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SHORT COMMUNICATION

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Saving Flatlines through Mechanical Resuscitation

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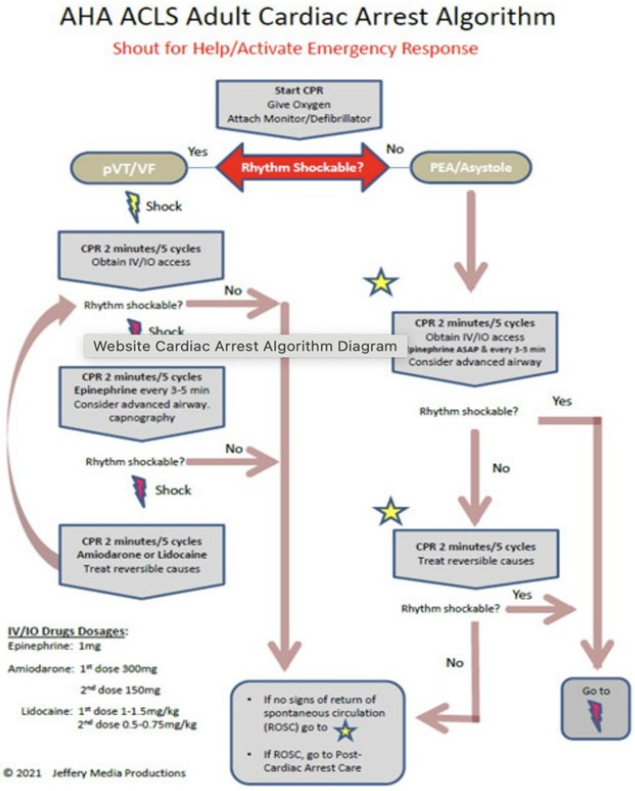
Short Communication

Cardiac arrest, two words that may be triggering for many, can be deadly within seconds. A cardiac arrest is defined as the termination of the beating heart, causing reduced blood flow to the body. Without a heartbeat, no electrical activity is being conducted by the heart, causing a flatline on the telemonitor known as asystole. There, a human being is lying pulseless, unconscious, and ultimately facing unrevisable death. In the United States alone, there are greater than 436,000 cardiac arrest's annually [1]. These cardiac arrests can occur due to various diseases and diagnoses, including but not limited to myocardial infarctions, traumas, alcohol or drug overdoses, arrhythmias, and the one I personally witnessed, organ transplant failure.

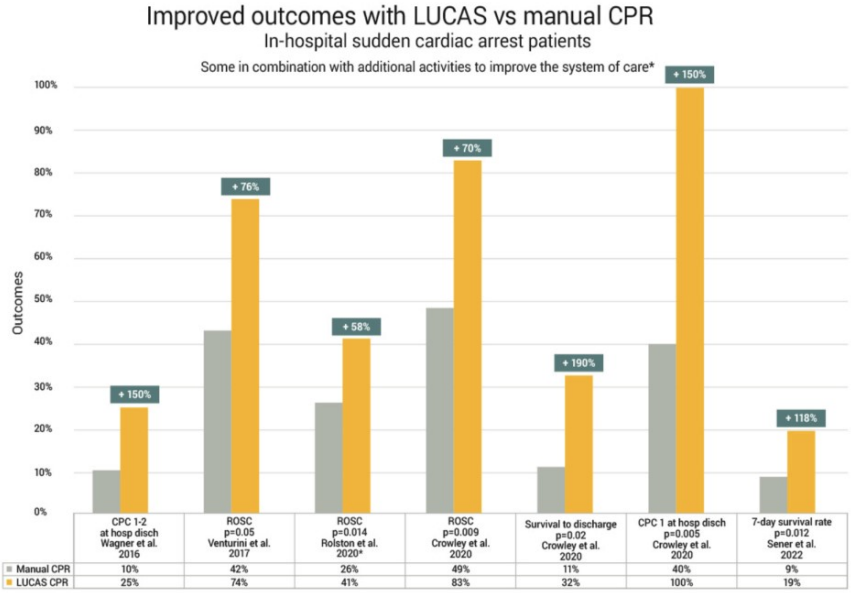


To reverse cardiac arrest, in 2024, there are several ways to perform resuscitation in hopes of restarting electrical activity and restoring blood flow to the heart. This includes performing cardiopulmonary resuscitation (CPR), [2] using an automated external defibrillator (AED) and using Basic Life Support (BLS). However, currently in medical centers, what is mostly commonly used is the Advanced Cardiac Life Support (ACLS) algorithm, as many health care workers are certified to practice this. As shown depending on the patient's present heart rhythm, the ACLS algorithm uses a mix of supplemental oxygenation, manual resuscitation, manual chest compressions, defibrillation, and antiarrhythmic drugs to get the patient's heart back to adequately pumping blood. With the ACLS algorithm only working so much, there is a new innovation that was made to help save additional lives. This device is known as the Lucas device.

The Lucas is a hands-free device that provides efficient mechanical chest compressions for adults without the need for health care workers to provide manual chest compressions. These compressions are programmed to give precise depth and speed. It allows health care workers [3] and first-hand responders to be hands-free during a cardiac arrest without having to provide manual compressions and trade off. The battery provides convenience as it does not need to be plugged in when in use, and only after 45 minutes does it need to get recharged. Gyory [4] suggest that, when compared to manual CPR, this device provides an increased rate of acceptable compressions.

