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**Advances in Stroke Care Reach
Patients Throughout the Region**

More than 795,000 people across the United States had a stroke in 2017, and about 140,000 of these ended in death. That's a stroke every forty seconds—and nearly 700,000 of these are ischemic strokes, caused by a blockage in a large blood vessel in the brain.

There's good news in stroke care, however. In 2018, the American Heart Association/American Stroke Association released new guidelines for the treatment of acute ischemic stroke. The guidelines increased the time window in which the removal of a blood clot in the patient's brain using a specialized catheter and stent—a procedure called a surgical mechanical thrombectomy—could temper or even reverse the effects of a stroke.

The guidelines are the result of new research, which proved that large vessel strokes can be treated with surgical mechanical thrombectomy for up to sixteen hours after onset—and, in some cases, as much as twenty-four hours.

This longer interval means that patients who cannot say for certain when their stroke began, including those affected during sleep in the middle of the night, now have an opportunity for treatment. “Our system treats roughly 2,500 stroke diagnoses in a year,” said Tarun Bhalla, MD, PhD, UR Medicine's director of stroke and cerebrovascular services. “This year, with the expanded time window, we'll do more surgical procedures for stroke than are treated with IV tPA,” the intravenous drug tissue plasminogen activator, which must be used within four and a half hours of stroke onset to be effective. “This really highlights the power of stroke becoming a surgical disease. Mechanical thrombectomy can now be effective in up to twenty-four hours after onset.”

Dr. Bhalla and Thomas K. Mattingly, MD, MSc, are the two stroke surgeons on call 24/7 at UR Medicine's Strong Hospital, providing neurovascular expertise around the clock. “These patients must be carefully selected to be sure that they have brain tissue left to save,” said Dr. Bhalla. “We've actually brought in the same software used in these recent studies, to help us in screening patients that might benefit from a mechanical thrombectomy.”

IschemaView RAPID software helps physicians identify the areas of the brain that are already experiencing reduced blood flow from the stroke, and the areas that are at risk, and then shares that information with the stroke team. Images collected through computed tomography (CT), CT angiography (CTA) and CT perfusion (CTP) allow physicians to see the blood flow and blood vessels in the brain. These scans reveal which areas of the brain are not getting sufficient blood flow and nutrients, deficiencies that can lead to brain cell deterioration and death. Immediately after the scans are completed, the images are sent to the team of physicians involved in diagnosis and treatment, allowing them to confer simultaneously in determining the



Tarun Bhalla, MD, PhD

best course of treatment.

This past fall, UR Medicine's stroke team deployed its own innovation to make this software breakthrough even more effective. In October 2018, they introduced the Mobile Stroke Unit (MSU), an ambulance-like “emergency room on wheels” that now brings lifesaving care to stroke victims throughout the greater Rochester community.

This unit is just 13th in the nation and the only of its kind in the Western and Central NY region. Operated in partnership with American Medical Response, Inc. (AMR), the MSU contains specialized staff, equipment, and medications to diagnose and treat stroke at the patient's site, and transport the patient to the nearest hospital with the appropriate level of care, all while the initial treatment is in progress.

The MSU carries a portable CT scanner, which staff members use to image the patient's brain and determine what kind of stroke—ischemic or hemorrhagic—the patient is experiencing. If the stroke is ischemic, as are more than seventy percent in our region, the team can begin the intravenous tPA to attempt to break up the blood clot in the brain. Meanwhile, the CT images are sent via a secure online network to the physicians at UR Medicine, who determine the best course of action and prepare the needed resources before the patient even arrives at the hospital. If surgery is indicated, the patient can move directly into the operating room upon arrival.

“This really is an emergency room on wheels,” said Dr. Bhalla. “It is not only the ambulance with EMS personnel on the scene; it brings all the capabilities of the ER to the patient. We can draw blood samples, do imaging, and make decisions about the type of stroke someone may be having. Also onboard is state-of-the-art networking and telemedicine equipment, so we can bring our stroke care expertise directly to the stroke victim. In the emergency rooms of any given hospital in the city, there can be hundreds of patients simultaneously vying for attention from providers. In the MSU, you are the only patient, and you have the attention of the entire team to solve your particular problem.”

