



Science of Screening

Breast Cancer Screening and the COVID-19 Pandemic

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Abstract

The novel SARS-CoV2 (COVID-19) pandemic has had a major impact on breast radiology practices. Initially, nonessential imaging studies, including screening mammography, were curtailed and even temporarily halted when lockdowns were instituted in many parts of the United States. As a result, imaging volumes plummeted while health care institutions worked to ensure safety measures were in place to protect patients and personnel. As COVID-19 infection levels started to stabilize in some areas, breast radiology practices sought guidance from national organizations, such as the Centers for Disease Control and Prevention, the Centers for Medicare and Medicaid Services, and radiology specialty societies, to develop strategies for patients to safely return for screening mammograms and other outpatient imaging studies. Postponement of breast cancer screening has led to delays in cancer diagnosis and treatment that could negatively affect patient outcomes for years to come. In order to continue to provide necessary imaging services, breast radiologists will need to face and overcome ongoing practical challenges related to the pandemic, such as negative financial impacts on practices and patients, the need for modifications in delivery of imaging services and trainee education, and differences in the health care system as a whole, including the shift to telehealth for clinical care. Nonetheless, despite the disruption the COVID-19 pandemic has caused, the need for breast radiology procedures, including breast cancer screening, remains strong.

Key words: screening mammography; COVID-19; delayed diagnosis; breast cancer.

Introduction

Breast cancer screening, like all medical interventions, must take into account the risks and benefits of the procedure. Most breast radiologists in the United States are familiar with the current, disparate guidelines for breast cancer screening. Screening recommendations from different organizations conflict about the age at which to start and end screening mammography and the frequency at which these exams should occur. Multiple societies (the American College of Radiology [ACR], the Society of Breast Imaging [SBI], and the American Society of Breast Surgeons [ASBrS]) prioritize the lifesaving benefits of screening mammography and advise women of average risk to begin screening mammography

at age 40 and continue annually for as long as they are in good health (1,2). Other groups (including the United States Preventive Services Task Force and the American Cancer Society [ACS]) weigh the risks of screening mammograms (including recall for additional imaging) more heavily and recommend less frequent screening over a narrower age range at the expense of a mortality reduction (3,4).

Despite differences among screening recommendations, the research studies of screening mammography from which those guidelines were formulated occurred in the context of an underlying level of overall risk from competing causes of mortality in the environment where the study subjects existed. The age at which to begin screening mammography

Key Messages

- The COVID-19 pandemic has created challenges for breast radiology practices and has led to delays in breast cancer detection and treatment.
- Breast radiology practices will likely continue to struggle to adjust to volume shifts and financial difficulties related to the COVID-19 pandemic.
- Despite the challenges raised by the COVID-19 pandemic, there is still a strong need for breast radiology services, including screening. Unlike virtual telehealth clinical visits, imaging requires an in-person, physical interaction. This necessity for a face-to-face encounter may provide new opportunities for breast radiologists to leverage radiology services to improve the overall health and wellness of patients and communities.

was selected because, below a certain age, the expected yield of cancers is not large enough to bring sufficient benefit in lives saved. The same is true for screening mammography in patients over a certain age and/or with serious comorbidities, where the detection of subclinical disease may not impact mortality or extend meaningful years of life. The COVID-19 pandemic, however, challenged some of these assumptions and compelled health care providers to reevaluate the risk/benefit calculations of performing screening mammography in the current environment, at least in the short term. As clinicians shifted to virtual visits to protect patients from COVID-19 exposure in health care facilities, radiologists also had to consider the risks of performing imaging studies from the viewpoint of multiple stakeholders (patients, technologists, clerical staff, trainees, referring providers, radiologists, and the families of all those involved) in this new paradigm. Although no amount of scenario planning can elucidate a clear path for every potential circumstance, there is undoubtedly value in reexamining how breast radiology can be accomplished throughout the COVID-19 pandemic.

