

CASE STUDY

LUCAS[®] CHEST COMPRESSION SYSTEM

Mechanical, High-Quality CPR Boosts Neurologically Intact Survival

CHALLENGE

Improve CPR quality and provide continuous compressions—as patients and teams move from ambulance to ED to cath lab—to increase neurologically intact survival of cardiac patients.

Innovating to Improve CPR

Although the American Heart Association identifies high-quality CPR as the primary component in influencing survival from cardiac arrest¹, many EMS and hospital systems struggle to improve their performance. Before 2007, Allina Health in Minnesota was among the strugglers.



“EMS personnel would feel discouraged traveling to the scene of a cardiac arrest, knowing the patient most likely wouldn’t survive,” said Steve Hagstrom, paramedic and clinical educator for Allina Health Emergency Medical Services. “We used to feel good about doing everything right, but the patients still usually died.”

Steve Hagstrom,
Paramedic and Clinical Educator,
Allina Health EMS

In addition to improving CPR quality, the agency wanted the ability to provide adequate CPR in a moving ambulance and to protect crew safety. Allina Health EMS has a culture of innovation, and they applied it to improving resuscitation results. “One of our highest priorities is aggressively investigating new EMS technologies and techniques, determining their value based on the latest science, then putting those methods and devices to work as early as possible,” said Medical Director Charles Lick, MD.

About Allina Health

One of the largest employers in Minnesota, the Allina Health system includes 13 hospitals, 90 clinics, varied specialty care services and an EMS division that provides care to one million people in 100 Minnesota communities. In 2013, their 90+ vehicles responded to 62,000 emergency calls across a 1,600-square-mile area.



“To say LUCAS is well received is a huge understatement,” said Brian LaCroix, president of Allina Health EMS and a paramedic himself. “It helps people feel they are part of something really special—and move a needle [SCA survival rates] that hasn’t been moved in 40 years.”

Brian LaCroix,
Paramedic and President of
Allina Health EMS

SOLUTION

LUCAS 2 Chest Compression System, deployed in ambulances and hospital emergency departments, to provide consistent, high-quality mechanical chest compressions and free EMS and hospital staff for other lifesaving duties.

Hands-Free Quality Compressions

In 2007 the system began using 30 LUCAS 1 Chest Compression System devices. After first trialing another mechanical compression device, Allina Health chose LUCAS because it was lighter to carry and easier to use and maintain. Personnel reacted very positively to LUCAS, Hagstrom said. “They can put it on in as little as 15 seconds.”

“Change can be hard at times,” acknowledged Susan Long, director of clinical and support services, “but the addition of the LUCAS device to our ambulance equipment has been wonderful. Crews and first responders love it—it makes the scene of a cardiac arrest go smoother and provides better CPR than we can provide manually.”

“Everyone is happy with LUCAS performance,” said Dr. Lick. “It does a better job than manual compressions. The first time first responders see LUCAS, their eyes get big, and then they step back and think, ‘Oh, that’s how I’m supposed to have been doing CPR for the last 20 years?’”

In the Twins Cities metro area, all major EMS agencies use LUCAS devices. Allina Health EMS has used the LUCAS device more than any other single EMS system—nearly 1,800 patient uses to date. Because of high satisfaction, Allina Health updated to the LUCAS 2 version of the product without considering other brands on the market.

The EMS system also has improved CPR quality by taking a “pit crew” approach, in which everyone is assigned a role, and using a ResQPOD® device, which is designed to augment blood flow to the vital organs during CPR.

In addition to LUCAS and the LIFEPAK® 15 device, crews respond to calls with an ArrestPAC bag that keeps everything readily available when needed—ResQPOD, handy printed protocols for ventricular fibrillation, ventricular tachycardia, asystole and PEA, along with saline and drugs appropriate for treating each arrhythmia. They reported that all of these interventions and protocols have improved survival rates.

RESULT

Neurologically intact survival to hospital discharge increased five percent overall in the first six months after implementing LUCAS. Today, Allina Health EMS’s survival rate for sudden cardiac arrest is among the best in the U.S. The device provides better compressions than manual CPR over long periods and allows for functional CPR in a moving ambulance. Plus hands-free CPR makes the scene of a cardiac arrest run more smoothly.

Measuring Success

All Allina Health hospitals and clinic sites are fully integrated with one medical records system, which allows them to easily measure patient outcomes through discharge from the hospital.

In 2013, Utstein Witnessed Bystander Survival rates for out-of-hospital cardiac arrests (witnessed by a bystander, found in a shockable rhythm and receiving some bystander intervention such as CPR and/or AED) were 50% for Allina Health EMS, and higher than the national survival rate of 38.2% nationally. The agency had 65 survivors from cardiac arrest, as a result of interventions including LUCAS, pit-crew CPR, ResQPOD and therapeutic hypothermia for cardiac arrest patients who had return of spontaneous circulation (ROSC).



