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Coronavirus disease 2019 (COVID-19) pandemic: Review of guidelines for resuming non-urgent imaging and procedures in radiology during Phase II☆

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ABSTRACT

Since the spread of the coronavirus disease 2019 (COVID-19) was designated as a pandemic by the World Health Organization, health care systems have been forced to adapt rapidly to defer less urgent care during the crisis. The United States (U.S.) has adopted a four-phase approach to decreasing and then resuming non-essential work. Through strong restrictive measures, Phase I slowed the spread of disease, allowing states to safely diagnose, isolate, and treat patients with COVID-19. In support of social distancing measures, non-urgent studies were postponed, and this created a backlog. Now, as states transition to Phase II, restrictions on non-essential activities will ease, and radiology departments must re-establish care while continuing to mitigate the risk of COVID-19 transmission all while accommodating this backlog.

In this article, we propose a roadmap that incorporates the current practice guidelines and subject matter consensus statements for the phased reopening of non-urgent and elective radiology services. This roadmap will focus on operationalizing these recommendations for patient care and workforce management. Tiered systems are proposed for the prioritization of elective procedures, with physician-to-physician communication encouraged. Infection control methods, provision of personal protective equipment (PPE), and physical distancing measures are highlighted. Finally, changes in hours of operation, hiring strategies, and remote reading services are discussed for their potential to ease the transition to normal operations.

1. Introduction

In the wake of the coronavirus disease 2019 (COVID-19) pandemic, the United States (U.S.) is adopting a four-phase approach to controlling the disease. Broadly stated, the phases are I. Slow the spread of disease; II. Phased reopening of non-emergency operations; III. Establish immune protection and lift physical distancing; and IV. Rebuild a resilient system with improved readiness for the next pandemic. Phase I of this plan involved increasingly restrictive layered measures called non-pharmaceutical interventions (NPIs) including social distancing to slow the spread of disease [1] (Fig. 1). This allowed states to build infrastructure to safely diagnose, treat, and isolate patients with COVID-19 [2]. Once a series of criteria are met and transmission measurably slows in a given area, Phase II can be initiated. Each U.S. state has its own criteria for commencing Phase II, and this process will begin by incrementally removing layers of NPIs and then conducting surveillance of the effects of this relaxation. With measures such as physical distancing and the ability to conduct contact tracing in place, some non-emergency services will gradually resume [2,3]. Phases III and IV will result in further relaxations of NPIs after a vaccine is developed and as resilient systems of response are created to address future pandemics, respectively.

Abbreviations: COVID-19, coronavirus disease 2019; U.S., United States; PPE, personal protective equipment; NPI, non-pharmaceutical interventions; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare and Medicaid Services; MR, magnetic resonance imaging; CT, computed tomography; US, ultrasound; PET, positron emission tomography; NM, nuclear medicine; PAPR, powered air-purifying respirator

☆ The authors declare that they had full access to all of the data in this study and the authors take complete responsibility for the integrity of the data and the accuracy of the data analysis.

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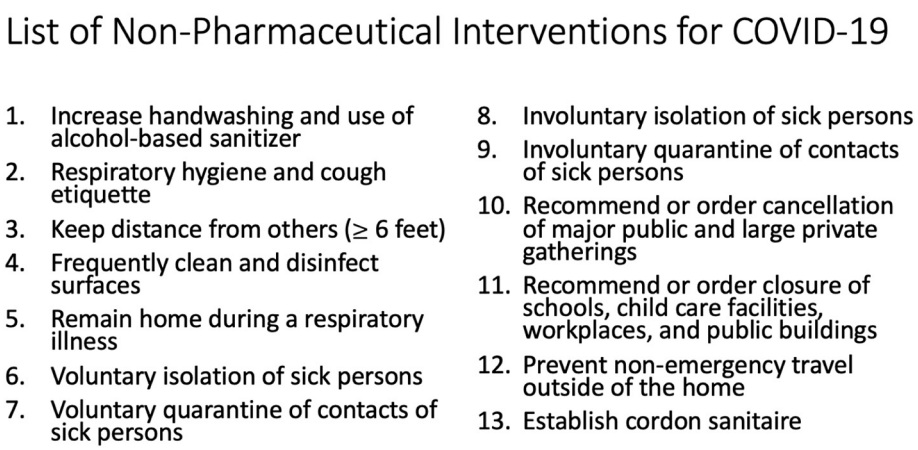

Fig. 1. List of non-pharmaceutical interventions for COVID-19.

