

Best Practice

Improving In-Hospital CPR Performance

The Situation

Inspired by steep improvements in CPR performance by local EMS, EvergreenHealth set out to improve resuscitation practices at its own emergency departments in suburban Seattle using a data-based performance review process.

Consistently ranked by HealthGrades among the top five percent of hospitals in the nation for clinical excellence, EvergreenHealth wanted to better measure what they were doing and help ED resuscitation teams improve.



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Kevin Hanson, MD,
Director of EvergreenHealth
Emergency Department



EvergreenHealth, which averages seven resuscitations each month, operates a Level 3 Trauma Center at its Kirkland medical center and a free-standing Emergency Department in Redmond. The healthcare system is a public hospital district serving 850,000 residents in north King and south Snohomish counties.

In July 2013, EvergreenHealth began putting a process in place similar to Redmond Medic One, an EMS agency serving the hospital. This process had shown markedly improved CPR performance and this paper describes the steps and improvements one system was able to implement in a short period of time.

Room for Improvement

To help benchmark their current CPR quality, EvergreenHealth began using CODE-STAT™ Data Review Software with Advanced CPR Analytics from Physio-Control.

“I knew we had room for improvement and that getting data would help us with that,” says Kevin Hanson, MD and Director of the Emergency Department.

Capturing and reviewing data from a small set of resuscitations showed an average compression rate of 140/min, compared to the 100-120/min recommended by the American Heart Association guidelines. EvergreenHealth also discovered they were close to the AHA recommended compression fraction of at least 80 percent.

“Our compression rate was too fast almost every time,” Hanson says. “We also saw that we had some room for improvement in hands-on time, although that wasn’t the big issue for us.”

EvergreenHealth had seen Redmond Medic One improve its adherence to AHA guidelines by measuring performance and giving quick feedback to paramedics and EMTs after each call. Realizing the link between patient survival and CPR quality, the healthcare system adopted that approach.

“I knew if our resuscitation team could just see the data in an organized fashion, we would see improvement,” says Michael Swenson, RN, EvergreenHealth’s Manager of Emergency Services.

For a number of years EvergreenHealth had been using Physio-Control LIFEPAK® 12 and LIFEPAK 15 monitor/defibrillators in-hospital and receiving 12-lead ECGs from EMS via the LIFENET® System. But like most hospitals, they were not accessing the raw data from in-hospital defibrillators for post-event analysis. CODE-STAT data review software gave them that ability.

“Getting such in-depth data on every resuscitation lets us give feedback to the nurses and techs doing the work, and to the doctors overseeing it,” Hanson says.

The Approach

EvergreenHealth worked with Dana Yost,* senior paramedic with Medic One, to help them devise and implement a plan based on Medic One’s process, but tailored to the hospital.

Yost recommended that the emergency department look at resuscitation practices with an emphasis on minimizing interruptions and controlling compression rate.

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“Teams should think in terms of Quality Improvement (QI) instead of Quality Assurance (QA),” says Yost. “I recommend reviewing every case every time and giving timely feedback to the lead physician and resuscitation team.

“Duplicating what Redmond Medic One has done but in-hospital was slightly more complicated,” Yost adds. “The technology is the same, but assistance from many more departments is needed. Having all players at the table before starting the project is the key. Also having department heads that drive the concept is vitally important so that if the implementation slows, the project has the muscle behind it to succeed.”

How It Works

“Now that we have the ability to look at our own performance data, our new philosophy is measure-improve-measure improve” says Swenson.

Data where it needs to go

At the end of each resuscitation, an ED-Tech pushes a button on the LIFEPAK monitor/defibrillator to transmit the resuscitation data via high speed internet through the LIFENET System to the CODE-STAT database on the Evergreen hospital server. Designated “annotators” get an alert letting them know a case is ready for review.

To make the system work the most efficiently, EvergreenHealth’s Biomedical Services configured the hospital’s LIFEPAK devices to transmit data to the CODE-STAT database with the push of a button.

The Information Services Department installed gateway modems that attach to their Wi-Fi system and installed software on annotators’ desktop computers.