Breast Radiology at the Start of the COVID-19 Pandemic

Historically, breast radiology personnel have most likely assumed their work environment was safe. Prior to the pandemic, few probably pondered the potential hazards of shaking hands, sitting next to a colleague in the reading room, going to an educational meeting, eating in a restaurant, touching a doorknob, or flushing a toilet. Limited availability of personal protective equipment (PPE) presented an additional unanticipated safety risk for which practices may have felt unprepared as COVID-19 cases surged. In response, the Centers for Disease Control and Prevention (CDC) issued an updated PPE and safety guidelines (physical barriers and engineering controls, visitor policies, limitations on face-to-face encounters and the number of health care workers involved

in patient care, and the use of telemedicine) to help inform and guide health care workers and the public (5). Early in the pandemic, the need for adequate hospital and intensive care unit beds and ventilators for coronavirus patients was also recognized. As a result, many nonemergency medical procedures were postponed to both conserve PPE and maintain access to hospital beds and equipment.

National medical specialty organizations soon recognized the need to offer guidance to their members and patients as well. The ACS advised patients not to visit a health care facility for routine cancer surveillance (6). On March 26, 2020, the ACR and the ASBrS issued a joint statement recommending that all facilities delay breast screening exams, routine breast visits, and consultations for nonurgent breast abnormalities until the pandemic was brought under control in each community (7). The SBI also recommended that individual facilities delay screening exams and diagnostic studies without a clinically concerning symptom (8).

As the pandemic swept through the United States, regulatory agencies also realized the risk of contracting COVID-19 while traveling and visiting health care facilities for inspections. In March 2020, the United States Food and Drug Administration (FDA) temporarily postponed all on-site inspections, including those of mammography facilities under the Mammography Quality Standards Act (MQSA) (9). At the time, the FDA offered mammography facilities regulatory flexibility, citing three possible scenarios. First, facilities that closed because of COVID-19 were advised to document the time period when mammography was not performed and ensure required quality testing occurred on reopening. Second, if an annual medical physicist survey was delayed beyond 14 months, the facility was instructed to contact the FDA or state agency to obtain an extension. Finally, if a facility remained open but had noncompliance citations, detailed documentation of the circumstances were required to be maintained (10). On July 10, 2020, the FDA announced the resumption of on-site surveillance inspections based on “the virus’ trajectory in a given state and locality and the rules and guidelines that are put in place by state and local governments” (11).

Practical Considerations as Breast Radiology Practices Reopened

As the initial wave of coronavirus infections ebbed, health care delivery systems, including radiology practices, made plans to return to routine patient care such as screening mammograms. To provide resources for medical facilities, the CDC issued a “Non-COVID-19 Care Framework,” and the Centers for Medicare and Medicaid Services (CMS) published “Recommendations for Re-opening Facilities to Provide Non-emergent Non-COVID-19 Healthcare” (12,13). The rapid evolution of our understanding of the novel SARS-CoV-2 posed an additional challenge to the resumption of nonurgent medical services as treatment and

prevention recommendations changed frequently. This uncertainty continues to be a source of confusion and frustration, making it especially important for breast radiologists to keep abreast of updates to local, state, and national recommendations (including those from the CDC and the CMS) to optimally serve their patients' needs.

Mammograms, breast ultrasound, and imaging-guided interventional procedures require close and often prolonged contact between the patient and breast radiology team members; this physical proximity makes infection control precautions particularly critical. Although most practices have probably already put COVID-19 safety precautions in place, the pandemic will almost certainly continue for the foreseeable future. Therefore, reinforcement of current recommendations may still be of value. In May 2020, the SBI published guidelines encouraging breast radiologists to address the needs of all stakeholders (patients, surgeons, medical and radiation oncologists, and administrative colleagues) in their reopening plans (Table 1) (14). The SBI's "Recommendations for a Thoughtful Return to Caring for Patients" also provided a triage system to meet patients' imaging needs from most to least urgent, allowing for differences based on capacity and services offered (Table 2) (14). The ACR issued a statement on resuming radiology services as well, with the guiding principle, "If the risk of illness or death to a healthcare worker or patient from health care-acquired COVID-19 is greater than the risk of illness or death from delaying radiology care, the care should be delayed; however, if the opposite is true, the radiology care should proceed" (15). Many of the ACR's recommendations were similar to those of the SBI, though the ACR's scope was somewhat broader (Table 3) (15). Among its recommended safety measures, the ACR encouraged the use of home workstations, which pose unique challenges in mammography that differ from other imaging modalities. Mammography workstations have strict quality-control requirements with physicist inspections and rigorous ambient lighting specifications. In addition, the large file size of mammograms and digital breast tomosynthesis can lead to unacceptably prolonged image loading times. There is also