After implementing LUCAS, Allina Health started seeing more patients return to ROSC after extended CPR and do well after leaving the hospital. As a result, EMS protocol is for 30 minutes of compressions and to consider longer resuscitation unless the patient is in asystole the entire time. “There are numerous cases where we got the patient back after 40 or 50 minutes and they survived to walk out of the hospital,” Dr. Lick said. “Having a mechanical device that reliably does good functional CPR consistently I’m convinced has led to some of those survivors.”

Charles Lick, MD,
Medical Director

Quality Feedback Loop

“Now paramedics ask, ‘If I didn’t get the patient back, why not?’ With LUCAS we know that if we do everything right the patient can survive,” said Hagstrom.

Making sure everything is done right is easier since Allina Health EMS started measuring performance on every cardiac arrest call and providing timely feedback to crews in September 2013, using CODE-STAT™ Data Review Software from Physio-Control. Within 24 or 48 hours of the event, crews receive a graphical representation of how well the CPR was managed for self-review. Studies show that such timely feedback improves performance. “We’ve already made some changes to our cardiac arrest procedure to decrease pauses in compressions,” Dr. Lick said. “That CODE-STAT data led directly to changes in protocol to improve performance, and we think, care.”

Allina Health also conducts a monthly case review to look at individual patient cases. The training is shared via the Web, allowing the company’s geographically dispersed employees and partner agencies to participate remotely.

Building Teams from Dispatch to Hospital Discharge

Perhaps an unexpected benefit of having LUCAS onboard is the strengthening of relationships between EMS, fire, police and hospital staff.

“We used LUCAS to improve our relationships with our first responders,” explains Hagstrom. “We put a lot of time and effort into bringing it to different fire departments and police agencies and training them on its use. Everyone embraced the LUCAS and the “pit crew” concept. This has not only improved cardiac arrest care but also has improved patient care overall.”

The need for high-quality CPR doesn’t end when patients reach the hospital, which is why all Allina Health non-pediatric hospitals in the Twins Cities metro area have at least one LUCAS device, and many have multiple units, deployed in the emergency department, cath lab and ICU.

“Someone who has suffered a sudden cardiac arrest in the field has a good chance of suffering another one as we work on them in the Emergency Department,” Dr. Lick said. “The LUCAS is as valuable in the hospital as it is in the field.”

Cath lab staff and nurses also are trained on using the LUCAS device, freeing hospital teams for other duties and eliminating the stress and burden of providing prolonged CPR by hand.

KEY POINTS

- Medics are more positive and proactive in cardiac arrest cases, as they now believe there is a significant chance these patients can have a good outcome. Seeing good results in extended CPR cases, they embraced protocol changes to increase CPR time before ending a code.
- Prehospital and hospital care are integrated. Attention to detail at every step of care adds up to a significant difference in saving time and saving lives.
- Allina Health measures CPR performance and gives crews timely

feedback after each resuscitation case, which has been shown to improve performance.

- In the ED and cath lab, hands-free CPR frees staff to provide faster, better patient care.
- Allina Health is seeing more cardiac arrest patients leave the hospital neurologically intact and resume their normal lives.
- Today, Allina Health EMS's witnessed bystander survival rates are among the best in the nation, as a result of interventions including LUCAS.

THE TOOLS

- **The LUCAS 2 Chest Compression System** is designed to deliver effective, consistent and uninterrupted compressions according to current AHA guidelines to facilitate ROSC. It delivers automated compressions at a consistent rate and depth from first response in the field to ambulance transport and throughout the hospital. LUCAS facilitates consistent blood flow from the moment it is turned on, helping to improve a patient's chance for a successful outcome.

- **LIFEPAK 15 monitor/defibrillator** automatically captures continuous ECG waveforms and impedance data showing chest compressions and ventilations. It also gathers the EtCO₂ waveform, collects defibrillation information, and records temperature and 10 parameters. All LIFEPAK devices have the power to escalate to 360J for difficult-to-defibrillate patients.
- **CODE-STAT Data Review Software** receives code event and patient data captured by the LIFEPAK 15 monitor/defibrillator, allowing review and analysis of events. The software generates a succinct report of a cardiac arrest call, with chest compressions superimposed onto the patient's continuous ECG report. The software can also provide summary reports for specific time periods (i.e., monthly or yearly) to quickly identify statistics for a given period.



See the power and simplicity of the LUCAS chest compression system for yourself. Contact your Physio-Control sales representative to learn more.

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

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