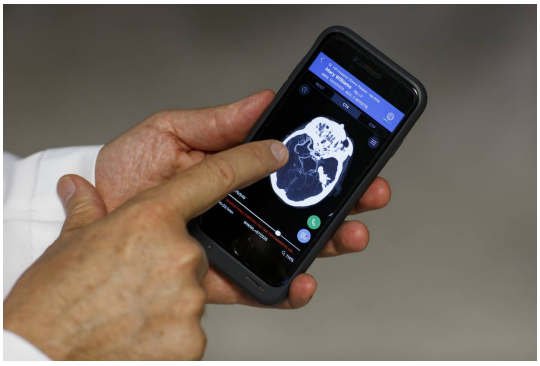
HEALTH CARE

New Technology Promises to Speed Critical Treatment for Strokes

Several young companies are introducing methods to quickly and precisely address severe blockages in major arteries caused by blood clots



Dr. Thomas G. Devlin shows a demo screen of the Viz.ai app. The technology uses algorithms and brain-scan databases to quickly provide diagnostic information to doctors. PHOTO: MELISSA GOLDEN FOR THE WALL STREET JOURNAL

By Thomas M. Burton
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Thousands of stroke victims are disabled every year because the right treatment comes too slowly. Some emerging technologies may change that.

The technologies use computer algorithms to cross-reference a stroke patient's brain scan with a vast database of scans from other victims, allowing a precise diagnosis in minutes. It can be done by less-experienced doctors in outlying hospitals or by paramedics with portable scanning devices in an ambulance. The scans and results can be quickly sent to a specialist at a regional stroke treatment center who can confirm the diagnosis.

The result: Victims of strokes—an interruption of the brain's blood supply that deprives brain tissue of oxygen—can be rushed to a stroke center with the most-skilled doctors who can remove blood clots. That contrasts with a too-common scenario: languishing for hours at a less-equipped hospital waiting for a diagnosis that often comes too late to help.

"There is no more time-sensitive treatment in all of medicine than treating the stroke victim," said Thomas G. Devlin, chairman of neurology at the University of Tennessee's Erlanger Medical Center in Chattanooga, a top stroke-treatment center. "The new technology has the potential for shaving off critical minutes, sometimes even hours, in the diagnosis, triage and treatment of stroke."

Companies developing different forms of this new technology include Viz.ai Inc. of San Francisco and Neural Analytics Inc. of Los Angeles. Both have been testing their new imaging at Erlanger and elsewhere. Another important new technology, called RAPID from IschemaView Inc. of Redwood City, Cal., produces automated images showing how much brain tissue is salvageable after a severe stroke. Many stroke neurologists say this technology could break new ground in getting stroke patients the right treatment.

At issue with the technologies are the most severe blockages in major arteries caused by clots.

Dr. Devlin is chairman of neurology at the University of Tennessee's Erlanger Medical Center in Chattanooga, Tenn., which is testing the new technologies. PHOTO: MELISSA GOLDEN FOR THE WALL STREET JOURNAL

Under current protocols, patients with severe strokes are typically rushed to the nearest hospital, regardless of the facility's ability to treat the most-severely ill patients. Once there, such patients undergo tests and scans for a diagnosis that often takes hours. With the clock ticking, many patients find their best chance for survival and recovery is an innovative procedure called a thrombectomy, which allows doctors to remove a clot to restore blood flow, according to stroke doctors, medical records and journal articles.

The thrombectomy has proven highly effective and is transforming stroke treatment. But as The Wall Street Journal recently reported, many stroke patients lack timely access to the complex procedure.

Many hospitals don't have the expertise or the facilities, leaving them with two choices: Lose precious time transferring a patient to a better-equipped stroke center, or treat the patient with a clot-dissolving drug. This drug works well for some moderately ill stroke patients. But the therapy often fails for thousands of severely stricken patients—those with large clots blocking major arteries.

A study in the journal Circulation last year of 984 such patients showed that treatment delays for them led to worse outcomes if they were transferred between hospitals instead of going straight to a hospital that could pull clots out with a thrombectomy. The new technologies could help fix that.

Erlanger treated 1,721 patients last year with clot-based strokes, 180 of whom got thrombectomies. The hospital employs a far-flung network of helicopters and ambulances that can rush stroke patients from up to 150 miles away. But like most top stroke centers, Erlanger depends on fast referrals from other hospitals for optimal treatment. Minutes make all the difference between recovery, disability or death, doctors say.

In one case during January, a 64-year-old stroke patient arrived at another Chattanooga hospital at 1:07 p.m. After two brain scans, she was transferred to Erlanger at 8:05 p.m., too late for a

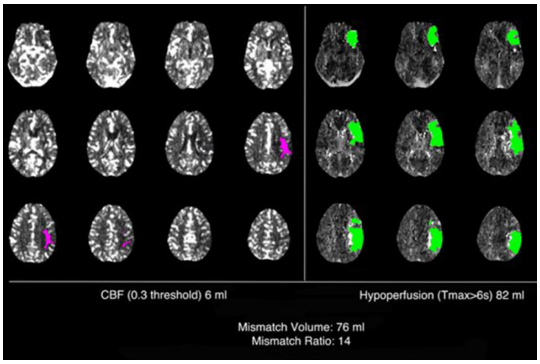
thrombectomy, Dr. Devlin said. She now resides in a nursing home, unable to speak or use her right leg and arm, her husband said.

The technology from Viz.ai (the ai is for artificial intelligence) recently gained Food and Drug Administration approval. The company and Erlanger are talking to other Chattanooga hospitals about installing its diagnostic software there, which would allow neurologists to see brain scans almost simultaneously.

