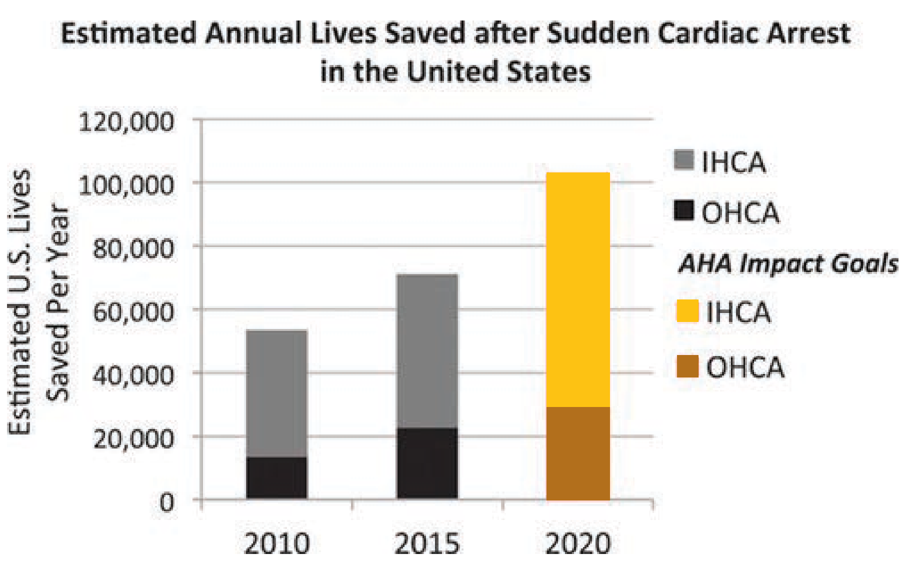
CPR optimization

Driving perfusion during sudden cardiac arrest (SCA)

Ten years ago, the American Heart Association (AHA) Emergency Cardiovascular Care Committee (ECC) estimated a 10-year impact goal of doubling survival rates from SCA. However, current out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA) survival rates continue to be low, despite a major shift to high-performance CPR (HPCPR) in the last decade.[1]



The power of perfusion

Designed to drive optimal perfusion, HPCPR is a multifaceted set of basic interventions requiring choreographed coordination and effective leadership for best results. The attention to preparation, training, and immediate-and post-event performance feedback is key for increased survival rates. Recent data shows the initial shockable rhythms in SCA patients are less prevalent, making HPCPR essential now and in the future.[2]

5 ways HPCPR drives perfusion

1 Compression rate of **100–120 per minute**

2 Compression depth of **2–2.4 inches (5–6 cm.)**

3 **Recoil** with no residual leaning

4 **50–50** Duty cycle

5 All pauses in chest compressions should be **less than 10 seconds**

Although HPCPR can improve survival rates, there are many options in monitoring, training, implementation, and quality improvement programs.[3] How can we help increase the number of lives saved?

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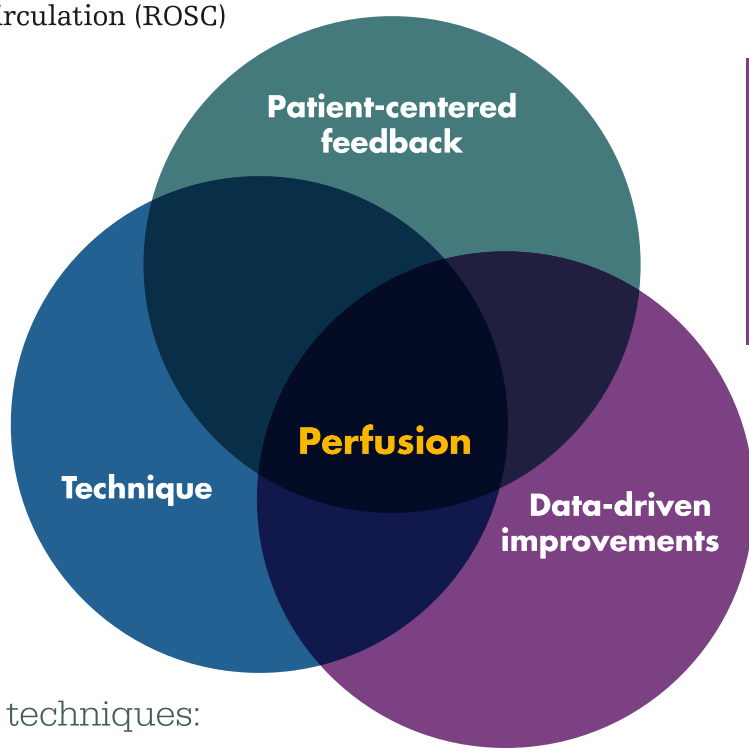
Patient-centered feedback:

