Radiology: Imaging Cancer

Transitioning to a New Normal after COVID-19: Preparing to Get Back on Track for Cancer Imaging

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Key Points

- **Institutions face dual challenges of maintaining operations during stay-at-home safety orders and planning for a future that will not resemble our past "normal".**
- **Fear of hospitals and loss of insurance from unemployment likely will be obstacles to cancer screening and other non-emergent imaging studies.**
- **Backlog of postponed and rescheduled imaging studies will create a surge that taxes capacities of scanner time and personnel.**
- **Economic impact of the pandemic threatens current and future support for imaging scientists and research activities in cancer imaging and image-guided therapy.**

Introduction

The first case of COVID-19 in the United States was reported on January 20, 2020 in Washington State (1). The cluster of cases continued to expand in Washington and soon began to spread to other states. By mid-March, COVID-19 had been reported across all 50 states (2). As a result, aggressive social changes were implemented across the United States, ranging from closures of multiple facilities (including schools, bars, restaurants, and athletic facilities), social distancing, and stay-at-home orders. In the midst of these changes, cancer imaging practices

needed to ensure the safety of their patients, and thus many imaging practices went on a temporary shutdown or scale-down as the pandemic continued to emerge within the United States. The current responses now reflect the rapid changes that were implemented in radiology clinics during the 2003 severe acute respiratory syndrome pandemic (3).

As of this writing, 466,000 people have been diagnosed with COVID-19 in the United States alone (2) with an expected peak of cases being projected for mid-April to May (4). Given the lack of widespread testing, this number almost certainly underestimates the extent of infection with SARS-CoV-2. To reduce the burden on any single hospital facility, many cities in the United States are assembling temporary hospitals and care facilities or deploying hospital ships to care for COVID-19 and non-COVID-19 patients. Officials in selected states, like Illinois and California, have recruited retired doctors and nurses to come back to clinical service to help with the COVID-19 response. In addition, medical schools are moving up graduation for fourth-year students and credentialing early as medical doctors.

The COVID-19 pandemic presents institutions and radiologists with two formidable challenges: 1) trying to maintain clinical and research operations in the face of social distancing and stay-at-home-orders; and 2) plotting a course to transition from the immediate threat of the SARS-CoV-2 virus to an uncertain future that certainly will not resemble conditions we previously regarded as normal. While recognizing that COVID-19 has disrupted essentially all aspects of life, this commentary focuses on the immediate and projected future impact on clinical care and research in cancer imaging and image-guided therapy. We asked leaders in cancer imaging from a variety of institutions to respond to a series of questions about temporary shutdowns and resultant impact on clinical imaging and research in cancer moving forward. We summarized

responses to each question listed as subheadings in this commentary. Responses come from a variety of clinics and universities from the United States, as well as from the United Kingdom and China. Our intent is to inform the cancer imaging community of ongoing practices and policies implemented in response to COVID-19 rather than presenting a rigorous scientific analysis.

What processes were used by institutions to determine which cancer imaging or image-guided therapy studies would need to be canceled?

As the outbreak of COVID-19 emerged in the United States, there were two main priorities that clinics had with regard to decision-making on cancer imaging appointments: keeping people healthy and preserving personal protective equipment resources. Practicing social distancing and preserving personal protective equipment during an imaging appointment would be difficult, forcing institutions to prioritize appointments. Many institutions categorized appointments into three general groups: nonurgent, semi-urgent, and urgent. Imaging appointments that fell under the nonurgent category were general elective screening appointments (mostly lung and breast screenings) and those in which the outcome would not change a specific therapy or treatment plan. In many cases, nonurgent imaging appointments were planned to be rescheduled in the time period of May-June depending on geographic location (while adjusting for ongoing changes of the outbreak). Triage procedures for prioritizing appointments also caused postponement of non-urgent treatments, including interventional radiology procedures and radionuclide therapy. Semi-urgent cases were assessed on a case-by-case basis. Appointments that were deemed urgent were scheduled as planned in many cases. Urgent appointments were those in which patients were planning to come in for follow-up imaging for previous high-risk cancers (Lung-RADS 3, BI-RADS 4 and 5, etc), response to therapy, or planned biopsies. Some clinics continued

to see all symptomatic cancer patients and honored appointments if patients came. Tumor boards at some clinics still held meetings over web-based platforms.

Clinics have been conscious of the language used to describe the postponement of appointments, and some have not used the word “canceled” but rather emphasized to patients that imaging appointments were “delayed” and planned to be “rescheduled”. Some institutions have provided two to three different alternative dates for appointments, with flexibility to changing stay-at-home orders. Some patients have requested to keep imaging appointments due to concerns of losing their job or health insurance during the course of the outbreak.

What is the estimated timeline for resuming canceled appointments and studies?