Phase I for health care systems was fundamentally a viral pandemic mass casualty response [4,5]. Following guidelines from the Centers for Disease Control and Prevention (CDC), non-essential clinical activities, including elective procedures, face-to-face outpatient visits, diagnostic testing, and procedures were canceled or rescheduled [6,7]. Although radiology departments have continued to do urgent and essential imaging examinations during Phase I, most practices deferred important but non-urgent procedures such as cancer screening and percutaneous tube changes. For some institutions, this deferment exacerbated the previously existing backlog of imaging of weeks or months [8,9]. This may cause delays in diagnosis which may worsen prognosis and affect patient management even after the pandemic concludes [10]. Rescheduling non-essential clinical activities also leads to patient anxiety, inability to meet the needs of referring clinicians, as well as financial stress on the radiology department from a combination of decreased revenue from decreased caseload, and ongoing changes in staff size and payment practices [8]. These issues are further compounded by a nation-wide pressure to resume non-urgent operations across healthcare systems in order to mitigate the wider economic impact of COVID-19 and allow hospitals and practices to survive fiscally. However, it must be understood that these hypothesized increases in demand and the potential resulting adaptations by radiology departments may only represent one end of a spectrum of possibilities. There is an equal, if not growing, possibility that imaging demand may take many months or years to recover as part of the "new normal" following this pandemic. Understanding and making decisions based on the risk of transmission of COVID-19 in healthcare settings is critical in the process of reopening. Moreover, the resulting fears and anxieties related to potential infection cannot be underestimated for both patients and healthcare workers.

In this article, we review current guidelines and literature in an effort to develop a roadmap for radiology departments to resume non-urgent imaging studies and elective procedures in a safe and efficient manner during Phase II reopening that allows for re-adjustment as new developments occur.

2. General considerations for the U.S. healthcare system

The Centers for Medicare and Medicaid Services (CMS) released recommendations on April 19th, 2020 regarding the re-opening of facilities providing non-emergency, non-COVID-19 related healthcare based on the White House gating criteria [11]. These criteria specifically say that, for a given region, there should be downward trajectories in both "influenza-like illnesses" and "COVID-like symptoms" in the previous 14 days, a downward trajectory of total diagnosed cases or positive tests over the previous 14 days, [12] provisions to be able to treat all patients without crisis care, and provisions to have enough testing in place for at-risk healthcare workers [13]. For the growing number of areas with relatively low and stable incidence rates of COVID-19 infections, robust hospital testing systems, and otherwise downward trajectories in viral-appearing respiratory illnesses over 14 days, the phased resumption of routine care is encouraged. Specifically, those institutions transitioning from Phase I to Phase II must satisfy the aforementioned gating criteria for 28 days and prove there is no evidence of rebound or surge in COVID-19 cases [2]. While this process unfolds, the CMS continues to urge evaluation of the incidence and trends of COVID-19 cases in the region using available kits for nucleic acid amplification testing and anti-SARS-CoV-2 antibody detection. Additionally, providers are asked to continue triaging to determine which procedures, chronic disease management, and preventive care require face-to-face interaction. Scoring systems are being used, for example, by the American College of Surgeons, to create a tiered system for resuming elective surgery [14].

3. Implications of Phase II for radiology departments

As Phase II begins, there will be logistical challenges in managing the demand due to the resumption of the deferred routine imaging studies. In addition, demand may be increased as imaging may serve as an adjunct for the physical exam in specialties that have adopted telehealth technologies to minimize face-to-face consultation and imaging is necessary for preoperative planning of the previously deferred elective surgeries. There may be bottlenecks such as scanner availability and wait times resulting from the large number of cases rescheduled from the previous months superimposed on the low density of template schedules necessitated by social distance and infection control measures outlined in recent recommendations from the American College of Radiology [15]. The associated inconveniences and fear may in turn deter patients from seeking routine care. It is likely that radiology workflows will also incur additional inefficiencies, causing this backlog to continue to grow before actually decreasing in size.

