefore, radiology staff members have been provided with appropriate cleaning materials and instructions for cleaning workstations. Because of to increased demand on hospital environmental services, our physician operations staff assisted with additional workstation cleaning. For technical operational areas, technical leadership worked with hospital infection control to enhance infection precautions within our clinical services areas. Training was performed to minimally affect room turnover time so that operations and patient wait times are not impacted significantly.

CONSULTATIONS, INTERDISCIPLINARY CONFERENCES, AND TUMOR BOARDS

Historically, referring physicians have maintained their practice of coming to the reading rooms for in-person consultations directly with radiologists. Since the outbreak of COVID-19, balancing the need to be available while maintaining social distancing has been important. All nonemergent consultations are highly encouraged to

take place via telephone or video conference. In addition, 24-7 attending physician coverage in the emergency department continues but with social distancing. A sign was placed outside all reading rooms to guide referring providers about the appropriateness and method of executing in-person consultations. In addition, emergency department consultations for referrers who are wearing personal protective equipment of any kind has been strictly forbidden. Our emergency department radiologists routinely check urgent scans directly on the scanner console in consultation with clinical emergency teams, such as trauma surgery. That practice was curtailed sharply to minimize additional contact, and a radiologist is summoned to review scans in real time only when life or death decisions need to be made.

RESIDENT AND FELLOW EDUCATION

Maintaining the educational mission is a core principle of the MGH Radiology department and Harvard Medical School. With the support of Harvard Medical School, all faculty have been provided with HIPAA-compliant teleconference accounts. Trainees were also considered in the social distancing plan. Trainees on clinical services are able to leverage real-time communication tools within our PACS to allow for text communication with staff radiologists, with backup communication for urgent or critical findings via direct telephone communication. There is also an option to review cases virtually with the attending radiologists through a videoconferencing tool that allows for bidirectional screen sharing and mouse control.

Our department has maintained a dedicated educational media services center for over 20 years, which provides wide ranging support for video, print, and other media forms. This service center provides support to staff for didactic lectures that are shared through online conferences. Trainees can ask questions through a chat or audio link. Because the examination volume has markedly decreased, the educational leadership has instituted a new lecture series comprised of four lectures per day, with equal representation from all divisions, as well as a virtual wellness and fitness hour available for all residents and fellows.

REASSIGNMENT OF TRAINEES AND STAFF

The Graduate Medical Office worked closely with the Department of Medicine to develop a coordinated plan for resident and fellow re-assignment to COVID-19 inpatient floors. Additional re-assignments to other services are forthcoming. Key principles include the following: (1) Requests for trainee coverage from the Department of Medicine and other departments must go through the Radiology Program Director. (2) Assignments must be appropriate to an individual's training and the length of time since the trainee had relevant experience. The Chairs of Radiology and Medicine agreed that to qualify for reassignment to the inpatient medicine service, trainees should have served on inpatient floors within the last 3 years. Every first-, second-, and third-year radiology resident as well as fourth-year radiology residents and fellows serving on the interventional radiology service are eligible. (3) The Department of Medicine will provide orientation appropriate to the trainee's planned role and clinical background and assure appropriate supervision and availability of personal protective equipment in all situations. (4) Reassignment will remain voluntary as long as possible. All residents and fellows to date have volunteered. However, everyone has to be flexible. If the number of COVID-19 cases continues to escalate, the department will have to have an all-hands-on deck approach. (5) Trainees on the thoracic radiology and emergency radiology services have been exempted because their examination volume is expected to rise as the number of COVID-19 cases rises. (6) Trainees who are immunosuppressed, have severe chronic lung disease, have been exposed to a COVID-19-positive patient, are pregnant, or are living with elderly parents are exempted. Trainees with other health concerns will make them known to occupational health representatives or the program director who will determine their eligibility for reassignment. (7) Fellows with full licenses will be given attending status. (8) A call room within the department has been made available for reassigned residents. (9) To maximize the availability of residents and fellows, we have removed them from nonessential rotations. We have created a master list of all trainee absences as well as intradepartmental and extradepartmental assignments. This will allow us to continually assure adequate coverage within the radiology department as well as determine capacity for service in other departments.

It is imperative that trainees are integrally involved in the process of reassignment and that communications occur frequently and are transparent. We have implemented the following: (1) We have invited several resident and fellow trainees to be on the Radiology Educational Leadership Team. (2) The radiology department held a trainee town hall to address trainee reassignment, which included the chief medical officer and the division chief of general internal medicine soliciting trainee questions. Additional departmental trainee town halls will be held on an ad hoc basis. In addition,

Graduate Medical Office leaders are holding weekly trainee town hall meetings to address questions and concerns and disseminate information to all trainees in our system. (3) The radiology department has instituted departmental town halls 3 days a week. All ongoing issues related to reassignment will be addressed during these town halls. (4) The Educational Leadership Team members are participating in Graduate Medical Office program director meetings 3 days a week. All relevant information will be disseminated to the departmental leadership and trainees. (5) The radiology resident and fellowship program directors are holding virtual meetings with each other and with their trainees on a weekly or more frequent basis.

As the crisis unfolds, other role groups in the department may be reassigned, including support staff, technologists, nurses, and attending radiologists. It is anticipated that the reassignment process for these role groups will be similar to the process used for residents and fellows.

LEADERSHIP COLLABORATION

Communication during the pandemic has been essential because information has been changing rapidly. Chairs at our system hospitals have also been in frequent communication with radiologists and technical operational staff regarding local policies and best practices. Chairs have been responsible for communicating updates to the radiologists that directly report to them through daily communications (conference calls and e-mails). We chose to host frequent virtual town halls that provide up-to-date information regarding clinical, technical, education, and research operations while providing a forum for department members to ask questions.

CONCLUSION

As the COVID-19 pandemic unfolds, we hope our experience can offer potential solutions for radiology departments to respond rapidly. We hope our strategy will allow us to practice social distancing with minimal impact to clinical services and educational initiatives. However, we also note that information is rapidly evolving and by the time this article is in press, new information may guide a different approach.

ACKNOWLEDGMENTS

We thank the MGH Department of Radiology faculty, residents, fellows, and staff for their innovative approaches to the COVID-19 pandemic, specifically, Michael Gee, MD, Michael Lev, MD, and Sharada Das for assistance in implementing many of the changes detailed above. Moreover, we wish to express our heartfelt gratitude to the many technologists, nurses, and radiologists who serve on the front lines in caring for those with suspected or known COVID-19; their self-sacrifice and bravery are greatly respected and appreciated.

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The authors state that they have no conflict of interest related to the material discussed in this article.

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