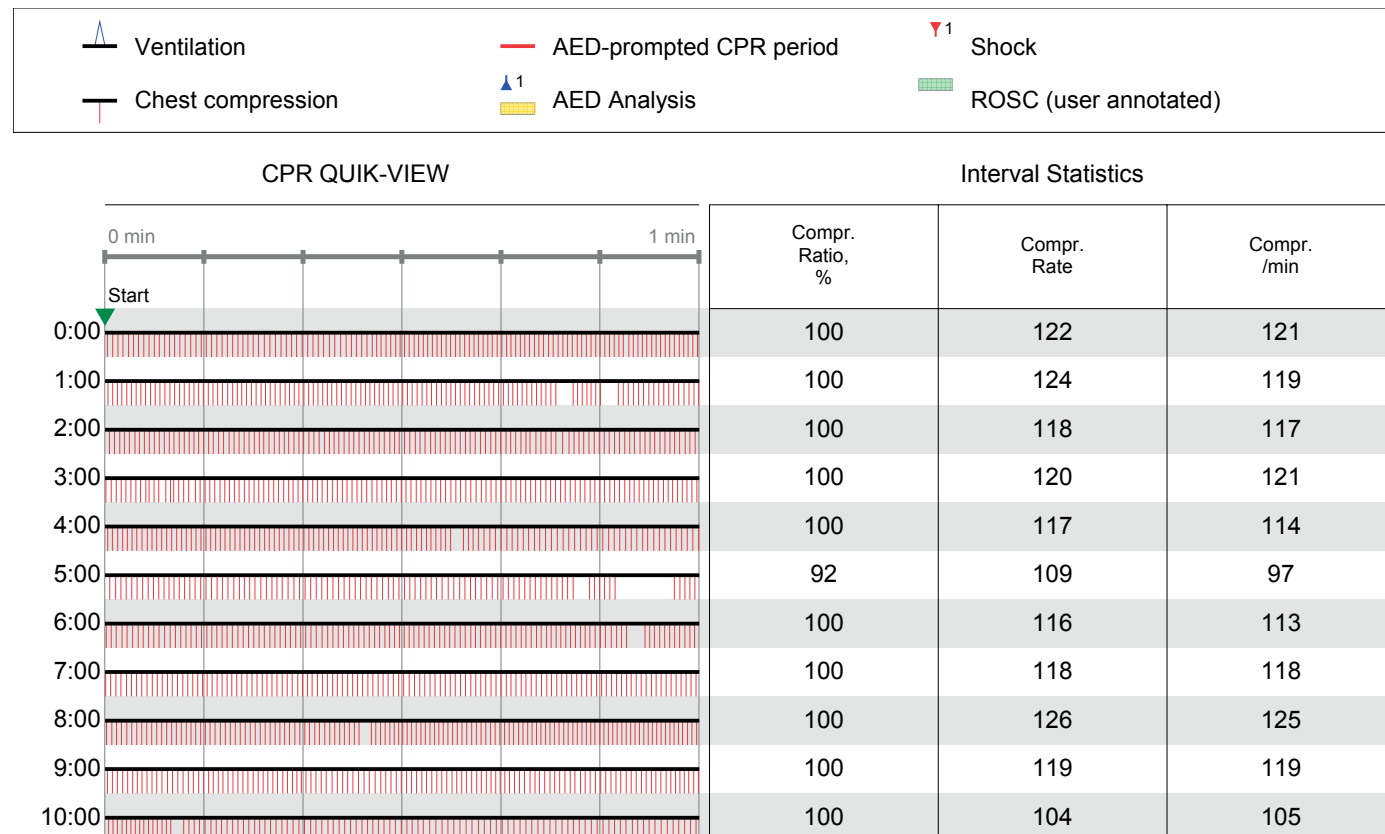
“We wanted a system that was easy, consistent and could be replicated,” says Swenson. “It made sense for us to use LIFENET to transmit the data because it was easy and we were already using it to receive 12-lead ECGs from the field.”

Trained annotators

Two annotators were designated to review each ED resuscitation, which helps assure that at least one annotator is usually available. New annotators get up to speed after about four hours of training and annotating several cases under the supervision of an experienced annotator. Yost initially trained the annotators at EvergreenHealth and Physio-Control provided step-by-step annotation instructions and support.

The annotator marks up the start and end of the cardiac arrest call, verifies the record is correct (such as looking for wave form artifact that is falsely recorded as compressions) and notes ROSC (Return to Spontaneous Circulation), if any.

“Any hospital can do the exact same thing as us,” says trauma coordinator Dawn Shimabukuro, one of the new annotators. “It wasn’t that difficult to get up to speed,” says annotator Stephen Sugarbaker, an experienced RN. “I got pretty comfortable within a few cases, plus being that there are two of us trained to annotate, we can bounce questions off each other.”