As demand for imaging returns, radiology departments must transform their practice to meet the new requirements imposed by infection control during the COVID-19 pandemic. Reassurance must be provided in the form of signage and explicit communication with patients regarding preventive practices at a given imaging center, whether through phone consultation, online information, and/or materials provided in the facility [15]. The new workflow will require more routine supply checks and walk-arounds of the imaging suite to ensure consistent quality of disinfection practices. Effective communication with patients regarding these practices during Phase II is needed to ensure compliance with safety measures and to alleviate patient anxiety related to exposure risk. Missed appointments during Phase II may result from patient anxiety, lost insurance, or other barriers preventing a

patient from traveling to the hospital or imaging center [2]. These missed appointments further exacerbate the problem of radiology imaging capacity.

4. Phase II radiology recovery phase overview

The basis of an effective and safe return-to-work plan in radiology will be predicated on effective COVID-19 disease surveillance and a process to incrementally create imaging capacity while mitigating the risk of disease transmission. While imaging capacity ramps up, there must be an equitable process that prioritizes access to care for the patients most in need of radiology services. Per statements from the American College of Radiology, this process must take into account a variety of safety measures required to perform routine care, respect local pandemic statistics, manage the fears and anxieties of patients and staff, and follow the guiding principle of providing indicated care only when the risk of illness or death to a HCW or patient is less than the risk of illness or death from delaying care [15].

Key tasks will include performing risk assessments of patients and staff, creating a program of radiology HCW disease surveillance, identifying pacing items for radiology operations, establishing a review process to assess performance during expanding operations, and standardizing communication about rapidly changing processes to referring providers and patients.

The decision to image will be based upon a balance between urgency of need for imaging and the risk of transmitting COVID-19 (Fig. 2). The basis of this determination will be risk assessments of patients. The healthcare system should have a standardized method for determining the level of risk and communicating the current status of patients who are asymptomatic, symptomatic, or have documented COVID-19.

HCW surveillance should include daily self-assessments, supervisor-led screening, organizational level enhanced screening, and programmatic testing as appropriate. CDC guidance for HCW return to work after COVID-19 infection is two negative PCRs 24 h apart. PCR tests may remain positive for 30 or more days after resolution of symptoms, further emphasizing the critical importance of infection control and prevention among HCWs. Additionally, CDC recommends 14 days of quarantine for HCWs with high risk exposures (less than six feet of distance for greater than 10 minutes without adequate PPE). A single infected HCW could result in the shutdown of an entire functional area if appropriate symptom surveillance, sick-call procedures, and protective measures are not applied [34].

As the radiology planner begins the process, an early requirement will be to identify pacing items for operations in each modality or section of radiology. A pacing item is a key resource without which a given capability becomes non-functional. It will serve as a rate limiter for a section and define that section's capacity. Usually, this item will be equipment table time, technical staff to operate the equipment, or diagnostic staff to interpret images. In the current setting, the pacing item may be personal protective equipment (PPE) early on, but it will likely become technical staff as PPE availability improves.

Next, the radiology planner must establish a review process to periodically evaluate operations during expansion. They must identify benchmarks of capacity based on historical capacity before COVID-19 as well as current capacity while routine care is being deferred. In this discussion, incremental increases in capacity are arbitrarily set at 20% with a review period in increments of 4 to 6 weeks. The duration under review should be sufficient in length to allow for capture of new COVID-19 infections in staff, to assess the rate of new COVID-19 infections in the community, and to determine if the burn rate of PPE or the ability to maintain equipment is exceeded. They should set thresholds for the capacity review process that would trigger a return to previous operations. For this discussion, benchmark thresholds include a new COVID-19 diagnosis in a HCW, total number of COVID-19 inpatients at the hospital > 10, PPE < 2 weeks supply on hand, and vendor being unable to support equipment.

