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LIFENET® System

Best practice

Speeding time-critical care at University Hospitals

University Hospitals Cleveland Medical Center

Mobilizing specialized care teams before patient arrival is key to improving treatment and outcomes. It requires accurate interpretation by EMS in the field and a secure way to transmit vital patient data and alert members of the care team, wherever they may be.

Leading medical centers—like University Hospitals (UH) in northeastern Ohio—started years ago to create ST segment elevation myocardial infarction (STEMI) systems of care for patients with cardiac arrest caused by sudden, complete blockage of coronary arteries. Now, UH is using lessons learned from STEMI patient care to improve treatment of other time-critical patients, such as stroke and trauma.

The UH system includes its flagship academic medical center in Cleveland and a network of 18 regional hospitals. UH also serves as medical authority for EMS agencies in 165 towns and cities across northeastern Ohio.

Here's their story.

Challenge

Before 2005, many Cleveland-area EMS and hospitals lacked the tools and processes to provide the recommended standard of care for STEMI patients. Few EMS crews were equipped and trained to transmit ECGs to a hospital to quickly identify patients with STEMI. It wasn't standard practice to take patients directly to a hospital capable of performing emergency angioplasty. Once a patient reached the appropriate hospital, precious minutes were spent getting through the emergency department and to the interventional cardiac catheterization lab for definitive treatment.

In 2005, the average door-to-balloon time at UH was about 96 minutes, longer than the American Heart Association (AHA) 2005 Guidelines of 90 minutes or less for STEMI patients to receive PCI treatment after hospital arrival.[1]

University Hospitals set out to change that, building on a long tradition of innovation in emergency medical care. More than 20 years ago, UH's Cleveland Medical Center began receiving prehospital ECGs from EMS for interpretation by a hospital-based cardiologist.

Solution

UH was able to take a whole-systems approach to STEMI care in 2008, when they implemented the LIFENET System to share clinical data before patient arrival, so the receiving hospital could activate the cath lab. UH was one of the first medical systems in the nation to use the LIFENET System to quickly activate user configured protocols to help increase operational efficiency. UH's ability to quickly alert and assemble care teams and thus reduce time to activation took another leap forward in 2010, with LIFENET OnePush to automate protocol activation. With OnePush, the alert goes simultaneously to all relevant team members' pagers and can also be sent as a text to their cell phones.

"OnePush is so much faster and much more reliable for activating protocols," says Dan Ellenberger, EMS director at UH. He considers it essential that EMS squads be able to activate protocols before hospital arrival.

"At University Hospitals, the Emergency Department is the front door to the hospital, but EMS is the first touch for our patients. We want UH-level care to start in someone's living room or by the side of the road, and continue as they are brought into our hospitals, all the way through to discharge," adds Ellenberger, who directs the UH EMS Training & Disaster Preparedness Institute.

Expanding time-critical systems of care

In recent years, UH has built on its STEMI care success, developing systems of care and using LIFENET OnePush to activate specialized hospital teams for patients stricken by stroke, shock and trauma. Both EMS en route and teams within the hospital use OnePush to activate the care protocols and alert teams for time-critical patient care.

"When it comes to any time-critical alert, we're using OnePush."

Dan Ellenberger, UH EMS director

Similar to the standards for STEMI, ACC/AHA guidelines for stroke care call for rapid identification of a stroke and immediate EMS transport to the nearest center able to provide specialized care.[2] At the hospital, a CT scan of the patient's brain helps determine if the stroke is caused by a clot (ischemic) or bleeding (hemorrhagic).

For acute ischemic stroke, the Guidelines recommend a door-to-needle time of 60 minutes or less after stroke onset (no later than 4.5 hours) for patients eligible to receive clot-busting r-tPA (tissue plasminogen activator) by IV.[3] In addition, for eligible patients with large occlusions, mechanical thrombectomy to remove the clot is advised within 24 hours of a stroke event. If the stroke is hemorrhagic, the patient requires further evaluation to determine appropriate treatment.

OnePush is instrumental in speeding operational efficiencies for stroke patients, says Julie Fussner, BSN, RN, CPHQ, SCRN, Stroke Operations Manager at UH. Their brain attack activation alerts the stroke team and helps assure that the CT scanner is available. Upon hospital arrival, the EMS squad takes the patient directly for brain imaging to help determine likely treatment.

To identify stroke patients more rapidly, UH is creating an EMS tele-stroke program, using technology that allows a physician to watch in real time as paramedics in the field assess suspected stroke patients. The live-streamed assessment helps the UH physician determine if the patient is having a stroke. If so, a brain attack protocol is activated. The program has been rolled out to UH's Parma and Portage medical centers.

UH uses OnePush to forward the appropriate notifications, patient vital signs, blood glucose levels and last known well times to the entire hospital stroke team. The activation also alerts the ED charge nurse and physician, neurointerventionalists, stroke team, CT imaging team, pharmacist and the neurological ICU team, explains Kelly Montgomery, BSN, RN, SCRN, stroke coordinator at UH.

A OnePush stroke alert is also used if a stroke patient self-transports to the Emergency Department. The LIFENET System records events, noting the time of the protocol activation, which helps document response times for quality improvement purposes.

