

# Upgrading Interventional Labs to Improve Workflow and Efficiency at Mount Sinai Health System

Edward Kim, MD, is Director of Interventional Oncology and Professor of Radiology and Surgery in the Division of Vascular and Interventional Radiology at the Mount Sinai Health System. Dr. Kim recently shared his views on replacing his aging imaging equipment to improve the efficiency of the interventional radiology suite at Mount Sinai.

**M**ount Sinai Health System is a multi-hospital health care system. At Mount Sinai Hospital on the Upper East Side of New York City, we are one of the busiest tertiary care practices in the country. We perform a variety of procedures, ranging from interventional oncology to peripheral arterial/venous disease, as well as men and women's health.

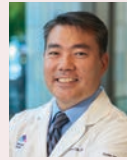
## Future of medicine

As we look toward the future of medicine, opportunities lie in integration with machine learning and big data, and using that to make physician workflow, diagnosis, management, and treatment more efficient, ultimately benefiting patients as well as physicians. We want to get more precise as patient care evolves. The term precision medicine has been thrown out with multiple subspecialties. Taking oncology as an example, whether it is medical oncology or interventional oncology (IO) becoming more accurate with the targeting and treatment of tumors and characterization is essential for better patient care.

As the population ages, we see an increase in the number of patients and medical disorders. We are also dealing with a physician shortage that I don't think will be mitigated in the foreseeable future. Becoming more efficient is vital for patient care. In 2014, we adopted a technology in our angio suite from Philips called EmboGuide, which has made our procedures much faster and more efficient. It utilizes cone beam computed tomography (CBCT), allowing you to segment lesions. The software automatically detects feeding vessels to the targeted lesions. Our group and groups from all over the world have published studies on how patient outcomes are better with CBCT, including longer median overall survival when it comes to cancer and more accurate targeting. When we first started using EmboGuide, obviously there was a learning curve where it may take two hours for the procedure to be performed. But with experience, most procedures now take only about an hour to hour and a half.

## The importance of staying current

At Mount Sinai, we replace our interventional units every 10 years or so. The goal is to work with all of the same units throughout the health care system, so all the technologists and staff are familiar with the systems. So, if we come in at 4 am for, let's say for a bleeder, whether it is at Mount Sinai



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hospital or one of our satellite hospitals, we will feel comfortable using the equipment and delivering the best care for our patients.

As we planned to replace older equipment, we looked toward software that increases our efficiency, and image quality combined with reduced radiation dose to patients or to staff from the scatter radiation. We also prioritized finding an intuitive system that is easy to use. If you or your technologist can easily pull up your imaging settings for each procedure type with 1-click of a button, why wouldn't you want that system? It is going to lead to less frustration and shorter procedure time.

We replaced our older Allura unit with a new Azurion [Philips Healthcare] unit recently in one of our angio rooms, and it has become the workhorse for us. The image quality is outstanding, whether it's the fluoroscopy or the CBCT resolution. But what really differentiates the Azurion from other systems we have evaluated was the workflow and logistics. The system is seamlessly integrated so it feels like an extension of the physician. It's as if your next thought has been integrated into the workflow. If I want a CBCT and want to target lesions next with EmboGuide, I can efficiently access the software applications from the tableside touchscreen tablet with the click of a button. You're not wasting a lot of time. That is why we chose Philips and we prefer the Azurion.

Our technologists love the Azurion as well. A lot of built-in functions make their job more efficient such as the split-screen function where from the control room you can see a roadmap image as well as the live fluoro image side-by-side. On one screen you are doing the procedure, and on the other screen you can review images from previous DSAs. The techs and physicians love that they can work side-by-side without interrupting each other's work and control so much from the tableside touchscreen in the exam room.

A big advantage of the newer imaging systems is the workflow. There are fewer steps in positioning of the patient. We can have image recall for road mapping which leads to fewer scans and fewer digital subtraction angiography (DSA) runs. That in turn reduces patient radiation and contrast load. Acquisition times are shorter, so we as physicians treat more efficiently leading to shorter procedure times. Incrementally, you could now perform four complex procedures instead of three in a day. This throughput obviously increases the number of cases you can do safely. And the end goal is always patient care and improving the efficiency and outcomes of patient procedures.

### **Additional flexibility**

When selecting a new imaging system, we chose to go with a gantry that provided additional flexibility beyond the standard ceiling mounted c-arm. The FlexArm geometry supports more complex procedures. Previously, the arm had to be either at 90-degree turns to the patient, either head-on in the prop, or in the lateral position, but now we can be in any position. It can be positioned at a 45-degree angle, so we are unimpeded in terms of our access to the patients. Our anesthesiologists love it as it helps them maintain patient airway control and allows the interventional radiologists to have access without being impeded by hardware. We can now obtain CBCTs from both sides of the table, whether the C-arm is positioned left or right lateral for a roll scan. We have access through the internal jugular vein, as well as transsplenic access for portomesenteric reconstructions.

### **Making the case to upgrade**

To garner support from the C-suite to upgrade our aging interventional system, we presented an economic model and patient statistics to make an argument that upgrading the room and making it more efficient is not only beneficial to patients but to the entire health care system. Our practice is about 90% outpatient practice with IO and embolization codes have a high relative value unit. When we are primarily performing embolizations all day, it is easy to demonstrate to administration the amount of revenue we are generating annually for the hospital. We need a new room because if our

room goes down, our throughput and our revenue go down. Additionally, we've seen with the newer Azurion imaging system that our efficiency increases, so our revenue increases. The alliances we make with other services are important as well. For instance, because of our improved outcomes, our liver transplant team, which is a strong group within the health care system, advocates for us because we are essential to their program to bridge down-stage patients to transplantation. If we don't have the best equipment, not only does our department suffer but other departments, because of our symbiotic relationship, suffer as well.

Other reasons to upgrade include a reduction in radiation dose to patients with the technology, and augmented image quality. Looking toward the future with cutting-edge technologies, all these systems can be upgraded with software. Energy efficiency and sustainability are also important. Initially we had some pushback from engineers saying that we needed another power source, but that was quickly rebuffed by statistics showing that a new Azurion room requires less energy than previously existing systems.

### **Adopting new technology**

The adoption of technology and the learning curve of a new system depends on individuals, the group, and their mindset. Our group has always been at the forefront of embracing new technology and using it to make our physicians better and improve care for our patients. New technologies continue to make us more efficient as well. Let's say instead of doing 3 or 4 complex cases in a room per day, we can do 4 or 5. Performing an extra case each day gives us more experience, in turn making physicians better and procedures more efficient.

The reason it's been so easy for us to embrace Philips technology is the Philips' physician-first mentality. The biggest improvements when we started using Azurion have been with the workflow, the software systems, the integration, and helping physicians. We always want to be faster—we are impatient to begin with. But the Philips Azurion has changed our practice by increasing our volume and efficiency of our procedure outcomes. ■