Setting up the device is simple and easy, as there are only two parts to assemble it. A backboard is first slipped under the patient and connected to the top half of the device as it clicks into place. Once the device is securely clicked into place, it can be turned on with a click of a button. After this, the suction then needs to be pulled down and the choice of rate is given. These options include a setting of 30 compressions to 2 breaths, where the device will pause for you to provide the 2 breaths, or continuous compressions. Once this is chosen, the device begins to run. When the device is no longer needed, a button at the top may be pressed, and the suction can then be pushed back up. Next, the power-off button can be pressed and the device can safely be removed from the patient.

Now one may wonder why use this device when there are more cost-effective options. To start, multiple studies have proven better outcomes for patients experiencing a cardiac arrest when using the Lucas device. A study done through the Emergency Department at North Shore University Hospital showed that with the Lucas device, a team performing an advanced life support strategy, and a video review, this allowed for the rate of spontaneous circulation to improve from 26% to 41% for patients undergoing a cardiac arrest. Research between 2012 and 2022 shows how, in comparison to manual CPR, it is clear that the Lucas has provided better outcomes based on the percentages seen on the graph below (Lucas Chest Compression System, n.d.). (Lucas Chest Compression System, n.d.)



Cardiac arrest leading to neurological damage can occur following five minutes only [5]. However, the Lucas can reverse this as it is seen to provide better outcomes, with neurological status long-term as well. More than 99% of patients who survived due to the Lucas device were seen to have good neurological status post 6 months. With this, the Lucas is able to supply a greater amount of blood flow to the brain in comparison to traditional manual CPR (Lucas Chest Compression System, n.d.).

While an unexpected cardiac arrest can be deadly if occurring for a duration of more than eight minutes with no CPR, efficiency becomes key [5]. Efficiency is seen within the Lucas as it allows for a constant rate of compressions to be conducted while other interventions are done for the patient as well. This device allows for at least one additional health care worker to be there free during the code. This is helpful as understaffing in the inpatient setting is a common occurrence. Regardless if a hospital blackout occurs, the Lucas device would still be able to operate as it can operate with a battery.

While undergoing a cardiac arrest, each second is vital and can determine whether a person lives or not. According to the Cleveland Clinic (2023), "survival can be as high as 90% if treatment starts within the first minutes after sudden cardiac arrest." However, this percentage can go down approximately 10% with each minute that goes by. With first-hand responders getting to the seen first, they're able to start treatment soonest. Additionally, approximately 90% of cardiac arrests that cause death are not seen in hospitals [1]. This is why ensuring that first-hand responders, including paramedics, have access to the Lucas device can be life-changing. As the device comes with a traveler case, this makes it easy for paramedics to carry the Lucas over to the patient. The lucas allows for compressions to still be given not only while the ACLS algorithm may be undergoing but also during transportation as well. Which is useful in many cases for paraemedics, for instance, when loading the patient into the ambulance or transporting the patient to the trauma bay in the emergency department. Gyory et al. (2017) suggest that "chest compression quality may be better when using a mechanical device during patient movement in a prehospital cardiac arrest patient."

The current cost for the Lucas device is approximately $25,000. In response to the great assistance that the Lucas device has provided for first-hand responders, this caused Farmington's Fire Protection District to seek out donations from the public to assist with the cost of the device. This device would help address Farmington's fire protection district with the understaffed difficulties that they face as one hand becomes free [6]. During the pandemic in 2020, a grant of $4,711,481 million was given to five upper-midwestern states to supply 367 LUCAS devices for hospitals taking care of COVID patients. This grant was funded by the Helmsley Charitable Trust, which since 2015 has provided around $33 million to fund 2,400 Lucas devices [7].

After interviewing Ryan Burgess, RN, MSN (personal communication, November 18, 2024), the prehospital care coordinator in the emergency department at Ronald Reagan UCLA Medical Center, he was able to further provide his insight on the device. As someone who has observed the device prior to COVID, he explained how the Lucas device is seen to be extremely beneficial when being used during times when much movement is involved for instance, in an ambulance. He then went on to compare this to manual compressions, which he stated can be "extremely difficult" to perform as high-quality compressions during these circumstances of movement (R. Burgess, personal communication, November 18, 2024). He further went over precautions that need to be taken place when using the device; this includes ensuring the device is properly placed and set up to prevent adverse injuries from occurring. With this, he went over how health care workers may not be as focused when the device is being used, as he stated, "If someone is doing hands-on CPR, likelihood is you're watching what's going on. If you have a mechanical device, you may be taking your hands off of that device, and that can become problematic" (R. Burgess, personal communication, November 18, 2024). When asked if he would recommend this device to other hospitals even with the current cost of the device, he declared that he would, as he stated, "We have had good success with the Lucas device" (R. Burgess, personal communication, November 18, 2024). Ryan's remarks on the Lucas can confirm the need for health care workers, whether part of the emergency response team or located in a medical center, to have access to this device at hand.

As demonstrated and proven throughout this paper, the LUCAS device is seen to ultimately provide better patient outcomes, both short- and long-term, for patients requiring resuscitation measures. Along with more precision of compressions, this device is seen to provide much assistance to health care workers in multiple ways, including allowing for an additional open hand. This open hand enables the various additional interventions that must be undertaken during a patient's resuscitation to be carried out efficiently. Although costly, the numbers emphasize how effective and valuable the device is seen to be. It is not only ideal but a necessity to have this device placed in all patient settings. With this device, we can save more lives together.

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