

Best Practice

Improving Hands-on Compression Ratio

CHALLENGE

Increase hands-on compression ratio to improve resuscitation rates.

Redmond Medic One: Improving Performance

In May 2009, Redmond Medic One learned that their service had a recorded compression hands-on ratio of 66%—the lowest in the entire county. Although their service performs more CPR on cardiac arrest calls than the national average for EMS responders, Redmond Medic One knew they had to improve. They were acutely aware of research showing that increasing time spent on chest compressions and minimizing interruptions can lead to increased resuscitation.¹

Redmond Medic One is one of six ALS providers that respond to medical emergencies for Seattle and King County Medic One. Their service area covers 200 square miles and 270,000 people in north-east King County. The system uses a tiered response, with paramedic units dispatched only to advanced life support calls. There's one paramedic unit per 100,000 people. The BLS units handle less critical calls and assist on others.

"It was a real eye-opener for us" to learn that Redmond's compression fraction time was 66% compared to 70% for all of Seattle and King County Medic One, says Jim Duren, past EMS chief for Redmond, who now works directly for Seattle-King County EMS. "We recognized that to be successful, we had to become an educational and learning organization, to look at challenges with a different set of eyes." He tasked Senior Paramedic Dana Yost with improving the agency's CPR response.

Although much better than the 50 percent compression fraction typical of EMS agencies nationwide,² Redmond wanted to improve because the data shows that "as you increase CPR fraction time you increase the chance of resuscitation," says Yost.

The Redmond team went to work on a performance improvement plan.

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Jim Duren, past EMS Chief for Redmond



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Dana Yost,
Redmond Medic One Senior Paramedic

SOLUTION

Measure and review CPR performance using the System of Care from Physio-Control. Give rapid feedback to paramedics and EMTs. Identify training needs and change patient care guidelines to improve resuscitation efforts.

"You can't figure out what you can do better if you don't collect data. And you can't figure out what you can do better if you don't LOOK at the data. Our new philosophy is measure, improve, measure, improve," Yost says. "And I'm not talking about administrators—I mean the people on the scene, the people who are going to change things out on the scene, the people working on cardiac arrests."

To measure and improve performance, Redmond implemented the System of Care from Physio-Control: LIFEPAK® 15 monitor/defibrillators, LIFENET® System and CODE-STAT™ Data Review Software. "We now had the ability to look at our own data," said Yost.

The Approach

- Focus on compression fraction
- Quality Improvement (QI) instead of Quality Assurance (QA)
- Peer review of cases by fellow paramedics
- Rapid feedback to paramedics
- Monthly review of statistics by all hands
- Mock code drills as a team

"We are not doing anything that's magic," Yost says. "This can be duplicated."

Implementation

Data Where It Needs to Go

At the end of each cardiac call, medics push a button on the LIFEPAK 15 monitor/defibrillator to transmit the code data via high-speed modem through the LIFENET System to Redmond's CODE-STAT database. The LIFENET System then sends an alert to the smart phones of paramedics designated as "annotators" to let them know a case is ready for review.

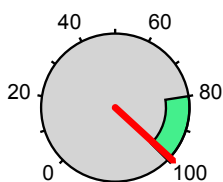
Peer Review by Paramedics

The medic/annotator marks up the start and end of the cardiac arrest call, verifies that the record is correct (such as looking for waveform artifact that is falsely recorded as compressions) and notes ROSC (Return of Spontaneous Circulation, if any). New annotators get up to speed after an hour of training and annotating three cases. Two are designated for each shift. This aids in making sure at least one is usually available.

"Any agency could do the exact same thing as us," using their handbook of step-by-step instructions on how to annotate the call and where to send the report, says Yost.

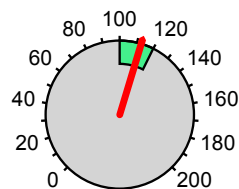
The CODE-STAT software creates a progress report showing compression fraction ratio (percentage of time that CPR is performed during the total time on call) and compressions per minute.

Compressions Ratio
(/total time)



25:28 / 25:42 = 99 %

Compression Rate



113/minute

Rapid Feedback for Self-Evaluation

"The annotator isn't saying whether it was good or bad, just what happened. Medics are just getting the facts," says paramedic Amy Moorhead, a member of the annotators' team. The annotator sends the progress report to the paramedics on the call. An average call takes about 30 minutes to annotate, and it's typically completed within 24 hours—sometimes even before the medics return to quarters.