A detailed minute-by-minute record, with red hash marks depicting each compression, provides a quick overview showing compression consistency and any gaps in CPR such as to administer a shock, intubate a patient or transition EMTs between 2-minute stints of CPR. This allows medics to see areas that may need work.

“It’s not about fault, it’s about improvement.”

Michael Swenson, RN, Manager of EvergreenHealth’s Emergency Services

Rapid feedback for self-evaluation

The annotator sends the progress report to the lead physician on the case. An average case takes between 15 - 30 minutes to annotate, and it’s typically completed within 24 hours—sometimes sooner. The intent is to give feedback as soon as possible so that the physician and staff can figure out what to improve for the next case.

The annotated report clearly shows hands-on compression ratio and compressions per minute, plus a minute-by-minute record showing compression interruptions. Physicians as team leaders share the findings with the rest of the resuscitation team on the case.

“As we’ve gotten the feedback we’re passing it along,” says Hanson. “It has definitely made a difference to the physicians. We can say, ‘On the next resuscitation watch your rate, you’re going too fast.’ It’s nearly live feedback, so to speak.”

“It’s not about fault, it’s about improvement,” says Swenson. “We display the reports openly on the employee education boards, so other staff can learn. This is a model administrators should use to empower staff to make changes.” Having staff review their reports with other staff spurs both friendly competition and teamwork.

Taking It to the next level

Now that the ED is regularly capturing data from resuscitations and giving feedback to physician leaders of resuscitation teams, EvergreenHealth is poised for further improvements. Next steps, according to Hanson:

- Share the CPR reports with nurses and technicians, both individually and throughout the ED.
- Use data from the CPR reports to plan trainings. EvergreenHealth has a CPR trainer who observes most resuscitation blue events and leads training throughout the hospital.
- Practice as a team so nurses and ED technicians choreograph their response to resuscitations.
- Once more resuscitation data is collected, periodically review performance ED-wide, not just event-by-event.
- Eventually expand the process house-wide (beyond the ED, where it was initially implemented). Hanson would like to use the same process in the ICU and elsewhere throughout the hospital.

Steps to Success

- Determine your current compression fraction as a benchmark for improvement.
- Immediately after resuscitations, send the event data to a centralized depository. Data can be transmitted from LIFEPAK monitor/defibrillators, such as the LIFEPAK 20e, 15 or 12 monitor/defibrillators to your CODE-STAT database via the LIFENET System. The LIFENET System also alerts annotators.

- Designate appropriate staff as annotators; make sure you have a backup. Physio-Control has created a handbook with step-by-step instructions to guide those new to the role.
- Send the annotated report directly to physicians, and task them with sharing the report soon with the rest of the team.
- Use the CPR reports to pinpoint where performance needs improving. Practice to train nurses and ED technicians as a team, as they will perform during a real resuscitation.
- Review overall performance at regular intervals. CODE-STAT software provides summary reports for specific time periods (i.e. monthly or yearly) to quickly identify statistics for a given period.

The Tools

LIFEPAK monitor/defibrillators from Physio-Control automatically capture continuous ECG waveforms and impedance data showing chest compressions and ventilations when in paddles/pads mode. The resuscitation data can be sent to CODE-STAT software through the LIFENET System using a gateway device (broadband modem, wireless gateway, etc.).

LIFENET System, the Physio-Control web-based data network, routes the data to the appropriate CODE-STAT database and automatically sends alerts to annotators.

CODE-STAT Data Review Software with Advanced CPR Analytics receives the data from the LIFENET System, making it accessible for review and analysis. The software generates a succinct report of a cardiac arrest event, with chest compressions superimposed onto the patient’s continuous ECG report. The report also shows compression fraction time and compressions per minute. The software can also provide summary reports for specific time periods (i.e., monthly or yearly) to quickly identify statistics for a given period.

EvergreenHealth is the premier hospital and Level III trauma center in north King and south Snohomish counties, with emergency departments located in Kirkland and Redmond, Wash., serving nearly 850,000 people in the region. Evergreen has on staff 900 physicians and 3,000 staff and is seen as an innovator and front-runner in the region when it comes to medical care.

Redmond Medic One is one of six providers that respond to medical emergencies for Seattle & King County Medic One. Redmond Medic One covers 200 square miles and serves 270,000 people in northeast King County.

*Dana Yost is a Medic One Senior Paramedic and Best Practice Case Co-Author