A Viz.ai study of 300 patients, which prompted the FDA approval, showed that the company's software was able to notify a stroke neurologist on average 7.3 minutes after the brain imaging took place—compared with the hours that it sometimes takes with conventional diagnostic procedures. The technology accurately identified severe strokes as precisely as expert stroke radiologists do, the study found.

The system holds promise for improved outcomes, medical experts say, but only if it can be widely adopted by hospitals. One concern is cost. Companies developing the technology haven't set a price but say it won't be cost-prohibitive.

Some neurologists who specialize in thrombectomy say many doctors at outlying hospitals will resist transferring patients and losing their business. But Dr. Devlin said several hospitals are already planning to install Viz.ai technology in their facilities.



A new technology from IschemaView produces images of horizontal brain slices to show how much tissue is salvageable after a severe stroke. The images on the left show, in red, dead portions of the brain, and on the right, in green, threatened portions, including the dead cell area. The system helps doctors determine whether a thrombectomy would help. PHOTO: ERLANGER MEDICAL CENTER

The idea for Viz.ai's system came in part from Chris Mansi, a British neurosurgeon who in 2014 participated in a successful operation on a brain-injured woman. But she later died because it had taken four hours to get her to the right hospital.

Dr. Mansi later enrolled in Stanford Business School where he took an interest in developing technology to speed such patients to the right specialist for better outcomes. He also took a course on venture capital for entrepreneurs, taught by former Google chief Eric Schmidt. At the course's end, Dr. Mansi made a presentation that impressed Mr. Schmidt. His venture-capital fund and others invested $7.5 million in what became Viz.ai. Dr. Mansi serves as Viz.ai's president and chief executive.

"I like the medical imaging area, as I think AI will lead to much better outcomes," Mr. Schmidt said. "There are so many opportunities to change and improve medical care through AI."

The other company developing similar stroke technology, Neural Analytics, uses ultrasound devices that would attach to the patient's head in the ambulance to produce images that measure blood flow in the brain. Neural Analytics' Lucid system compares patients' brain blood-flow images with a database of thousands of such images to quickly pinpoint the problem. Paramedics could then direct the image immediately to a stroke hospital.

Robert Hamilton, the company's chief scientific officer, was a Ph.D. student in bioengineering at UCLA when he and colleagues thought of this technology for other types of brain injuries. They later realized that it could also be used to rapidly detect strokes caused by blood clots. The company's most recent study, conducted at Erlanger by Dr. Devlin, showed its technology detects 97% of large-artery strokes. It is seeking FDA approval and hopes to be selling its product by this fall.

"By detecting in the ambulance which patients have blood flow disruption," said Dr. Devlin, this device "has the potential to revolutionize stroke care."

Write to Thomas M. Burton at tom.burton@wsj.com

HEALTH CARE

How Doctors Locate Stroke Victims' Brain Clots

Neurologists seek clues that determine how severestrokes are and how to best treat them

Medical staff monitor a diagnostic angiogram of a patient at the University of Tennessee's Erlanger Medical Center in Chattanooga, Tenn. The facility is testing new technologies that promise to speed diagnoses. PHOTO: MELISSA GOLDEN FOR THE WALL STREET JOURNAL

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CHATTANOOGA, Tenn.—It was 2 p.m., and the seventh stroke patient of the day, an elderly woman, was just flown in by helicopter to Erlanger Medical Center.

Neurologist Emily DeCroos asked her a series of questions.

"What time did you wake up?"

"What day is it? What month?"

Repeat after me: 'No ifs ands or buts.'"

Other common commands: Close your eyes and stick out your tongue. Show me two fingers on your right hand.

Each question is aimed at homing in on where in the patient's brain a clot is likely to be lodged. Doctors will also test the patient's field of vision by holding up fingers on the periphery of what the patient can see, moving their hands and asking how many fingers the patient sees.

Upstairs in the angiography suite, where brain procedures to treat strokes are done, Drs. Thomas Devlin and Harris Hawk recently examined cross-sections of a patient's brain scan, showing what tissue has already been destroyed and what portion of the brain can still be saved. This analysis helps doctors further pinpoint the clot's location and treatment options.

Some brain cross-sections feature a digital rendering of a tiny, odd-looking man wrapped atop the brain image. This little cartoon man has an abnormally large face, lips and thumbs. His very short arms and legs are spindly.

The cartoon is a simple graphical diagnostic tool that aligns parts of the body to areas in the brain that control those body parts. Larger size means larger areas of the brain devoted to the functions of those body parts.

The cartoon aid is a great tool for medical students or doctors in training to help quickly identify problems. Many stroke specialists don't need to see the actual image on a screen because they've committed simple and effective tool to memory.

"If the patient's eyes are to the left or to the right, or if the patient can't speak, or can understand speech or not, it helps us pinpoint the stroke," said Dr. Devlin. "I have that picture in my head every time I see a patient."

All of this also helps doctors determine whether a stroke is caused by a clot blocking blood flow to the brain or by a brain hemorrhage that causes internal cranial pressure, which can also block flow.

If a clot, stroke doctors can give a clot-dissolving drug or retrieve the clot with a catheter device.

But all of this depends on paramedics and other hospitals getting the patient to Erlanger quickly enough to make a difference. That's where the new imaging and computer technology comes in.

If paramedics in a helicopter or ambulance can send precise images instantaneously to doctors here at the outset of a stroke, that can prevent delay in treatment. Doctors will know with great certainly if a clot-retrieval procedure will help, and can avoid the hours' delay that now is common.

Or if the patient is at another hospital, that hospital can instantaneously share images with Erlanger.

"There is no substitute for doing the imaging and seeing exactly what's wrong," said Dr. Devlin.

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