additional expense for higher-resolution monitors on which mammograms must be viewed (16).

In addition to guidelines from radiology specialty societies, the COVID-19 Pandemic Breast Cancer Consortium (a multidisciplinary group of breast cancer specialists with representatives from the ACR, American College of Surgeons Commission on Cancer, National Accreditation Program for Breast Cancer, ASBrS, American Society for Clinical Oncology, National Comprehensive Cancer Network, and the Society of Surgical Oncology) published two documents: "Recommendations for Prioritization, Treatment, and Triage of Breast Cancer Patients During the COVID-19 Pandemic" (17) and "COVID-19 Pandemic Breast Cancer Consortium's Considerations for Re-Entry" (18) to address the care of breast patients.

The COVID-19 Breast Cancer Consortium's initial document was published on April 8, 2020, and it may have anticipated a better-controlled pandemic trajectory than has transpired in much of the United States to date. Breast patients were classified in three priority levels (A, B, and C) by specialty (breast imaging, surgical oncology, medical oncology, and radiation oncology). Patients in priority A had life-threatening or clinically unstable conditions that necessitated urgent treatment. Priority B patients did not require immediate treatment but would need to begin therapy before the pandemic had passed. For priority C patients, it was decided that care could be safely deferred until the COVID-19 pandemic was over. For breast imaging, priority A clinical presentations were believed to be rare and to be limited to examinations for severe breast abscess and serious postsurgical complications. Priority B breast imaging included diagnostic evaluation for abnormal mammograms or suspicious clinical findings, biopsy of BI-RADS 4 and 5 lesions, and breast MRI to determine extent of disease or before initiation of chemotherapy in patients with recently diagnosed breast cancer. All other breast radiology procedures (biopsy of lower suspicion findings, BI-RADS 3 follow-up imaging, and screening examinations) were assigned Priority C, though screening *BRCA* mutation carriers

Table 1. Society of Breast Imaging Recommendations for a Thoughtful Return to Caring for Patients (14)

- Screen every patient at scheduling and again immediately prior to entering the facility for direct COVID-19 exposure or symptoms
- Proceed only with patients who have cleared your COVID-19 screening process
- Reduce or spread out appointments from pre-COVID levels to avoid patients accumulating in waiting rooms
- Return to pre-COVID levels later as the risk of recurrent outbreaks further diminishes
- Evaluate and consider modifying waiting and changing rooms to ensure patients can maintain social distancing
- Evaluate and streamline registration, check-in, and check-out processes to limit the amount of time patients are in the facility
- Evaluate numbers of staff involved in the care of each patient, and limit that number to the smallest possible for every visit
- Ensure staff and patients continue to wear masks for all visits
- Consider gowns and masks for all procedures along with gloves
- Please see CDC guidance for details of appropriate types of PPE
- Consider implementing streamlined or abbreviated imaging protocols to decrease time and number of visits that patients make to your facility. Examples include abbreviated MRI protocols, same-day screening interpretation, same-day biopsy performance, and coordination with clinical services to image patients being seen on site by clinical colleagues

Abbreviations: CDC, Centers for Disease Control and Prevention; PPE, personal protective equipment.