The Radiology Recovery Process should be staged, incremental, and regularly reviewed (Fig. 3). Failure to meet performance standards should trigger a review of the problem and a return to the previous level of capacity. A modality or functional area in a radiology department may not know what its maximum capacity is to provide safe care. Furthermore, one modality's maximum capacity, pacing items, or relative risk profile may be different than another's. As such, this incremental process should take place in each section until their maximum capacity is established.

The radiology planner should anticipate that these Phase II operations may last as long as two years if COVID-19 follows a pattern set by the 1918 influenza pandemic. As such, workflow solutions should be periodically reviewed and sustainable. Health and safety of technical staff should be prioritized. Having adequate testing capability and sufficient PPE on hand will be prerequisites to initiating Phase II. If testing is not as robust as planned, return to prior phases may be advisable.

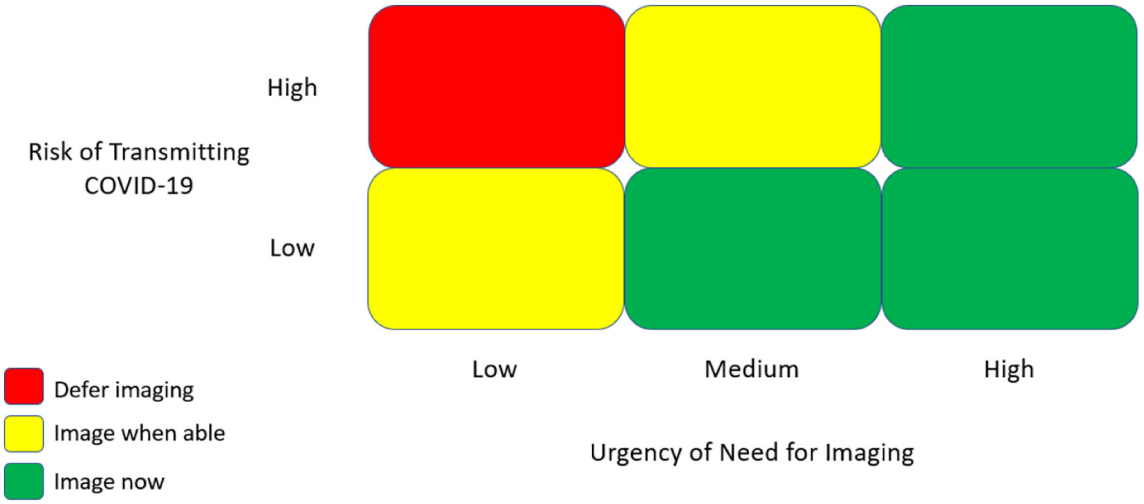

Fig. 2. Risk matrix: Phase II imaging. Urgency of need for imaging is defined by the ordering provider and communicated to the radiology service through standard (a valid order) or nonstandard (phone call or other agreed institutional method).
Ability to image (image when able) is defined by the capacity of the system relative to demand for imaging and limitations imposed by social distancing and infection control measures.