End-tidal CO_2 ($EtCO_2$) monitoring can indicate CPR quality and detect return of spontaneous circulation (ROSC)



Data-driven decisions to make improvements:

Objective data collected from a LIFEPAK® device as soon as the pads are placed offers insights to care teams for future CPR improvements

Tactics and techniques:

Mechanical CPR devices like the LUCAS® chest compression system provide Guidelines-consistent CPR metrics on rate and depth with ventilation prompts and pauses

With tones or rate prompts:

Metronome: Chest compression rates are variable during a resuscitation. Metronomes can decrease variability and results in compression rates closer to the target rate of 100 to 120/min.[3]

With immediate feedback:

Accelerometer-based: Single sensor accelerometers measure the absolute compression distance traveled, which includes compression of the human chest and any soft surfaces underneath the body. Actual sternal-spinal displacement is not isolated. Studies show compression depth calculation is overestimated by as much as 35-40% on soft surfaces.[4]

A large cluster randomized trial across 21 U.S. and Canadian EMS agencies found real-time visual and audio feedback "altered" performance in closer alliance with guidelines, however no improvement in ROSC or "other clinical outcomes" were noted. The difference in depth was only .08 inches or 2 mm.[5]

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Patient-centered physiological feedback

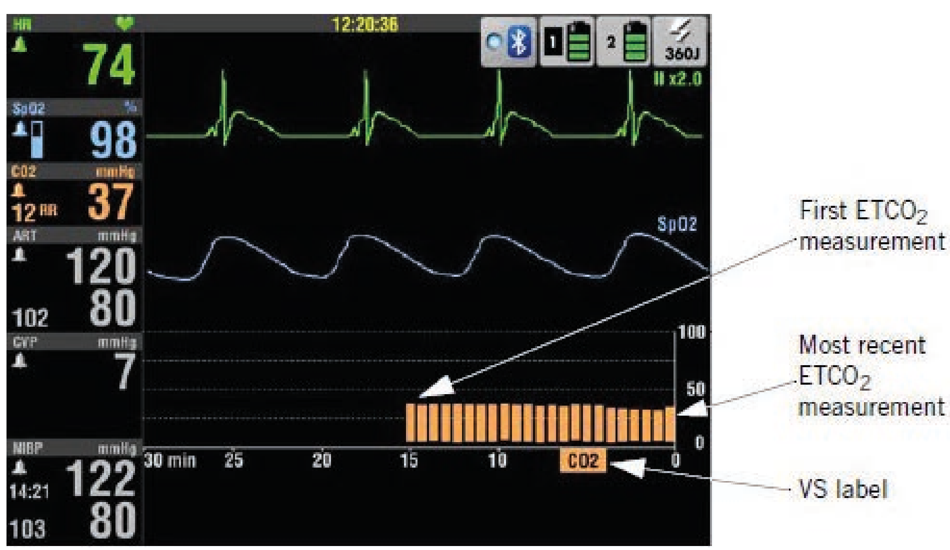
Using hemodynamic monitoring:

- Physiology-directed CPR or "personalized CPR" has been used to monitor the patient's response to CPR since the AHA Consensus Statement in 2013.[3]

Using $EtCO_2$:

- Waveform capnography and $EtCO_2$ values have been a Class I recommendation for confirmation of endotracheal intubation (ETI) placement and ongoing monitoring since 2010.[6] However, waveform capnography is also used as a measure of perfusion. The correlation between $EtCO_2$ and cardiac output has important implications during CPR:
    1. During cardiac arrest, $EtCO_2$ levels can relate to cardiac output generated by chest compressions providing indication of CPR quality[10]
    2. Chest compression depth was a significant predictor of increased $EtCO_2$. $EtCO_2$ levels were higher in patients with ROSC.[7]
- The height of the CO_2 waveform should be monitored with the goal of achieving values of at least 20 mmHg.[8]
- Capnography can also monitor effectiveness of compressions related to various hand positions during resuscitation to determine optimal CO_2 output.[9]
- $EtCO_2$ coronary perfusion pressure, arterial relaxation pressure, arterial blood pressure, and ventral venous oxygen saturation correlate with cardiac output and myocardial blood flow during CPR.[10]

Trending $EtCO_2$ on the LIFEPAK 15 can be used in resuscitations showing the first captured value up to the most recent value. CO_2 measurements are taken every 30 seconds, displaying how the values are trending over a specified time.



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Technique

Mechanical CPR

Some SCA patients will not respond to CPR and defibrillation alone, and may need more advanced circulatory intervention. The LUCAS® 3 chest compression system provides consistent and high-quality chest compressions shown by research to increase the chances of good patient outcomes.

The LUCAS device also reduces the radiation burden to CPR providers while maintaining Guidelines-consistent chest compressions during continued PCI in the cath lab.