Table 2. Society of Breast Imaging Recommendations for a Thoughtful Return to Caring for Patients Sample Triage System (From Most to Least Urgent) (14)

1. Women whose breast cancer surgery was postponed. These women may need imaging post neoadjuvant treatment and localization procedures.
2. Women who were recommended to undergo percutaneous breast biopsy.
3. Women who were recalled from their screening exam but had a postponed recall diagnostic evaluation.
4. Women who require a short interval follow-up or have a more long-standing or intermittent (ie, nonurgent) clinical issue with their breast who need a diagnostic appointment. An example of such a patient is someone with intermittent breast pain.
5. Women who wish to return to breast screening (any modality). This may be triaged by prioritizing patients at higher risk for breast cancer or by selectively delaying some supplemental screening. Implementation strategies will depend on your patient population and/or the logistic details specific to your facility and region.

under age 40 was suggested if care would be delayed more than 6 months (17).

The Consortium's second document was published online on May 19, 2020 and acknowledged geographic differences in the progression of the pandemic. The authors emphasized the need for local decision-making based on the phase of the COVID-19 pandemic and the availability of resources (such as PPE and hospital capacity). They utilized a tumor board format to discuss the risks and benefits of resuming care with the following five clinical vignettes (18):

- How do we care for our asymptomatic patients who are at high risk for breast cancer and present for office visits in the post-COVID era?
- How do we handle the backlog of patients whose surgical treatment was delayed due to the pandemic?
- As our operating rooms reopen, how should patients who were placed on endocrine therapy prior to definitive surgery be managed?
- As we emerge from the pandemic, how do we manage patients who have already begun neoadjuvant chemotherapy?
- How do we manage a patient who is not a candidate for breast-conserving surgery but is ready for their operation?

In order to successfully provide routine care such as screening mammograms during the pandemic, breast radiology practices will need to identify and address the opinions and concerns of patients. Before reopening, our organization conducted almost 5000 phone surveys of patients who had in-person visits in March 2020 (when COVID cases were escalating dramatically in our region). Our patients' sentiments about returning for in-person care varied (36% positive, 21% mixed, and 33% negative). In mid-April 2020, 717 different patients were interviewed by phone, and 56% felt very comfortable returning for in-person visits. Those interviews revealed several key themes, including uneasiness about social distancing in facilities, the availability of masks for personnel and patients, and the possibility that providers might be infected with COVID-19. A recent article in the *Journal of the American College of Radiology* analyzed 678 posts by patients on the breastcancer.org website between March 11 and April 23, 2020. These data were derived from

an online forum about delays in breast imaging and treatment due to COVID-19, and the highest number of posts (30%) was related to stress and concerns about COVID. Diagnosis and treatment delays (19%), coping and support (13%), work and financial challenges (11%), and self-cancellation of imaging and clinical visits and COVID-19 susceptibility due to cancer (8% each) comprised the next most frequent subjects. Although the forum responses were posted early in the pandemic, the authors decided this information could be useful to radiology practices preparing for a second wave of COVID infections (19).

Many radiology departments, particularly those with training programs, are composed of open reading rooms with multiple collocated workstations and frequent face-to-face interactions among attending radiologists and trainees, referring providers, technologists, nurses, and medical and allied health students. Communication between radiologists and other members of the health care team may provide some of an imaging physician's greatest value to patients and colleagues. Nonetheless, in an infectious disease pandemic, workspaces must be carefully and thoughtfully scrutinized to maximize safety. The presence of bacteria on equipment in radiologist reading rooms has previously been reported (20). The viability of COVID-19 in droplets on different surfaces, including plastic, has likewise been studied (21–23). Routine cleaning of clinical and nonclinical areas, minimizing equipment sharing (including PACS and other computer workstations), and optimizing physical distance and number of individuals in dining areas, break rooms, and employee lounges are all important to reduce the risk of COVID-19 transmission. Even department social functions can lead to COVID-19 outbreaks, as occurred at a party attended by members of the Department of Anesthesia at the University of Florida (24).