As of this writing, the projected peak of cases in the United States is mid-April to May (4). “Bending of the curve” in many states will extend this curve into the months of May and June, with a reduced rate of new COVID-19 cases. Institutions are monitoring the progression of infection in their respective states. Current estimates from different U.S. institutions suggest that appointments could start to be tentatively rescheduled sometime starting May 1 to June 1, 2020. Social distancing, lay-offs, and a reduced number of patients with health insurance may result in prolonged amount of time to get back to normalcy with some physicians estimating that this process could take 6-12 months. While some facilities may be closed, telehealth appointments are being made for surgery consultations during this time. Telehealth appointments offer a means to encourage patients to reengage in cancer imaging studies, although patients clearly will need to come to a central or mobile facility for actual imaging studies. In China, hospitals are requiring a chest CT scan and a nucleic acid test for patients who are hospitalized to exclude

COVID-19. As of early April 2020, some hospitals in China have already resumed normal cancer screening appointments. Similar testing practices may need to be taken as the pandemic progresses in other areas of the world.

Do institutions think there will be a "surge"? How will institutions manage a "surge" in cancer imaging patients after the shutdown ends?'

Some institutions expect that there will be a high demand for scheduling appointments once stay-at-home orders are relaxed. Personnel are beginning to make plans for re-opening after the shutdown is over. To help adjust for a surge of patients, institutions are planning extended operating hours to appointments on evening and weekends. In some cases, imaging protocols may be shortened to help increase throughput of patients. Even with proposed modifications to availability of scanners and examination time, most institutions already operate imaging equipment at near capacity with appointment slots during evenings and weekends. Trying to reschedule several months of imaging appointments likely will result in prolonged (weeks to months) wait times, which may deter many patients. One important factor that will need to be considered as the stay-at-home orders are relaxed is the high likelihood that social distancing practices will remain in force until mid-2021 (5). Social distancing practices will need to be implemented as patients come in for their appointments to protect both patients and clinical personnel. Throughput of patients likely will be delayed due to continued enforcement of more extensive cleaning procedures for imaging rooms and equipment.

To what extent could this break in screening and cancer imaging impact future imaging studies to patients?

There were a variety of opinions on this topic that mainly fell within two general categories: patient mentality and availability of health insurance. It may be likely that patient mentality about screenings will not change, and patients will continue to come in for screenings once clinics open back up again. Due to the potentially extended time period of the outbreak, some patients may opt out of screening for this year but return for next year's screening examination. Reminder emails may need to be sent out to help patients get back on track for their imaging.

Another factor that will need to be considered is potential fear of going back out into public places after the initial outbreak spike is over (predicted to be June 2020); some models suggest that this pandemic will last 12-18 months (5). Patients undergoing chemotherapy are at an increased risk of severe COVID-19 infection, and it is likely that these individuals will not opt to immediately go back out into society when the initial outbreak has ended. There are concerns that patients in remission may decide not to schedule appointments for follow-up imaging. In this regard, it will be important that clinics emphasize that they will take every precaution necessary to keep these patients safe and protected during their appointments. Facilities are considering dedicated entrances and traffic patterns for immunocompromised patients, including patients undergoing chemotherapy, who return to hospitals and treatment centers for clinic appointments and imaging studies. Instances of patients missing appointments, not seeking medical treatment, and becoming worse due to fear of COVID-19 have been reported in China.

One of the dramatic effects that we have witnessed in the United States during the month of March was the rapid increase in unemployment. Within the second half of March, there were as many as 6.65 million unemployment claims that had already been submitted throughout the

United States (6). As of this writing (April 9, 2020), unemployment claims exceeded 16 million. This number is likely to rise even more as stay-at-home orders are being extended to the end of April and even until the beginning of June in some areas. Since most persons in the United States receive health insurance coverage through work, unemployed individuals and their families may not have sufficient resources to pay out-of-pocket costs for nonurgent or even semi-urgent imaging studies. These financial obstacles will make it difficult for patients to come in for their normal screening or other imaging appointments.

When did institutions begin restricting research activities and to what extent? Were there any exceptions?

Similar to the implementation of postponement of imaging appointments, most research restrictions occurred between March 12-23, 2020 in the United States. These closures undoubtedly led to the loss of valuable data because "ramping down" typically occurred over the course of a few days. Research labs were instructed to only continue research if terminating the project would harm the project, be prohibitively costly, or time consuming. Any noncritical research activities were shut down. Labs that were in these situations were told to designate one to two key personnel to work on these projects, while larger projects were permitted three to four people. Additionally, as there are many labs that use animal models for research, key personnel were assigned for the care of these animals for the duration of the outbreak. Labs were asked to reduce or terminate breeding of any new animals during the shutdown and not start any new experiments with animals. Many investigators euthanized mice to minimize costs of housing animals during a shutdown, and some institutions required researchers to prioritize only a small subset of mice to save in case of severe shortages of veterinary personnel.

One exception to this rule was to continue any ongoing research directly related to COVID-19 or other essential human subject research. Projects related to COVID-19 had to be submitted to the institutional review boards for prioritization so that these projects could be initiated in an expedited manner. Institutions differed in policies for continuing cancer therapy trials that rely on imaging studies to monitor response to treatment. At some institutions, almost all imaging studies for cancer trials continued with minimal interruptions. Conversely, other facilities suspended all but essential human subject research studies in which the absence of imaging would impact the health of a patient with a clinically significant standard of care component (such as keeping a patient on a drug).

What are the potential short- and long-term impacts on cancer imaging research?