"When they walk back in the station they can pull up their own cardiac arrest call and self-evaluate, using the raw data" says Yost. "Paramedics do their own review. It's not quality assurance—it's quality improvement."

"We are not doing anything that's magic. This can be duplicated."

Dana Yost, Redmond Medic One Senior Paramedic

RESULT

Six months after implementing the feedback loop, Redmond Medic One's hands-on time was 83%—the best in the county. The improvement lasted—their hands-on compression ratio measured 90% in both 2012 and 2013.

Seeing the Call Data Spurs Improvement

"Paramedics are Type A personalities. They're always way harder on themselves than I could ever be. I make them beat themselves up with the data," Yost laughs. "Change came because they saw data themselves that they never got to see before and said, 'Wow I need to improve.'"

Paramedics share the report with the EMT team that partnered with them on the call. "It's not about fault, it's about improvement," says EMT Shannon Norman. Some reports are cause for congratulations. Others are learning opportunities.

The report "gives us another way to talk about what went well and what could be better," says Moorhead, who has had her own cardiac arrest calls reviewed. "It increases our relationship with the EMTs. It's a great tool."

Paramedic Skip Boylan says the report is "like looking in a mirror to see how well I did. These reports don't lie." He likens them to firefighters' debriefings after a fire. "Cardiac arrest is a major event...I don't like walking away from a call not knowing how I did. These reports let you do self-analysis and group analysis."

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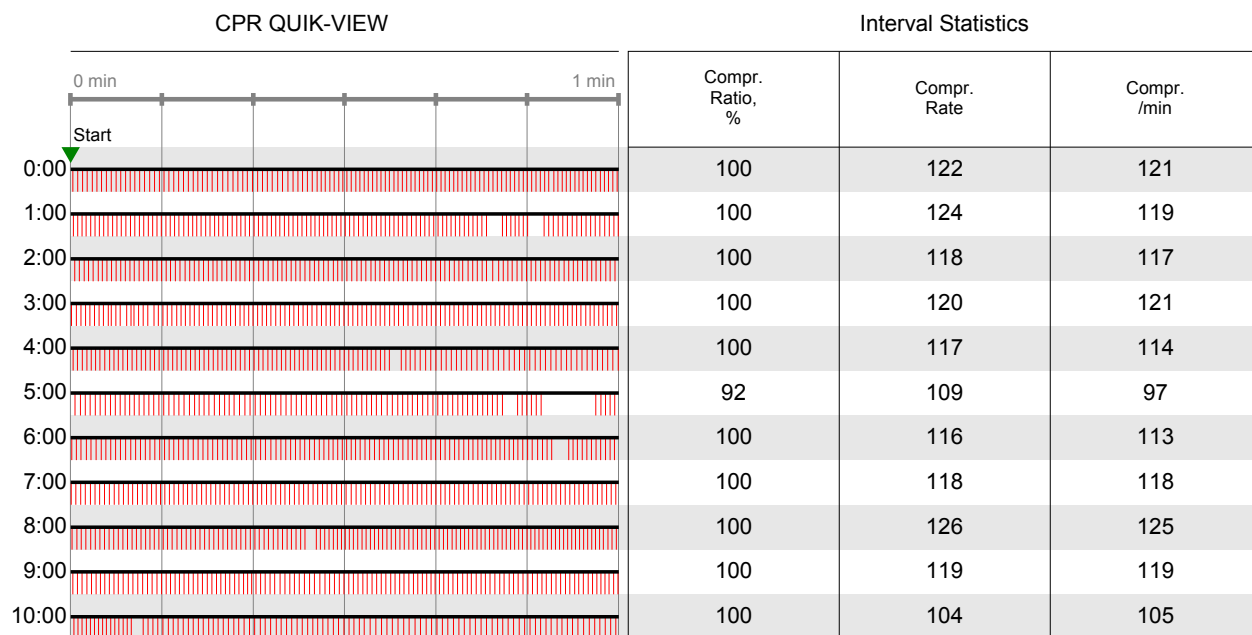
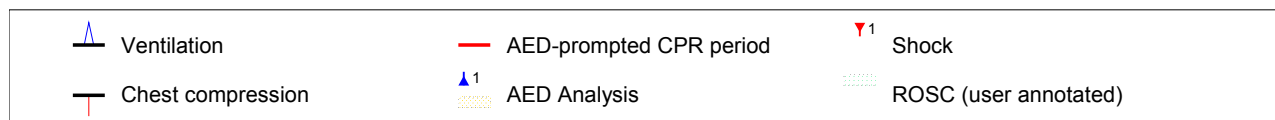
Training to Save Time

"It wasn't enough that paramedics could see where they needed to improve," said Duren. "The agency needed to reach EMTs and firefighters who perform most of the hands-on chest compressions."