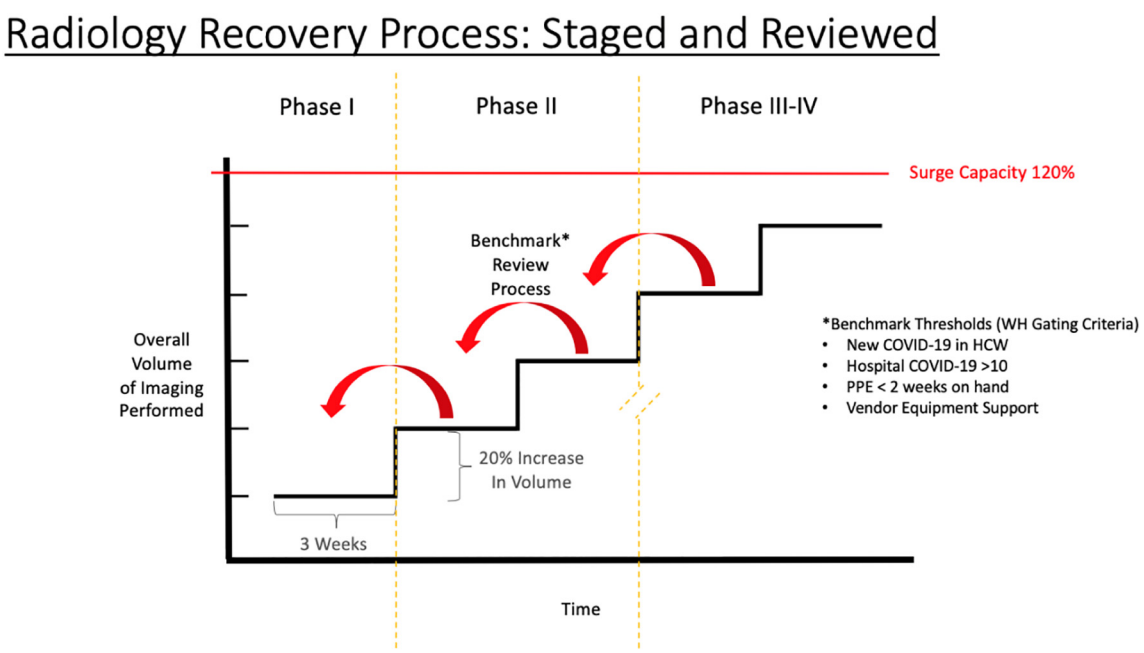

Fig. 3. Radiology recovery process: staged and reviewed. Recovery operations should be incremental, staged, and reviewed. Increases in operations or introductions of new procedures should be followed by an evaluation period of three weeks to determine if there is an effect on employees. A new diagnosis of COVID-19 infection in a health care worker should trigger a review and return to previous operations. Employee surveillance should include daily self-assessments, supervisor led screening, hospital level enhanced screening, and programmatic testing as appropriate.

To say that communication is key risks hackneyed understatement, but it may well prove to be the single most important determinant of success or failure. Stakes are high for staff, referring providers, and patients and buy-in to your process will be a necessary criterion for its success. Assuming essential testing and PPE are available, the main constraint in this process of returning to work in radiology will be patient access to care. If adequate imaging capacity was a rarity prior to COVID-19, it will be non-existent during COVID-19. It is important to understand that patients may be unable to gain timely access to imaging as processes lose efficiency due to infectious control measures. Every effort should be made to develop an equitable process that prioritizes patients most in need and to communicate this process transparently to stakeholders.

4.1. Resuming non-urgent imaging and procedures

Medical facilities have begun resuming routine care depending on their fulfillment of gating criteria and authorization by state, county, and municipal authorities. Furthermore, at an institutional and departmental level, there must be adequate provision of PPE, for all physicians, nurses, and technologists [16]. With the prospect of physical distancing measures being in place until at least early 2021, pending the development and widespread availability of a COVID-19 vaccine, patients and staff must be protected during the "soft" reopening expected during Phase II. In the absence of comprehensive evidence-based recommendations, adopting strategies from countries that have successfully controlled the spread of infection is helpful. This is especially pertinent for patients with high-risk preexisting medical conditions, for example those with cancer and autoimmune diseases who are on immunosuppressive treatment regimens, for whom there are safety-related, financial, and logistical obstacles to proper care [10].

Workflow for each modality, including x-ray, computed tomography (CT), magnetic resonance imaging (MR), ultrasound (US), and positron emission tomography (PET), entails specific provisions for patient preparation, levels of patient contact, imaging suite ventilation, and acquisition times. In addition, the safety of imaging suites must be maintained with standardized cleaning of the bay and scanner with vendor-approved disinfectants [17]. The use of a tiered system for scheduling, exposure reduction techniques, and strategic resource utilization are recommended to ensure a safe and smooth reopening of radiology.