Extending care across the region

As the only Comprehensive Stroke Center certified by the Joint Commission in the greater Rochester region, UR Medicine works to find solutions that will reach beyond Monroe County and assist regional hospitals in saving lives and reduc-



The UR Medicine Mobile Stroke Unit is the first of its kind in the region and only 13th in the nation.

ing morbidity in stroke patients. “Stroke care is a regional solution—it’s never a one-size-fits-all approach,” said Dr. Bhalla. “The MSU is a great solution for anyone within a thirty-minute drive of the hospital, but outside of that, a patient will likely go to a local hospital. Over the course of the next several months, the service will work to expand to neighboring counties in the region so that patients in more rural areas outside of that radius, may call for an ambulance which would rendezvous with our MSU while it’s on its way to Rochester.”

Across the broader region, UR Medicine has already put solutions in place to reach patients throughout the fifteen counties outside of Monroe, who may need more advanced stroke care than the local hospitals in those areas can provide. Working with Christopher Zammit, MD, an emergency physician and stroke specialist; Curtis Benesch, MD, MPH, stroke neurologist and Stroke Center director; and Sarah Gallagher, UR Medicine’s regional stroke coordinator, the Stroke Center has developed an initiative called Code LVO—to rapidly identify, triage, and transfer large vessel occlusions, the cause of the most severe ischemic strokes.

“We looked at how the region was performing, and found a couple of areas where we really thought the time window to treatment could be lessened,” said Dr. Zammit, who is fellowship-trained in stroke and neurocritical care. He has also worked as a helicopter flight physician, giving him a firsthand understanding of this emergency response and transfer process. “Dr. Bhalla, Dr. Benesch and I engineered a care pathway by

soliciting feedback from local hospitals and transport teams throughout the region, along with the many providers and personnel at Strong Memorial hospital that must come together to efficiently treat large vessel occlusion stroke patients.”

The care pathway guides the patient’s journey from “door in” to “door out,” (DIDO) at the sending hospital, to the “skin puncture time,” or time that the surgical treatment is initiated at Strong Memorial Hospital, in the fastest and most effective way possible.

Working directly with Arnot Ogden Hospital in Elmira, the collaborating medical center farthest away from Rochester, the stroke team gained an understanding of how the care pathway could work in local hospitals. They presented this information to other hospitals, and seven of them immediately signed on to follow the improved pathway. “The rest are doing most of the elements of it,” said Dr. Zammit. “We’re working on 100 percent.”

When a patient comes in with stroke symptoms that measure a six or above on the NIH Stroke Scale, CT angiography imaging is performed immediately. “This allows us to see the blood vessels and find the blockage,” he said. The images are immediately transmitted into a cloud imaging viewer for the acute stroke specialist at Strong to review for a large vessel occlusion and signs of a stroke. “If the signs of damage are very extensive, and opening up the blood vessel is not going to help that patient, we want to avoid their having to travel all the



Curtis Benesch, MD, MPH

way to Rochester only to discover there was no clinical advantage to making the trip here.”

If the patient does have a large vessel occlusion and there is evidence that brain tissue can be saved by surgically opening the blockage, the UR stroke specialist will advise the local hospital that it should proceed emergently with the transfer process.

Simultaneously, the “Code LVO pathway” is activated at Strong, which includes hospital-wide notification to the emergency department, neurology, neurosurgery, radiology, operating room, and intensive care teams to prepare for the patient’s arrival. These steps eliminate the potentially long wait times that can occur in attempts to reach the appropriate physician via phone and explain the patient’s case, thereby getting the patient to the operating room without delay.

The UR Medicine stroke team added another action to the care pathway: When the patient arrives at the local hospital with stroke symptoms that rank ten or higher on the NIH scale, the hospital can call immediately for an emergency helicopter. “It’s called the Auto Launch program,” said Dr. Zammit. “Twenty to thirty percent of the time, we won’t need to transport the patient, but the helicopter will be there for the ones we do. The

helicopter crews are happy to do that—they understand how important it is to enhance the speed and get them to a higher level of care.”

The streamlined process has made a significant difference, he added. “From Elmira, for example, it used to be door-to-door was four hours. Now it’s an hour and thirty-five minutes.”

“If Rochester is the epicenter of stroke care in Western New York, the farther away you get, you really have to figure out creative ways to get those patients here as quickly as possible,” said Dr. Bhalla.

Telemedicine, the ability to view imaging remotely, and other innovations are also in use here to reach as many people as possible with the lifesaving care they require.

“The MSU is just one example of the institution’s deep commitment to stroke care to the region,” said Dr. Bhalla. “We really look at this as a system-agnostic asset to the community. It will take them to any Rochester hospital that offers the kind of care they need. The patients are, and will always be, our first priority.”

**For more information on the
UR Mobile Stroke Unit, please visit:
mobilestroke.urmc.edu**

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The MSU is equipped with a CT scanner, telehealth equipment, lab testing devices, and acute stroke medications.