7 seconds
median interruption when transitioning from manual to LUCAS device compressions during routine BLS/ALS use[11]

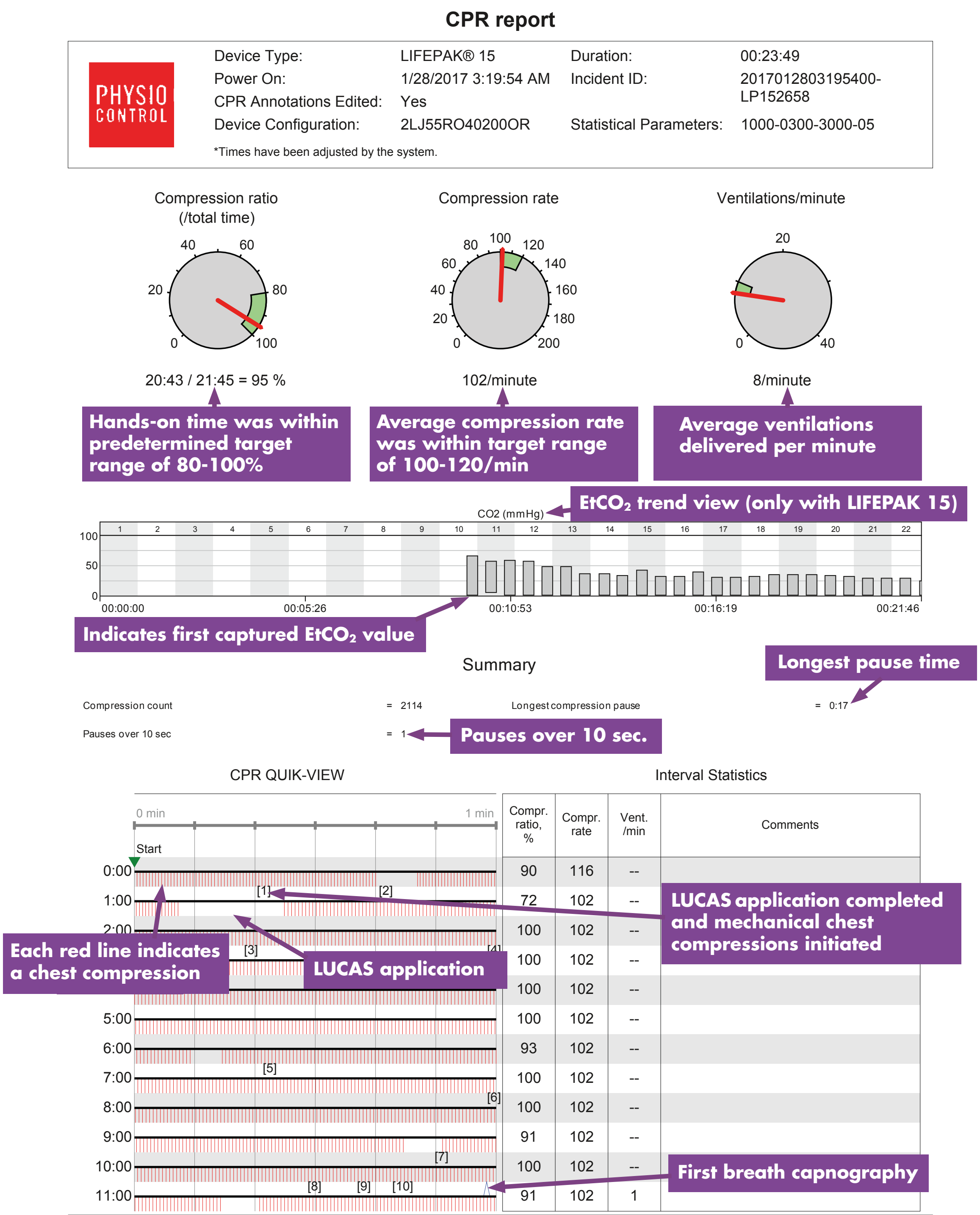
+60%
increased blood flow to the brain vs. manual CPR[12]

139%
higher coronary perfusion pressure vs. manual CPR[13]

Data-driven improvement

Post-event data review is the last, and arguably the most critical step for sustainable CPR improvement at an institutional level. The collection, analysis, and sharing of data can power performance review and meet AHA recommendations for post-event review. Without measurement, improvement can't occur.

CODE-STAT™ data review software and service provides critical information on CPR metrics and performance and helps drive future improvements.



For more information on CPR optimization, contact your Stryker sales representative.

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For a brief summary of important disclosure and safety information regarding LIFEPAK devices, visit our website at https://www.strykeremergencycare.com/disclosure-and-safety-information/

Please consult Operating Instructions at www.physio-control.com or call 800.442.1142 for complete list of indications, contraindications, warnings, cautions, potential adverse events, safety and effectiveness data, instructions for use and other important information.

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