4.2. Tiered system for reopening radiology departments

While the goal in Phase I had been to defer less urgent imaging in order to ensure capacity for emergent indications, in Phase II, the goal is to tackle the backlog on less urgent studies, with priority maintained for emergent and urgent cases. This is based on local availability of PPE and COVID-19 testing as well as decisions made by region-specific practice committees and task forces [15,16]. Having a tiered reopening strategy may be a safe and efficient way to decrease the backlog of imaging by triaging patients. Referrer-to-radiologist discussions are paramount in complicated cases. Although evolving, consensus decisions should be considered – for example, an expert panel concluded that lung cancer screening enrollment may be deferred, and long-term surveillance of lung nodules may be modified given the need for resource conservation [29]. Another factor to take into account in decision-making is the availability of services from other departments, such as specialty clinic appointments and operating room availability for elective surgery, and the growth of virtual or tele-health care. These patients may be sent for radiological studies such as x-ray directly and hence may not have gone through proposed pre-screening before an in-person appointment. The authors propose four scheduling tiers: Tier 1, Tier 2, Tier 3, and Tier 4 (Table 1). These tiers are based on both patient urgency for imaging and available capacity for the specified modality. It is critical to reassess patients and viability of imaging or procedures every 4–6 weeks for Tier 2–4 patients.

Tier 1 encompasses patients with emergent and urgent need for imaging, this includes patients in need of diagnosis of potentially life-threating conditions or procedures needed to treat urgent diagnoses. This tier includes emergency department and inpatient imaging that should be performed as soon as possible. This also includes urgent outpatient imaging that require imaging within 2 weeks. Tier 2 patients have a less-urgent need for imaging at the time of review. These

Table 1
Tiered approach to triaging radiologic services based on acuity, patient status, and available resources during Phase II.

Tier and capacity for nonurgent imaging[a]	Level of urgency	Time frame	Example
Tier 1	Emergent/urgent	As soon as possible	Diagnosing potentially life-threatening conditions
Emergent/urgent only			Procedures needed to treat urgent conditions
Tier 2	Time-sensitive semi-urgent	< 4 weeks	BI-RADS 0, 4–6
Low capacity (< 25%)			Lung-RADs 3
			Planned biopsies
			Therapeutic response assessment
Tier 3	Semi-urgent	4–8 weeks	Semi-urgent imaging needs for indications that require referrer follow-up in the indicated time frame
Medium capacity (25–75%)			IR tube exchange
			Does not meet the definition of urgent
Tier 4	Elective	> 8 weeks	Elective screenings and procedures
High or full capacity (75–100%)			Routine monitoring of non-suspicious lesions
			BI-RADS 3
			Uterine artery embolization

[a] Capacity for nonurgent imaging is defined as the percentage of the total capacity that can be used for nonurgent indications with continued strict social distancing and infection control measures. This is an important metric to determine when different tiered patients can be imaged.

patients have time-sensitive indications such as BI-RADS 0, 4–6, Lung-RADs 3, planned biopsies, and therapeutic response assessment. This tier is typically reserved for known high-risk cancers or rapidly progressive conditions. This category includes patients that require imaging within approximately 4 weeks.

Tier 3 patients do not meet the criteria for urgent imaging needs; however, have semi-urgent imaging needs due to healthcare logistics related to scheduling that require referrer follow-up in the indicated time frame, but do not meet the definition of urgent. These patients require imaging within 4–8 weeks. Tier 4 patients are for elective services and can be scheduled after 8 weeks and generally used for elective screenings and procedures and routine monitoring of non-suspicious lesions. Examples include BI-RADS 3, IR elective procedures such as uterine artery embolization for leiomyomata, or annual cancer screening. This tier is reserved for indications that would not change management within this time frame. *Both tier 3 and tier 4 patients may inadvertently be rescheduled too many times due to the large backlog of tier 1 and tier 2 patients. It is important to re-evaluate tier 3 and tier 4 designated patients routinely to determine need for imaging. The time frame of re-evaluation should be based on current imaging throughput, backlog and imaging capacity.*

4.3. COVID-19 transmission reduction in Phase II

As medical facilities and radiology departments transition to Phase II, limiting viral transmission is essential to protect our staff and patients. This can be accomplished through patient screening, social distancing, proper use of PPE, and cleaning of radiologic equipment.

