

STRENGTHENING THE CHAIN OF SURVIVAL

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INCORPORATING REAL-TIME QUALITY MEASURES IMPROVES CARDIAC ARREST OUTCOMES



On Jan. 31, 2009, as a US Airways flight taxied on the Philadelphia airport runway, its passengers turned off cell phones just before their flight to the Caribbean. Among them, a 60-year-old man and his wife were eagerly awaiting departure for their anniversary celebration. The woman glanced over at her husband and noticed he'd stopped breathing.

Luckily, a paramedic and two nurses were on board. The paramedic performed CPR with the help of the flight attendants. They shocked the man with an AED and continued CPR until EMS arrived. Two shocks were required for his ventricular fibrillation, and on the second shock he converted to a sinus rhythm.

As he was transferred from the plane, the man re-arrested. EMS resumed CPR and transported him to the University of Pennsylvania hospital, where he was intubated and given epinephrine and amiodarone, while ED medical staff continued CPR with assistance from the Philips HeartStart MRx with Q-CPR* (a CPR measurement and feedback system), and defibrillated once more, this time successfully. Once spontaneous circulation was restored, he underwent induction of therapeutic hypothermia and was transferred to the ICU. After several weeks in the hospital, he experienced a full recovery with no evidence of brain or heart injury, and he has returned to his active normal life.

This case highlights the potential success that's achievable when the chain of survival is performed efficiently. From the moment of discovery to the final stages of the cooling process, the rapid execution of each critical step in this chain played a vital role in saving this man's life.

Changes in the Community

Sudden cardiac arrest (SCA) continues to be a leading cause of death in the United States, claiming the lives of more than 300,000 people each year, with half of those cases occurring out of hospital. Despite advance-

ments in defibrillation equipment and increased attention on CPR, only 5–10% of SCA victims leave the hospital alive. These bleak statistics illustrate the urgency for improving and implementing the chain of survival in order to increase the rate of survival to hospital discharge for cardiac arrest patients. The good news: Over the past few years, we have begun to see real improvements in survival rates in many communities.

Because a victim's chance of survival decreases by 7–10% for each minute without CPR from the time of arrest, bystander intervention is crucial.¹ Public access defibrillation (PAD) programs are being implemented nationwide to increase the access to AEDs among at-risk populations and in high-traffic public areas. A landmark study in 2004 established that PAD programs can double the survival rate from out-of-hospital arrest.²

In 2000, the Cardiac Arrest Survival Act (CASA) was passed, requiring AED programs to be instituted in all federal buildings. In addition, the use of AEDs was added to the list of protections under "Good Samaritan" laws, which were previously enacted in all 50 states to protect the lay public from liability if first aid or CPR was performed in an emergency.

The Next Level

Following SCA recognition and bystander assistance, EMS arrival and assumption of care becomes the most critical link in sustaining the life of a cardiac arrest victim. It cannot be overemphasized that high-quality CPR performance is essential for successful resuscitation.

Studies have shown that restoration of a pulse is very sensitive to chest compression rate and depth and pauses in compressions. One study found that minimally interrupted cardiac resuscitation (MICR) dramatically increases survival rates from out-of-hospital arrests.³ MICR emphasizes high-quality chest compressions alone, without intubation or supplemental ventilations, as the initial approach to cardiac arrest

resuscitation. Unfortunately, other research has shown CPR performance to be highly variable and often inadequate, both in and out of the hospital.⁴ This includes inadequate compression rate and depth as well as hyperventilation, all of which are detrimental to patient survival.

In an attempt to improve performance, CPR measurement and feedback systems, such as the Philips HeartStart MRx with Q-CPR*, monitor performance and provide real-time feedback to the caregiver. Such devices measure compression rate, depth and ventilation characteristics in order to ensure high-quality CPR performance during an actual cardiac arrest. Recent studies in both EMS and hospital care have shown improved rates of pulse restoration with the use of these devices (see sample feedback at right).

As CPR quality initiatives continue to grow, the practice of using real-time measurement and feedback during the resuscitation, combined with regular debriefing sessions using the data captured during patient events, has shown promising early results. Research has shown that debriefing with data obtained from measurement and feedback tools can increase subsequent CPR performance and improve outcomes from in-hospital SCA.⁵

Recent advancements in both real-time feedback and debriefing programs are working together to improve the overall quality of care in the chain of survival. Consequently, these programs provide a unique opportunity for EMS professionals to review and strengthen their CPR performance, providing a new means for improving outcomes of out-of-hospital arrests.

Conclusion

During the transition from initial arrest to hospital arrival, EMS personnel must continue to work diligently at performing high-quality CPR. Measurement of and feedback about CPR with follow-up debriefing helps improve the quality of CPR and the likelihood of the return of spontaneous circulation (ROSC).

Post-resuscitation care, specifically therapeutic hypothermia, can then be performed once ROSC is obtained. Some professionals are beginning to consider therapeutic hypothermia the "5th link" in the chain of survival. (For more on hypothermia, read "Regionalized Cardiac Arrest Care" on p. 6.)

Strengthening the links within the cardiac chain of survival has the potential to significantly improve outcomes of cardiac arrest victims. SCA survival statistics demonstrate how detrimental a weakness can be in any one of the critical links involved in this sequence. The rescue efforts on the US Airways flight illustrate what can be accomplished when the chain of survival is executed swiftly and decisively.



Philips Q-CPR meter enables the caregiver to rapidly adjust performance by displaying dynamic, real-time feedback for each compression, directly on the patient's chest.

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