Challenges for Academic Breast Radiology Departments in the COVID-19 Pandemic

The COVID-19 pandemic has posed particular problems for academic radiology departments. A survey of the Association of Program Directors in Radiology revealed 70.1% of respondents said the pandemic had negatively

Table 3. American College of Radiology Recommendations for the Safe Re-engagement of Nonurgent Radiology Care During the COVID-19 Pandemic (15)

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- **Enact safety measures**
 - Screen all patients for symptoms of COVID-19 during scheduling
 - Screen all patients, workers, and visitors for symptoms of COVID-19 on building entry
 - Create system awareness and flags identifying patients with recent COVID-19
 - Develop a plan for how to manage individuals who screen positive on building entry
 - Ensure sufficient personal protective equipment (PPE) for workers and patients, balancing current and future needs
 - Coordinate PPE use with health system efforts, emphasizing highest-risk care
 - Train staff and providers on safe PPE use and hand hygiene
 - Implement universal masking of health care workers
 - Implement universal masking of patients and visitors
 - Ensure PPE for aerosolizing care (N95, powered air-purifying respirator)
 - Concentrate activity at specific sites if insufficient PPE for enterprise-wide activation
 - Enable social distancing within waiting rooms, hallways, and work areas
 - Streamline patient flow to minimize unneeded contacts (eg, one-way corridors)
 - Implement methods to minimize time in waiting rooms (eg, waiting in cars)
 - Optimize the efficiency of every patient encounter
 - Provide care in designated areas to patients with known or suspected COVID-19
 - Clean and decontaminate patient care areas according to Centers for Disease Control and Prevention guidelines
 - Restrict the number of visitors accompanying the patient
 - Prevent symptomatic visitors from accompanying patients
 - Create a policy for the safe ambulatory imaging of patients with recent COVID-19
 - Enable remote work (eg, home workstations)
 - Enable telehealth when feasible (eg, pre- and postprocedure visits)
 - Develop an effective communication strategy for safe best practices
 - **Respect local pandemic statistics**
 - Defer time-insensitive care until at least 2 weeks after the local peak of the pandemic
 - Ensure PPE needed for low-risk care will not consume PPE needed for high-risk care
 - Follow institutional and governmental regulations
 - Monitor local data to predict secondary and tertiary peaks of COVID-19
 - Prepare for repeat de-engagement of nonurgent care if local data predict another peak
 - **Engage in risk-benefit decision making**
 - Consider benefits of radiology care against risks from health care–acquired COVID-19
 - Consider clinical acuity, risk factors, the underlying disease, and risk from COVID-19
 - Engage referring providers and other stakeholders to safely triage nonurgent care
 - Determine whether lower-risk diagnostic strategies can be pursued
 - Coordinate re-engagement strategies with institutional plans for ambulatory care
 - **Develop a tiered plan for re-engagement of nonurgent radiology care**
 - Tier 1: Urgent and emergent care
 - Tier 2: Nonurgent time-sensitive care
 - Tier 3: Elective care and screening
 - Tier 4: Research subjects for imaging trials
 - **Manage accreditation and regulatory deferrals to avoid unintended lapses**
 - **Address the backlog of previously deferred and delayed care**
 - Consider extending hours of operation to improve access and preserve social distancing
 - Determine if previously ordered care is no longer needed and can be canceled
 - Implement strategies to safely shorten imaging examinations and procedures
 - Consider modifying scheduling grids to promote social distancing
 - Enable clear communication of examination acuity by referring providers
 - Consider cooperation with regional “competitors” to smooth access challenges
 - **Manage fear**
 - Provide frequent, calm, fact-based information to patients and staff to alleviate fear
 - Message that for most radiology care, COVID-19 risk is low with appropriate safeguards
 - Message that COVID-19 risk is highest for aerosolizing procedures or prolonged contact
 - Advertise institutional infection control processes
 - Acknowledge that stress and anxiety are normal during a pandemic
 - Disseminate local and national wellness information
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impacted residency programs and 44.8% perceived a moderate/marked negative effect on resident morale. This adverse impact on morale was more severe in departments where trainees were redeployed (25). Physical distancing requirements have also necessitated changes in the work environment, including remote resident supervision by attending radiologists in separate reading rooms on site or from home. Efforts to preserve adequate PPE may have also limited resident participation in interventional and other hands-on procedures. In their assessment of COVID-related concerns for residency programs, Chertoff et al highlighted difficulties not only due to alterations in the teaching environment (reading rooms, procedural areas, and didactic and multidisciplinary conferences), but also in the loss of social interactions and activities, need for faculty development to teach effectively in a virtual environment, recruitment of future trainees, and postponement of board certification examinations (26).