Patient screening will be the first barrier for potential exposure. The use of a questionnaire to stratify low-risk and high-risk patients can be used to physically segregate these two categories of patients. The questionnaire should be answered on the day of imaging examination or procedure as patients may develop symptoms of COVID-19 between the time of making the appointment and the actual date of appointment, as outlined by RSNA, which also recommends screening infrastructure at front desks and facility entrances [16]. During the screening process the patient should be supplied with a surgical mask, regardless of symptoms of a respiratory tract infection. If masks are unavailable, facilities can advise patients to bring their own surgical mask or wear a cloth mask [18,19]. High-risk patients should be isolated and placed on contact/droplet precautions [18]. These patients should be provided with referral for medical evaluation based on severity of symptoms including medical evaluation areas such as tents, urgent care or Emergency Department. Urgent examinations can be imaged in a dedicated imaging suite, while non-urgent exams should be rescheduled. Additional considerations include use of COVID-19 testing, per guidelines from the Infectious Disease Society of America, reopening of elective services across medical centers should be accompanied by widespread testing and surveillance using validated techniques [20].

Enforcing physical distancing in waiting rooms and clinical care area decreases patient-to-patient exposure. This also includes entry and exit pathways for imaging suites and the facility at large must also be considered [22]. In general, patients should attend appointments alone and adhere to state guidelines for social distancing, unless they require a companion. The current recommendations advocate for six feet or more between patients and staff [19,23]. To better facilitate physical distancing, all congregating areas (e.g., waiting and break rooms) should be reorganized in the number of available seating and should be staggered in use when possible [16]. Small waiting room challenges can be overcome by use of “cell phone waiting,” in which the patient waits in their car or other designated area until the radiology department is ready to image [26]. Adding additional 10 or 15 min between appointments can help limit overcrowding in the waiting areas, especially late in the day due to unforeseen backups.

Personal protective equipment is an important transmission deterrent between patients and staff and should be used when coming into direct contact with patients [17]. Additionally, Radiological Society of North America COVID-19 Task Force recommends that all healthcare workers in clinical facilities wear clean surgical masks at all times regardless of direct clinical care [16]. Low-risk patients that lack symptoms of COVID-19 or tested negative, surgical masks and gloves with frequent hand washing is adequate. For high-risk patients, those with suspected or confirmed COVID-19 infection, contact and droplet precautions should be enforced as well as adding eye protection and isolation gown. If the patient is undergoing an aerosol generating procedures including, but not limited to: Intubation, lung biopsy/ablation, chest tube placement, thoracentesis, gastrostomy tube placement, an

N95 (or greater) mask or powered air-purifying respirator (PAPR) should be used instead of a surgical mask as the patient should be placed on airborne precautions. Although cloth face coverings are recommended for the general public, they are not considered PPE [[18,19,24,25,28].

Cleaning of radiologic equipment procedures differ between low-risk or high-risk patients. Cleaning equipment for low-risk patients should undergo standard cleaning procedures. Cleaning equipment for high-risk patients should undergo modified cleaning protocols based on institutional policies specifically for COVID-19 in accordance with vendor recommendations. This should be based on air exchange rates of the imaging suite [16,21]. Ultrasound probe covers should be used for every ultrasound examination. Standardized disinfection protocols for leaded protective equipment for fluoroscopy procedures should be instituted. Real-time decision making should be utilized to minimize time of contact without compromising the quality of diagnosis and care [27].

4.4. Strategic resource utilization

As we progress into Phase II, the need to add more resources and use them more efficiently is clear. These added resources should allow for increased scheduling capacity, increased imaging capacity, and increased interpretation capacity.

Scheduling capacity can be increased through adding scheduling staff and utilizing radiologists to triage patients based on orders received from referring clinicians. Allotting time solely for protocoling and designating the patient tier, will ensure proper triage. This is crucial step as many institutions had functioned at maximum capacity before the COVID-19 pandemic and this added backlog of months of imaging may cause delay in patient care [15].

Imaging capacity can be increase through extending hours of operation and the addition of additional imaging technologists. Radiology departments can also apply strategies that have been utilized successfully by institutions in previous outbreaks. For example, abbreviated protocols for MR and CT used in the Netherlands increased patient throughput without significant compromise in diagnostic accuracy [9,22].

