

One IR Department's Innovative Response to COVID-19

James Jeffries, MD; Osman Ahmed, MD; Jeffrey Leef, MD

The University of Chicago Medicine, Chicago, IL

COVID-19 has forced every specialty within the healthcare system, including interventional radiology, to overcome challenges few could have imagined before the disease invaded the US little more than a year ago.

Stories have been told of entire hospital departments—and private practices—being shut down as a result of the pandemic.

As patients began flooding emergency rooms, CT scanning and chest X-ray orders began flooding worklists. Interventional radiology became an integral component of the treatment of patients suffering from suspected and confirmed cases of COVID-19.

Indeed, although IR may not enjoy as much of the glamour that some other specialties do in the eyes of the public, the reliance of clinicians on IR during the pandemic is a testament to the critical role played by the specialty in the complex US healthcare system.

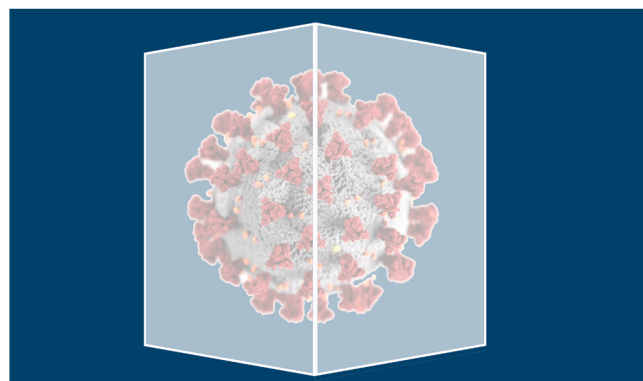
Like other hospitals around the world, The University of Chicago Hospitals were faced early on in the pandemic with a challenge: how to continue providing COVID-19 patients with state-of-the-art care while maintaining safety for patients and staff. This was a particularly significant challenge, as any patient who presents to the ED requiring urgent intervention before their COVID-19 test results are available is treated as if they are positive for the disease.

Our hospital leadership quickly realized that, even after implementing all recommended guidelines for personal protective equipment (PPE), much more needed to be done to improve safety and treatment capacity in IR. Specifically, our IR department lacked sufficient positive pressure ventilation rooms to evaluate and treat COVID-19 patients.

Prior to the pandemic, the protocol for patients being treated under airborne precautions was to don appropriate PPE, treat the patient in a standard angio suite, and then close the room for the remainder of the day while it was being decontaminated. But with only five angio suites available, our entire IR department workflow would quickly come to a halt when multiple COVID-19 patients needed urgent treatment.

But to paraphrase a well-known adage, necessity drives innovation, and in our case, that necessity for additional treatment capacity drove innovation that we were able to achieve very quickly and at relatively little cost.

With the input of physical plant operations, radiology administration, technologists, nurses, and physicians, a plan was implemented to transform one of our hybrid CT/angiography suites into an environment similar to that of an operating room.



More specifically, our goal was to build negative-pressure anterooms around both entrances to the angio suite. Creating negative room pressure is an isolation technique used to prevent airborne contaminants from escaping from one area to another; it is used to help contain such airborne contagions as tuberculosis, measles, SARS-CoV, MERS-CoV and now, SARS-CoV-2. The negative pressure within the anterooms draws out higher pressure air, along with any potential contaminants, that may be inside the angio suite.

The anterooms were built using the same polycarbonate and steel frame walls often used by the physical plant to isolate rooms undergoing construction or painting. Omniaire 600 Nitro portable HEPA air scrubbers were then attached to these anterooms; these and other similar devices are readily available on Amazon for anywhere from a few hundred dollars to more than \$1,000. They draw air in, filter it, and exhaust it into the adjacent hallway.

The anterooms were also constructed with a manometer to monitor the air pressure and ensure that the negative pressure inside them remained consistent relative to the angio suite. In this way, we were able to increase our capacity to treat patients with confirmed and suspected cases of COVID-19.

Indeed, by leveraging readily available resources and tools like these, our IR department was able to continue providing high-quality care to all COVID-19 patients while also maximizing safety of the healthcare staff—all for approximately \$10,000, a fraction of the cost required to construct a new isolation room.

As the challenge of COVID-19 treatment and this case study illustrates, the foundation of cost effective innovation that IR has built for itself clearly serves its patients and providers well, and will continue to do so well into the future.