The American Board of Radiology time and procedure volume mandates may also prove difficult to fulfill during the pandemic as resident assignments may be modified, including possible redeployment away from radiology departments. These mandates could be especially challenging in breast radiology because mammography volume declines were among the steepest at the beginning of the pandemic (27). Regardless, the mammography volumes and training listed below are required by the MQSA as public safety measures and remain in effect despite the COVID-19 pandemic (28):

- **12 weeks of clinical rotations.** At the discretion of the program director, telemedicine rotations for senior residents impacted by COVID-19 can be used to fulfill this requirement.
- **60 hours of didactic education.** Virtual conferences are acceptable.
- **Supervised interpretation of at least 240 mammograms.** For senior residents impacted by COVID-19, interpretation of already finalized mammograms in a blinded fashion is acceptable if needed.

The Accreditation Council for Graduate Medical Education noted residency programs might need to extend training to meet these requirements (28). Finally, given the additional stress and uncertainty facing trainees, academic breast radiology practices should ensure residents have access to departmental, organizational, and national resources to promote well-being.

Effects of Delaying Breast Radiology Procedures on Radiology Practices and Cancer Diagnosis and Treatment

During the COVID-19 surge in the spring of 2020, many health care institutions furloughed employees and cut salaries as clinical and imaging volumes plunged, and screening and

other nonurgent examinations were often eliminated altogether. When exam volumes were low in our department, mammography technologists were offered temporary redeployment to routine radiography or new COVID-related nonradiology jobs, such as temperature screeners at facility entrances and curbside delivery couriers for our outpatient pharmacies. Mammography technologists also helped reschedule patients by phone, which provided an opportunity for education about new COVID-related procedures and reassurance about safety from infection during radiology appointments. Because we are part of a large health system, we had access to institutional safety initiatives to help reopen breast radiology services. These organizational solutions included: hand sanitizer made by a local distillery; face shields 3D-printed by our organization; PPE produced in partnership with a regional clothing manufacturer; standardized, institutionally branded safe-to-return equipment and signage; apps for remote digital appointment check-in through our electronic health record; new furniture and barriers to enable social distancing in waiting areas; and free child care for employees. Like many other practices, we have extended our hours of operation to include early mornings, evenings, and weekends to accommodate patients whose care was delayed and revised increased exam volume targets for the second half of 2020. This additional work has also afforded technologists an opportunity to supplement earnings lost during the height of the pandemic.

Most breast radiology practices are familiar with the difficult-to-manage volume surge every October during breast cancer awareness month. Cancellation of low acuity exams due to COVID-19 may have the unintended consequence of establishing a pattern of uneven monthly screening volumes and breast cancer diagnoses that could persist for years. While some insurers allow patients to have one screening mammogram every calendar year, others (including Medicare) only permit patients to have a mammogram every 12 months (29). Thus, patients who had their annual mammogram delayed from April to June 2020 and whose insurance only covers a screening mammogram every 12 months will now continue to return every June. With no method to redistribute patients evenly throughout the year, a pattern of peaks and valleys in volumes could be established, creating long-term challenges in radiologist and technologist staffing and patient access. Ultimately, advocacy efforts with governmental and commercial payers to allow calendar year payments for breast radiology services may be necessary to reestablish a more even distribution of exam volumes.