Duren tagged paramedic Mark Donnell to lead the training effort. He created a mobile training unit, using a surplus medic unit and a SimMan® patient simulator, a Laerdal product. Mock drills are staged at the stations using the mobile unit and an ALS team, to help choreograph the multiple crews that typically respond to a cardiac arrest call.

Looking at the CODE-STAT reports, which break down the cardiac calls minute by minute "really opened our eyes," said Donnell. Training focuses on elements that make a difference in CPR time and quality:

- Limiting each EMT to 2 minutes of CPR, before handing off to another responder. One person is designated as timer to enforce the 2-minute cycles and set up transitions between EMTs.
- Improving choreography among all the responders to minimize gaps in CPR as a result of delivering shocks and other advanced care.
- Pre-charging the LIFEPAK 15 defibrillator to reduce non-CPR time.
- Training paramedics to monitor rhythm changes and perform advanced procedures—like inserting a central IV line and intubating a patient—without stopping CPR.



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 each two-minute stint of CPR. This allows medics to see areas that may need work.

Practicing Code Drills as a Team

The mobile unit lets teams practice cardiac arrest scenarios, look at the progress report and refine their teamwork and techniques.

“If something could use improvement, when the code drill ends you can hit the reset button and go right back into it. You can run it as many times as you need to,” says EMT Shannon Norman.

On mock drills “you get to work side by side with the whole team so when the real thing happens, you click,” says Boylan. The result is a closely choreographed cardiac arrest call where everyone knows what they are doing.

Summing up, Yost’s advice to other EMS teams: “Think of ways you can give instant feedback to people on cardiac arrest teams, practice your team so you know how to work together, and look at your data to see what can you do better.”

KEY POINTS

- Timely feedback to paramedics after each cardiac arrest call has been shown to improve performance.
- Clear, succinct, graphical reports generated by CODE-STAT software show the hands-on compression ratio and compressions per minute, plus a minute-by-minute record indicating compression interruptions.
- Making code event data available immediately after calls and designating paramedics on each shift as annotators means paramedic crews get quick feedback—sometimes as soon as they return to their station.

- System-wide improvements happen when medics share reports with their EMT partners and the entire paramedic team reviews cardiac arrest data every month.
- Training medics and EMTs as teams results in finely choreographed cardiac arrest calls. The minute-by-minute cardiac event reports help pinpoint training needs.

THE TOOLS

The **Physio-Control System of Care** is the industry’s only combination of lifesaving tools designed to work together to give you insight into CPR performance and device readiness—to help improve survival.

- **LIFEPAK® 15 monitor/defibrillator**, in paddles mode, automatically captures continuous ECG waveforms and impedance data showing chest compressions and ventilations. The code data can be sent to CODE-STAT software through the LIFENET System using a gateway device (broadband modem, wireless gateway, etc.). In addition, all LIFEPAK devices have the power to escalate up to 360J for difficult-to-defibrillate patients.
- **LIFENET® System**, Physio-Control’s web-based data network, routes code event and patient data to the appropriate CODE-STAT database and automatically sends alerts to annotators.
- **CODE-STAT™ Data Review Software** receives the event and patient data from the LIFENET System, allowing review and analysis. The software generates a succinct report of a cardiac arrest call, 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 provide summary reports for specific time periods (i.e., monthly or yearly) to quickly identify statistics for a given period.

To learn how the System of Care can improve your resuscitation efforts, contact your Physio-Control sales representative or call 1.800.442.4412.

References

1. Meaney P, Bobrow B, Mancini M, et al. Cardiopulmonary Resuscitation Quality: Improving Cardiac Resuscitation Outcomes Both Inside and Outside the Hospital: A Consensus Statement From the American Heart Association; *Circulation*. 2013;128:417-435.
2. Christenson J, Andrusiek D, Everson-Stewart S, et al. Chest compression fraction determines survival in patients with out-of-hospital ventricular fibrillation. *Circulation*. 2009;120:1241-1247.

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For further information, please contact Physio-Control at 800.442.1142 (U.S.), 800.895.5896 (Canada) or visit our website at www.physio-control.com



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