Researchers and investigators are taking advantage of the stay-at-home orders to finish writing manuscripts and grant proposals. Some individuals have remote virtual private network access into their systems, so some may even be able to start retrospective studies during this time. Additionally, students are also being encouraged to take new courses and write manuscripts. It may be possible that there will be many retrospective studies that are submitted and published once the lock down is over. To accommodate demands of a remote workforce, institutions have been forced to rapidly expand hardware and support for information technology.

From an administrative point of view, it will be necessary for programs to make sure that appropriate extensions are permitted for students and faculty. For example, faculty working on acquiring tenure may need an extension due to lost time to generate new data. Universities and

institutions will need to assess the availability of contingency funding to help labs get back on track once the shutdown is over. Additionally, many PhD or medical school interviews, as well as school selections may have been disrupted during this time period, and schools should be flexible with decisions that are being made by these prospective students.

There are multiple concerns about the future of cancer imaging research. Prospective, longitudinal studies that were ongoing during this period of time may have lost valuable datapoints. However, depending on the cancer growth rate, imaging of slow-growing tumors potentially will not change much in data analysis. It may take some time for researchers to collect additional data for prospective studies to make up for lost time. The forced hiatus in imaging studies may provide some insight on to what extent delayed imaging directly impacts clinical care and potentially allow opportunities for optimizing the timing of imaging in the future. As institutional review boards may be prioritizing COVID-19 related projects, there may be a delay in new cancer imaging studies that can be approved and initiated. Institutional review boards also will need to implement policies for protocol deviations caused by research shutdowns.

Even after institutions reverse shutdowns or ramp downs of research, we anticipate that social distancing policies will remain in place for several months to prevent a second wave of infections. Maintaining social distancing poses great challenges to studies involving clinical research, which typically relies heavily on interpersonal interactions among researchers, technicians, and patients. Imaging research involving wet-lab and animal experiments also will face ongoing challenges. Laboratory work areas and small animal imaging suites typically do not have sufficient space to prevent close interactions among people, and multiple users commonly

share lab instruments and imaging scanners. Laboratories may be required to enact staggered work schedules to allow persons access while avoiding interactions.

There is some uncertainty of where priorities will lie during the next round of funding for some agencies. It is probable that priorities will shift to research on infectious diseases, virology, immunology, and general pandemic responses, similar to requests for proposals related to bioterrorism research after the 9/11 attacks in the United States. Substantial concerns exist about a reduction in basic and clinical research funding and activity due to the economic crisis caused by COVID-19. For example, the Cancer Prevention and Research Institute of Texas (CPRIT) will delay funding for grants in 2020 and suspended the first cycle of funding in 2021 due to budget constraints. Internal funding at universities and clinics may be required to help maintain research activities in cancer imaging and other fields. However, institutions have incurred unexpected expenditures and losses of revenue during the pandemic, which will limit internal funds to support research in cancer imaging and other areas.

Economic effects of COVID-19 also have and will continue to impact faculty and research positions at institutions. Many universities enacted hiring freezes and canceled searches for new faculty positions during the current period of social distancing. At least one institution imposed hiring freezes for all new faculty and staff through the next 15 months with exceptions requiring approval at the highest levels of administration. Such policies remove opportunities for junior faculty wanting to begin careers in cancer imaging research. Moreover, salary support for many researchers at all levels, from faculty to trainees, comes predominantly if not exclusively from grants. Inevitable losses of productivity during periods of shutdown or slow down, delays

associated with ramping research back up, and a more challenging economic climate place jobs and careers of many cancer imaging scientists at tremendous risk.

Concluding Remarks

Disruptions in life caused by COVID-19 clearly have extended to cancer imaging for patients and research. Within the next few months, clinics will need to continue to act aggressively in their responses, deliberate unique ways to address the potentially ongoing spread of COVID-19, and compensate for lost imaging appointments during this time. After weeks or months of persons hearing messages to stay at home and remain away from people, convincing persons to enter a hospital environment will require concerted messaging efforts and pre-cautionary measures. While a majority of what has occurred in this pandemic is negative, this period has been exemplary of how radiologists, physicians, and research staff worked together to respond rapidly and diligently to this situation. The blueprint of responses and action plans for the current pandemic will serve as a model if ever needed again in the future.

Radiology: Imaging Cancer thanks the following for their contributions and insights to this editorial (listed in alphabetical order):

Sanjeev Bhalla, MD—*Washington University, US*

Adeline N. Boettcher, PhD—*Radiological Society of North America, US*

Lin Chen— *Sichuan Academy of Medical Science and Sichuan Provincial Peoples Hospital, China*

David Gierada, MD—*Washington University, US*

Christine Glastonbury, MBBS—*University of California, San Francisco*, US

Vicky Goh, MD, FRCR—*King's College, UK*

Weifang Kong, MS—*Sichuan Academy of Medical Science and Sichuan Provincial Peoples Hospital, China*

Susanna I. Lee, MD, PhD—*Massachusetts General Hospital, US*

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David Mankoff, MD, PhD—*University of Pennsylvania, US*

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Ashok Srinivasan, MD—*University of Michigan, US*

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