Concerns about the impact of the pandemic on cancer diagnosis and treatment have also emerged. Examination of the electronic health records of 39 health systems in 23 states demonstrated a dramatic decrease in screening for common cancers (breast, colon, and cervical) with a 94% reduction in weekly volumes in March 2020 compared to prepandemic volumes (30). Another study revealed a 28% year-over-year decline in total imaging volume during the

height of the COVID-19 pandemic with the greatest drop in volume for mammography (94% year-over-year) (27). A review of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) codes associated with laboratory testing revealed a significant decrease in patients with newly diagnosed breast, colorectal, lung, pancreatic, gastric, and esophageal cancers from March 1, 2020 to April 18, 2020, including a 51.8% decrease in newly identified patients with breast cancer (31). Another report demonstrated 44% of breast cancer survivors had experienced a delay in care related to the pandemic (32). An article modeling the impact of delayed cancer diagnosis in England estimated substantial increases in avoidable breast, colorectal, lung, and esophageal cancer deaths (33). The COVID and Cancer Research Network analyzed information from 20 health care institutions and documented a decrease in all patient encounters related to cancer during the pandemic (34). In a June 2020 editorial in *Science*, Dr. Norman Sharpless, director of the National Cancer Institute, predicted up to 10 000 excess deaths due to delayed diagnosis of breast and colorectal cancer in the United States over 10 years (35). Finally, an article in preprint estimated the pandemic would result in 6270 excess cancer deaths in the United Kingdom and 33 890 excess cancer deaths in the United States at one year (36). In addition to a rise in cancer deaths, diagnosis of breast cancer at a later stage will result in the need for more aggressive treatments, including chemotherapy and mastectomy (rather than breast conservation surgery).

Impact and Opportunities From the Shift to Telehealth

Nationally, there has been a shift away from in-person outpatient visits to telehealth during the COVID-19 pandemic. The United States Health Resources and Services Administration has even provided specific guidance for patients and providers to facilitate telehealth visits, as well as relaxing some regulatory requirements (37). Radiology services, however, still require a physical interaction between the patient and the imaging modality. The shift to telehealth could put imaging practices and radiologists in a new position that differs from the traditional, legacy model in which they are often not viewed as providing patient facing clinical care. Radiology practices will continue to have in-person interactions with patients, even when the encounter with a clinician is virtual. This could provide new opportunities for radiology practices to partner with clinicians to inform and educate patients on multiple topics, including COVID-19 and infection prevention procedures. Breast radiologists could also use their expertise in and understanding of screening in general to improve the health of patients beyond breast cancer. In addition, screening mammography could become a gateway to improve compliance with other screening and surveillance health care services. These new opportunities might include linking lung cancer screening

to mammography appointments (38), giving patients fecal immunochemical test kits at the time of their breast radiology appointment, or installing visual aids for melanoma in mammography dressing rooms (39).

Although telehealth for clinical services is a fairly recent development, radiologists have theoretically had the ability to work remotely since the advent of digital picture archiving and communication systems (PACS). With respect to mammography, the ACR Practice Parameter for the Performance of Screening and Diagnostic Mammography notes that diagnostic telemammography can be suboptimal because of the frequent need to correlate mammographic, sonographic, and clinical findings in real time. Nonetheless, remote supervision of diagnostic mammograms is permissible under the MQSA (40,41). If diagnostic telemammography is undertaken, the responsible radiologist must still be immediately available to review images and provide guidance throughout the examination. The risk of COVID-19 infection and the uncertainty of onsite child-care and education for the 2020–2021 school year undoubtedly make working from home attractive for many health care workers, including radiologists. Imaging technologists and procedural radiologists, however, do not generally have the option to work remotely. This disparity between those who can and cannot work from home may result in a perception of inequity. Breast radiologists may be among the radiology personnel who are unable to work remotely, due to both the imaging-guided procedures they perform and the previously described technical challenges and expense of telemammography. Regardless, radiology departments may need to adopt solutions such as teleradiology to address concerns such as child care, employees who are quarantined after COVID-19 exposure, and the safety of colleagues who are immune compromised or otherwise at risk for severe sequelae of COVID-19 infection.

