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Technology saving worst trauma cases

In Maryland and across the nation, mortality rates drop as medical equipment becomes faster and more sophisticated

By Foster Klug
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It's nine o'clock on a Saturday night when a 15-year-old boy with a bullet in his leg is rolled on a gurney into the Maryland Shock Trauma Center. More than 20 minutes have passed since he was shot in a drive-by.

The boy's eyes balloon with fright and his arms and legs tremble violently as a dozen doctors and nurses descend on him, shaving off his clothes with scissors, searching for other injuries.

On this night, the youth is lucky. His lone wound is fairly straightforward, and he's in a place where dedicated lifesavers wield some of medicine's most advanced tools.

At Maryland Shock Trauma, and other centers across the nation, leaping improvements in emergency medical technology are helping doctors save lives that, a few years ago, would almost certainly have been lost.

Most valuable are devices that swiftly offer detailed looks under the skin, be they portable ultrasound machines or thermometer-like oral probes that detect internal stomach bleeding.

For Dr. Thomas Scalea, Shock Trauma's chief physician, the more nimble and clearer-eyed inventions represent as radical a progression as the jump a century ago from horse-and-buggy to automobile.

"When I first got here (seven years ago), I'd sometimes say, 'Oh, that person's going to die,' " Scalea said. "Now, my expectation of who's going to die is very much different."

"I used to think there was a ceiling," he added. "There is no ceiling."

Critical seconds

Since Scalea arrived at Shock Trauma, technology has transformed nearly every corner of the emergency room, most impressively in ultrasound and CT scan machines.

"Every patient, it's like a detective project," he said. "You've got to figure out what's wrong, and you don't have much time."

With blunt-force injuries, which occur during automobile accidents and falls and account for most

trauma cases, a patient often has minor, if any, external bleeding; all the while, he or she could be bleeding to death internally.

Instead of inserting a catheter in the abdomen to blindly test for internal bleeding or using a 500-pound ultrasound machine that needs three people to maneuver and operate -- the old methods -- a 6-pound, brick-sized portable ultrasound now can detect bleeding in about 15 seconds.

It takes all of about 20 seconds for a bigger, stationary machine that travels a patient's length -- it's called a helical CT scan -- to provide doctors with a crisp, three-dimensional digital view of every part of the internal landscape, from the brain to the smallest artery.

The new "16-slice" CT machine, which looks like a large, white doughnut, rotates around a patient stretched out on a narrow table, capturing 16 images for every half-second cycle.

With the older CT scan, it often took more than an hour to see the result.

Doctors say it won't be long before they're wearing tiny ultrasound scanners around their necks, much as they now wear stethoscopes.

Machines affordable

Joan Liddy, a nurse at Shock Trauma, has had a front-row view of trauma injuries for 16 years, so certain recent cases stand out as technology-enabled triumphs.

She remembers a 17-year-old male whose car was broadsided by a dump truck about a year ago. It took about half an hour for emergency workers to pry him from the wreckage and get him to Shock Trauma.

Within 10 minutes of his arrival, doctors had the result of a helical CT scan showing a tear in his aorta; five minutes later, they were operating, and the boy's life was saved.

"When someone has a severe injury, five minutes can make a big difference in their outcome," Liddy said.

Even smaller trauma centers, which might not have the staff or facilities needed to perform complicated surgeries, can afford the fast-imaging machines and other new devices that are lowering emergency room mortality rates. Some of the new ultrasounds, for instance, cost about $25,000, well within most hospital budgets.

Medical technology also is making the battlefield more survivable.

Wounded soldiers in Iraq are diagnosed on portable CT machines, which are carted in semi-trucks and powered by generators. And the military uses anti-hemorrhaging bandages made from a protein-like substance found in shrimp shells that adheres to blood in a wound, stopping even severe bleeding almost immediately.

Advanced techniques credited

Nationally, improvements in emergency care have over the past 40 years helped lower the death rate for assault victims by nearly 70 percent, to 15,000 to 20,000 annually, according to a study headed by sociology professor Anthony Harris, of the University of Massachusetts at Amherst, which was done jointly with Harvard researchers.

The study credits a variety of medical improvements, including expanded 911 service, an increase in the number of hospitals and trauma centers, and better technology for emergency medical workers in the field, Harris said.

"With advanced life-saving techniques, they've been able to sort of freeze the deterioration of the patient and deliver him to the hospital within the 'Golden Hour,' " she said.

The "Golden Hour" is a concept developed by Shock Trauma's founder and namesake, R Adams Cowley. It holds that chances for survival dramatically increase when a patient is treated within an hour of injury.

New diagnostic devices alone have cut the mortality rate at the emergency units of the Methodist Medical Center in Dallas by 25 percent to 35 percent since 1998, said Dr. Robert Simonson, the hospital's associate director of emergency services.

He now can do a complete internal and external diagnosis within 15 minutes; five years ago, it would have taken an hour and a half.

At Shock Trauma, which belongs to the University of Maryland Medical System, the mortality rate now is about 3 percent -- half what it was 10 years ago -- even as the number of patients doubled to 7,000 annually, said Dr. Richard Dutton, the center's chief of anesthesia.

New inventions tested

Shock Trauma was the country's first trauma center, established in 1969. With its steady stream of severe injuries and worldwide reputation for skilled nurses and surgeons, it's where many new technologies first get tested.

One new digital X-ray system is based on a technology first developed to search South African miners for stolen diamonds. Doctors can scan a patient's entire body in 13 seconds -- versus the 45 minutes a conventional X-ray takes -- allowing them to trace a bullet's trajectory through the body, for example.

Emergency workers in helicopters and ambulances soon will be using the Capnometer, a thermometer-like device placed under the tongue that senses gastric carbon dioxide levels. Higher levels sometimes indicate a patient might be bleeding in the stomach.

And Shock Trauma is testing the portable, 1-pound Brain Acoustic Monitoring system, which lets emergency workers quickly assess brain injuries using a small forehead sensor. The system analyzes cerebral blood flow to see if a patient is unconscious from trauma or another cause such as drugs or alcohol.

Other new inventions are allowing doctors to better marshal information in the emergency room.

Shock Trauma has four Computers on Wheels -- flat-screen computers set on height-adjustable rolling carts, a tiny brass-colored bell tied to the front of each COW so even staffers in the heat of an emergency can hear them coming.

Instead of walking from department to department, doctors and nurses can pause during a procedure and search the COWs for every piece of information stored on every patient in Shock Trauma -- digital X-rays, CT scans, pharmacological information, even surgical techniques listed on Web pages at medical

schools.

Dr. Amy Sisley, a Shock Trauma surgeon, already is looking forward to the benefits of advances in wireless communications.

"Pretty soon," she said, "I'll be able to pull up a patient's information, from CT scans to pharmacology, all on my pager."

Having such gizmos allows Sisley and her colleagues a precious measure of control over what at times seems to verge on anarchy. At Shock Trauma, where a busy night can see a dozen mangled patients roll through the doors, they are often decisive.

"This technology saves so much time,' Sisley said, "and time saves lives."

On the Net:

http://www.umm.edu/shocktrauma