



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Coronavirus Disease 2019 (COVID-19) Imaging Austerity: Coming Back From the Pandemic

Aisling Snow, MD, George A. Taylor, MD

INTRODUCTION

The Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has created an unprecedented crisis in health care. Adult institutions have been flooded with coronavirus disease 2019 (COVID-19) patients, and their radiology departments have significantly reduced their throughput of elective imaging studies. Although children seem to be less clinically affected by COVID-19, pediatric imaging has also been severely constrained by staff shortages and infection control considerations. As a result, adult and pediatric radiology departments across the world are in the midst of enforced imaging austerity, with ongoing wholesale deferral and rescheduling of planned imaging. The longer population movement controls are deemed necessary, the larger the volume of displaced imaging that accumulates. Radiology departments are likely to be severely restricted for a considerable length of time even after populations are permitted to move more freely again. Bringing radiology back to full function will require a balance of clinical assessment, ethical judgment, and logistical planning.

POTENTIAL STRATEGIES

As COVID-19 recedes, our aim in redistributing deferred imaging volumes

is similar to the aim in critical care at the height of the crisis—to avoid overwhelming our system by reducing the peak of the strain on our departments. Safe and efficient “flattening of the curve” in the case of radiology, however, may be more nuanced than in a public health setting. Starting this process early will minimize further uncertainty and workload upheaval for patients and staff. We propose four steps that radiology departments should consider: task force formation, review of system capabilities, recovery process design, and creating a clear communication strategy.

COVID-19 Recovery Task Force

A specific COVID-19 recovery task force that is mandated to manage the reprioritization project should include radiologists, administrators, and modality specialist radiology technicians. Nursing and anesthesiology should also be included in pediatric radiology and interventional settings.

Relationships between referrers and the radiology task force should be fostered to form a unified approach to imaging workload realignment. Structuring collaboration with referrers using relatively simple processes such as documenting each referrer’s preferred method of communication about patients has already proved helpful in one of our hospitals.

All decisions made about patients’ imaging care by the task force should be clearly documented using available systems including the Radiology Information System (RIS), electronic health records, and PACS, as well as local shared electronic documentation. The volume of displaced imaging can be measured in absolute numbers or represented relative to the weekly or monthly volume performed under normal circumstances. Specific data about a department’s pre-existing waiting lists, including volume and prioritization categories, will form an important basis for planning. Depicting the displaced volume as a proportion of the length of the waiting list may provide further insight into the challenge that lies ahead.

Assessment of System Capability

The ability of each radiology department to reschedule its deferred volume will depend on the capabilities of the system as a whole. Whether capacity remains suppressed, returns to normal, or is able to increase after the acute phase of the COVID-19 pandemic will be determined by three main factors: staffing, stand-alone versus group position, and financial status.

Since the pandemic began, many practices have limited the number of in-house staff and have increased work

from home. The number of staff deployed in-house will continue to be based on multiple considerations, including IT capabilities, volume of hands-on procedures, required presence for pharmaceutical or contrast administration, oversight of on-site trainees, and the perceived value of “visibility” of radiologists at the hospital [1]. These factors will vary widely depending on the patient population being served (adult versus pediatric; multispecialty versus subspecialty settings). When the radiology department is part of a group, there may be better ability to flex to meet the changed demand, even in the absence of adequate baseline staffing and imaging resources. Before COVID-19, radiologist and technologist staffing already ran considerably below required levels at one of our institutions in Dublin, Ireland. Part of our output optimization now involves reassessing staff capabilities and locations of work to best match them to available facilities and clinical need.

Financial factors will be critical in rebuilding services, and reduced funding will limit strategies such as purchasing of additional equipment or hiring of additional staff. Indeed, many radiology practices in the United States in particular have experienced a significant economic downturn due to COVID-19, with reduced ability to pay staff already employed [2].

Recovery Process Design and Considerations

The deferral of planned imaging has the potential to be a stressor for multiple groups; patients or parents, referrers, radiologists, technologists, managers, and administrative staff all have the potential to feel worried or pressured by a change to imaging schedules. Institutions have a corporate responsibility to support staff and patients through these concerns.