Interpretation capacity can be increased through extended or staggered shifts for radiologists, including teleradiology and telehealth. In general, telehealth solutions prior to the advent of the coronavirus pandemic were being utilized at a level below theoretical capacity [30]. However, since Phase I of the pandemic has been in motion, multiple specialties have turned to telehealth [31,32]. While the infrastructure for teleradiology is generally more robust than telehealth in other specialties, the increase in use of these services during COVID-19 may require logistical changes. To ensure that radiographs, CT, MR, US, and nuclear medicine studies are read at the same standard of care as on-site services, large individual and institutional purchases may be required to assure quality of home workstation equipment [30]. While in-house radiologists and face-to-face interactions are required during studies such as fluoroscopy and interventional procedures, one strategy to minimize exposure is to implement remote procedural planning, clinical counseling, and follow-up appointments via currently available secure telephone or video platforms [31]. Overall, best practices are still evolving as the infrastructure of telehealth grows to meet this rapidly increasing demand. However, this could be a valuable opportunity for technologies previously considered a last resort to develop into a sustainable method of care delivery across multiple specialties.

5. Further risk management for Phase II and beyond

Radiology departments may fully reopen after all restrictions have been lifted by our government and institutions. During this transitional period, it will be imperative that we take advantage of imaging as it is gradually delimited. Since it still unknown if this pandemic will re-emerge in the proceeding months, decreasing the radiology backlog during this time will help our patients. This can be accomplished by extended hours by technologists, clerical staff, and radiologists. The increased use of remote workstations during the Phase I of COVID-19 pandemic can also be utilized during this window of opportunity. A major hurdle to this suggestion is the financial ramifications due to low imaging volumes in the preceding months and imaging volume in Phase I. This, in particular, may create a shortage of staff at a time when they are needed most for extended hours and increased imaging demand compared to pre-COVID-19 volumes. In combination with the added overhead from extended hours, hiring extra technologists, and recommended daily health screening for all employees, this may cause the productivity of a given individual to decrease in the adjustment period of the next several months. As a result, employees who, a short while ago, were experiencing salary cuts, furloughs, and layoffs will instead shift to negotiating labor practices and overtime pay. Finally, long-term repercussions of expanded hours, staggered shifts, and remote radiology services could impact the way outpatient-focused radiology practices accommodate patients, potentially allowing for greater flexibility during off-hours and higher overall volumes [8]. In addition to the aforementioned economic impacts, these changes can create quality of life issues for both imaging personnel and patients as they may struggle to organize care for children and other dependents to accommodate tests and procedures performed outside of normal hours. Furthermore, as healthcare workers inherently place themselves at risk by rising to meet these demands, there must be contingency plans in place for practices to adjust rates of imaging in response to even a single case of COVID-19 appearing among staff. The safety of both patients and employees must be prioritized and may require day-to-day changes in services and as leaders strive to achieve this delicate balance. Multiple institutions in the U.S. and across the world agree that success in the long-term hinges on supporting staff psychologically throughout this process to build resilience as we establish a new norm for radiology during Phase II and beyond [5,33].

Key points

- The main risks to resuming non-urgent imaging and procedures in radiology during COVID-19 will be transmission of infection and inability to meet demand for imaging and procedures while maintaining social distancing and infection control measures. These two risks run counter to each other, and the thoughtful planner will strike a responsible balance.
- An effective and safe return to work plan in radiology will require a broad understanding of multiple guidelines, and an application of these guidelines to the specific processes of individual radiology practices. Key tasks will include performing risk assessments of patients and staff, creating a program of radiology healthcare worker (HCW) disease surveillance, identifying pacing items for essential functions in radiology operations, establishing a review process to assess performance during expanding operations, and communication of rapidly changing radiology processes to stakeholders.
- Continual emphasis must be placed on protecting the health and safety of patients, their families, and HCWs. Social distancing, personal protective equipment (PPE), and infection control measures are critical prerequisites to expanding operations.
- Social distancing and infection control measures will negatively impact efficiency of operations. Every effort should be made to develop an equitable process that prioritizes patients most in need and to communicate this process transparently to stakeholders.

Author contributions

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Declaration of competing interest

None.

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