Critical elements of the system

In addition to rapid protocol activation and team alert, Ellenberger lists these other elements as essential to provide consistent, high-quality, rapid care for time-critical patients:

- Designating certain UH hospitals as receiving centers for events like acute cardiac arrest and stroke:
  - Seven UH hospitals and one community hospital partner are designated as STEMI receiving centers. They have a cardiac catheterization lab with an interventional cardiologist who is either in-house at all times or can be in the cath lab within 30 minutes. This avoids hospital-to-hospital transfers and assures patients are cared for by experienced teams. Most UH STEMI centers have on-call teams, so it's imperative to have the ability to receive a pre-hospital ECG and quickly alert team members if warranted.
  - University Hospitals Cleveland Medical Center is the first hospital in northeast Ohio to achieve The Joint Commission's rigorous standards for Comprehensive Stroke Center Certification. The Joint Commission has designated all eligible UH regional hospitals as Primary Stroke Centers, able to administer r-tPA to patients who meet the criteria. Patients who need mechanical thrombectomy are transported to Cleveland Medical Center for the procedure.
- Reviewing performance of individuals and the system:
  - After each STEMI or stroke event, everyone involved in that patient's care gets a feedback report.
  - UH conducts a system-wide quarterly review on STEMI and stroke cases, and is beefing up its analysis of trauma cases. In addition, the medical center is implementing a system approach to review all cardiac arrests handled by EMS agencies under its medical authority. To facilitate its QA efforts, UH uses CODE-STAT™ data review software from Stryker.

Results

UH's systems of care are leading to faster high-quality care for patients with STEMI and stroke:

- In 2017, the median door-to-balloon time for STEMI patients across the UH system was about 30 minutes. The fastest time was nine minutes.
- Average door-to-needle time for administering r-tPA to stroke patients in 2017 was 38 minutes at UH Cleveland Medical Center and 50 minutes at UH Parma Medical Center.
- For stroke patients who need mechanical thrombectomy to remove a clot blocking an artery to the brain, median door-to-groin time in 2017 is 91 minutes at UH Cleveland Medical Center.

An internal study at UH found OnePush is much faster and more reliable than the pager system, a 1980s technology that's still used to add redundancy. OnePush not only speeds patient care, says Ellenberger, it also decreases false activations in the middle of the night.

"It all revolves around early activation. We couldn't do this without early activation."

Dan Ellenberger, UH EMS director

Key steps for systems of care

Ellenberger lists these elements as critical to UH's coordinated systems of care:

- Create protocols for EMS and hospital teams to streamline and coordinate patient treatment. As the medical authority for EMS in 165 communities, UH plays a pivotal role in EMS protocols across northeastern Ohio.
- Link all members of the healthcare team via a secure data-sharing network to speed clinical alignment.
- Equip and train EMS squads to acquire and transmit 12-lead ECG data. All transport squads under UH medical authority have the ability to transmit ECGs via the LIFENET System.
- Designate certain hospitals as receiving centers for time-critical events like acute cardiac arrest and stroke. Require centers to meet set criteria, such as being able to receive 12-lead ECGs from EMS and perform needed treatment 24/7.
- Put procedures in place at regional hospitals to quickly identify patients in need of higher-level care, arrange patient transport and activate the protocol at the receiving hospital. UH uses LIFENET OnePush across its regional hospital system to automate STEMI protocol activation.
- Upon notification from EMS or transfer hospital, immediately alert needed caregivers so teams can be assembled and treatment facilities prepared before patient arrival. At its hospitals with high volumes of ED patients, UH stations a dedicated EMS "quarterback" in the ED to communicate with EMS teams on cases that aren't clear-cut and activate LIFENET OnePush.
- Reduce steps in the process wherever possible. For example, if paramedics have identified STEMI on a prehospital ECG, EMS bypass the UH ED and take the patient directly to the cath lab. If a patient is suspected with a stroke pre-hospital, the EMS squad takes the patient directly to the CT scanner.
- Measure performance and conduct post-event review with team members. Review system-wide data periodically to improve performance.

About University Hospitals

More than 30,000 UH physicians, nurses, employees and volunteers serve over 1 million patients and families. The health system's flagship academic medical center, University Hospitals Cleveland Medical Center, is an affiliate of Case Western Reserve University School of Medicine. UH Harrington Heart & Vascular Institute brings together renowned physicians and leading-edge technologies to provide the latest in cardiovascular care. UH EMS Training & Disaster Preparedness Institute provides emergency care through the UH hospital network and provides training to Fire Departments, Special Rescue Teams and EMS Agencies across northern Ohio. The Neurological Institute, Northeast Ohio's first designated institute for the comprehensive care of patients with diseases affecting the nervous system, is committed to providing patients with innovative, integrated and individualized care. The UH system also operates more than 40 outpatient health centers and 200 physician offices.

The tools

Stryker's innovative tools link field and hospital teams to help you work as efficiently as possible. Shortened time to treatment for STEMI patients has been shown to lead to increased survival.[4,5]

The **LIFEPAK® 15 monitor/defibrillator** continuously monitors all 12-leads and alerts caregivers to changes in patient condition with ST-segment trend monitoring. It records and can transmit patient vital signs, along with diagnostic-quality ECGs. Features such as capnography help care teams monitor patient status.

The **LIFEPAK 1000 defibrillator** for law enforcement first responders captures patient and performance data that can be downloaded using an infrared connection and easily viewed, analyzed and managed with CODE-STAT data review software.

The **LIFENET System** is a comprehensive cloud-based platform that enables sharing of critical patient data to help reduce time-to-activate. The OnePush feature allows designated EMS or hospital professionals to quickly activate protocols and alert teams for many emergent care needs, including STEMI and stroke.

CODE-STAT data review software downloads patient and performance data captured by LIFEPAK defibrillator/monitors, making it accessible for review and analysis. The software generates a succinct report of a medical event, such as cardiac arrest. It can provide summary reports for specific time periods (i.e. monthly or yearly) to quickly identify statistics for a given period.

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