As radiologists, our principal responsibility is to ensure equal access to imaging care that is based first and foremost on clinical need. For departments that entered the pandemic with well-curated waiting lists and for whom capacity remains robust, it may be possible to redistribute deferred cases without altering the scheduled appointments of other patients waiting for imaging. In the case of departments whose waiting lists were already long, or in which there is limited capacity to return to high output levels, a full re-evaluation of all cases on the waiting list may be justified to allow equity of prioritization across all specialties and referrers.

Working toward a fair reorganization of waiting lists will require that special attention be given to the interplay between the demands of urgent or emergent imaging, time-critical imaging (such as pediatric spine ultrasound), imaging of known versus potential disease, and screening programs. In North American institutions, there will be added complexity introduced to this process by the requirement to reassess insurance status and preapproval for imaging.

In some departments, a full rejustification and reprioritization framework will be required. Referrer and radiologist input will be necessary to determine if a study is still required, whether the correct study is ordered, and, if so and in the context of available resources, how quickly it should be and can be performed. One strategy is to consider assigning parcels of capacity to subspecialty subgroups of the task force that take responsibility for deciding on its best use; this could serve to ensure wider distribution of imaging across patient groups.

The majority of radiology departments will not have the capability to return to full function for some time, and it may be prudent to

identify a basic achievable weekly capacity in each modality. This should take account of altered staffing and residual COVID-19-related infection control restrictions, allowing patients to be rescheduled in an orderly and achievable way. Specific examples from some Dublin hospitals include:

- Using the agreed maximum capacity in each modality, slots are assigned to the highest-priority patients from three lists: the existing schedule, the cohort deferred during COVID-19, and urgent referrals. Patients on the original schedule who can no longer be offered an appointment are either deferred by agreement with their referrer or added to the urgent list for consideration the following week.
- Decoupling symptomatic breast imaging from clinic times due to a mismatch in safe volumes in the clinic and imaging environments. Imaging (with biopsy as required) is now performed on a scheduled basis, with strict maximum numbers.

Communication Strategy

Clear communication about the task force’s plans to corporate management, radiology staff, referrers, and patients or parents is likely to reduce queries about deferred imaging and ultimately assist in successful implementation the strategy. Being able to shine a light on the estimated time frame for increased demand on resources may also improve staff cohesion and ability to cope with the added pressure.

SUMMARY

Radiology departments worldwide have been severely affected by a period of COVID-19-induced imaging austerity that will reach beyond the peak

of the pandemic. Each department needs to rapidly take stock of the known and estimated future effects and begin to implement a strategy for returning to normal function. Proactive and careful management should allow departments to actively manage a recovery process that will last well beyond the immediate critical care

crisis. Planning our own recovery will ultimately protect patients and staff and enable us to respond robustly as the uncertainty of the coming months unfolds.

REFERENCES

1. Phillips CD, Shatzkes DR, Hsu KA, Doshi A, Filippi CG. From the eye of

the storm: multi-institutional practice perspectives on neuroradiology from the COVID-19 outbreak in New York City [E-pub ahead of print]. *AJNR Am J Neuroradiol* 2020 Apr. <https://doi.org/10.3174/ajnr.a6565>.

2. Cavallo JJ, Forman HP. The economic impact of the COVID-19 pandemic on radiology practices [E-pub ahead of print]. *Radiology* 2020. <https://doi.org/10.1148/radiol.2020201495> Epub 2020 Apr 15.

Aisling Snow, MD, is from the University of Dublin, Trinity College, Dublin, Ireland, and the Department of Radiology, Children's Health Ireland at Crumlin, Dublin, Ireland. George A. Taylor, MD, is from Harvard Medical School, Boston, Massachusetts, and Boston Children's Hospital, Boston, Massachusetts.

The authors state that they have no conflict of interest related to the material discussed in this article. Dr Snow is a partner in an academic institution and Chair of the Radiology Equipping Decision Group for Children's Health, Ireland. Dr Taylor is John A. Kirkpatrick Jr Emeritus Professor of Radiology (Pediatrics), Harvard Medical School, Boston, Massachusetts.

Aisling Snow, MD: Department of Radiology, Children's Health Ireland at Crumlin, Crumlin, Dublin 12, D12 N512 Ireland; e-mail: asn@tcd.ie