Economic Impact of the COVID-19 Pandemic on Patients and Radiology Practices

The COVID-19 pandemic has taken an undeniable economic toll on the United States, and many patients will almost certainly face financial challenges. According to the United States Bureau of Labor Statistics, the unemployment rate has increased by 4.4%, and the number of unemployed persons has grown by 6.8 million since February 2020 (42). Recently unemployed women may become uninsured or transition from commercial insurance to Medicaid in states where Medicaid was expanded under the Affordable Care Act. Although Medicaid does cover screening mammography without cost sharing by patients, coverage without out-of-pocket responsibility for other breast imaging examinations (including diagnostic mammograms, breast ultrasound, and breast MRI) varies. Nonetheless, states that expanded Medicaid have historically experienced improved compliance with routine mammography in every socioeconomic group (43). In addition, a recent study in *JAMA Surgery* demonstrated a reduced incidence of advanced breast cancers in Medicaid

expansion states compared to states where Medicaid expansion had not occurred (44). Still, underinsurance and loss of insurance could result in further decreases in volumes and delays in cancer diagnosis. In addition, changes in payer mix with fewer commercially insured patients could negatively affect the financial bottom line of radiology practices.

As radiology practices and health care systems have sought to temporarily ease the negative financial impact of the pandemic, some have accessed loans and deferred employer payroll taxes as part of the Coronavirus Aid, Relief, and Economic Security (CARES) Act. Looking forward to 2021, financial challenges may be compounded by the revaluation of the Evaluation and Management (E and M) Current Procedural Terminology (CPT) codes. Due to budget neutrality requirements, there will be significant decreases in reimbursement for specialties such as radiology that do not perform a large number of E and M codes. If the proposed changes to the 2021 Medicare Physician Fee Schedule take effect, the result will be an approximately 11% drop in Medicare reimbursement for radiology overall. This downward adjustment will apply to breast radiology services, with decreases of 10.8%, 11.1%, and 10.6% in reimbursement for screening, unilateral diagnostic, and bilateral diagnostic mammograms, respectively (45).

Finally, the COVID-19 pandemic and telecommuting could prompt changes in the housing market, with migration away from cities and toward suburbs. With the inconvenience and expense of commuting eliminated, a nonurban environment, with a lower population density and less reliance on public transportation, may be viewed as a safer housing option. Some patients may also choose to undergo screening mammography at community ambulatory sites rather than large, urban, academic centers to avoid facilities where COVID-19 patients are treated. A geographic shift of patient volume away from urban areas could necessitate relocation of imaging facilities; this could prove particularly difficult if a radiology practice's financial resources have become constrained as a result of the pandemic.

Conclusion

While the COVID-19 pandemic has affected virtually every aspect of the lives of patients and providers, the need for breast cancer care, including breast radiology services, is unabated. Although screening mammogram volumes were drastically reduced and some breast cancer treatments were modified in spring 2020 during the height of the pandemic, patients must resume care as soon as it is safe in order to minimize unnecessary breast cancer deaths and the need for more aggressive treatments due to delayed diagnosis. Radiology departments must provide an environment where patients and health care workers are protected from infection so that breast screening, diagnostic, and interventional procedures can continue. COVID-19 transmission and pathogenesis are still not well understood, and safety practices will continue to evolve as more evidence becomes available. Radiology practices have an opportunity to help

patients understand the science of the COVID-19 pandemic and infection prevention, particularly because imaging services, unlike telehealth visits, still require a face-to-face interaction with a technologist, radiologist, or both. In addition, new models of clinical care that arise out of the COVID-19 pandemic may position breast radiologists to have an even greater impact on the wellness of patients and communities in the future.

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