The Weil™ Mini Chest Compressor

In-Hospital Experience at a Southeast

Level 1 Cardiac and Stroke Center

Sudden cardiac arrest has been documented as one of the leading causes of death, with victims numbering in the hundreds of thousands annually. This number exceeds that of breast cancer, lung cancer, and HIV/AIDS combined. In 2013, only 9.5% of victims who suffer cardiac arrest outside of the hospital survive while those who suffer arrest while hospitalized fair significantly better with 23.9% surviving to discharge. 1)

Following the release of the 2005 American Heart Association (AHA) CPR Guidelines, hospital management recognized the mandate for moving the needle for survival, which prior to this time had been static for over 20 years. We implemented the guidelines for high quality CPR in conjunction with new technologies and therapeutic approaches (e.g., impedance threshold device (ITD), therapeutic hypothermia, EP cath lab access, et. al.). We established the goal of positioning ourselves as a resuscitation center of excellence. We then embarked on a journey of intentionally tracking the outcomes of our patients experiencing cardiac arrest. Our focus has been on in-hospital cardiac arrest and has typically excluded data for patients in the Emergency Department (ED) due to the myriad of factors in the presentation of these patients. The evidence of our success has been captured in the literature ranging from **Annals of Emergency Medicine, Respiratory Care,** to **Circulation**. One recent publication captured the impact of high quality CPR and the impact on survival following implementation of the 2010 AHA CPR Guidelines and the continued utilization of the advanced technologies described above. 2) This study documented a 77% increase in "survival to discharge" (STD) rate versus pre-2005 CPR which did not include use of the ITD (30.15% STD vs 17.2%). This study also demonstrated a 132% increase in the rate of "return of spontaneous circulation" (ROSC) (76.7% ROSC vs 33.1%).

Our successes demonstrated the significant benefits associated with focusing on provider engagement in high quality CPR. High quality CPR is characterized by the delivery of consistent chest compressions, full chest wall recoil, minimal interruptions, ITD use and the overall "pit crew" approach utilized by our team.

Even with our measured success, we have continued to seek the opportunity to impact the survival of our patients. We have continued in our search for tools to create additional separation from the norm which would potentially result in more favorable outcomes for our patients.

We saw that opportunity with the Weil™ Mini Chest Compressor. When presented with the opportunity to evaluate this device, we sensed the potential for increasing the bandwidth for survival for our patients. After a thorough evaluation of the device, we offer an anecdotal observation. In retrospect, we believe the measured impact of the device may be artificially diminished due to the level of success already demonstrated in the years leading up to this evaluation. The delta for significant impact was reduced as compared to the average hospital in America.

There have been several lessons learned through this process.

1. The implementation of this device offered several distinct advantages over traditional compressions delivered by humans:

A) When device is placed correctly, each compression is delivered at an appropriate rate and depth
B) The ability to deliver continuous, uninterrupted compression at least anecdotally increases the likelihood of a successful outcome
C) The device eliminates human fatigue as a factor in quality of compressions
D) The ergonomic advantages for providers are obvious; the device reduces the risk of injury, especially to back and wrist
E) The device is very useful for patients arresting multiple times. When left in place, the arrests are managed much more efficiently and effectively
F) The device allows caregivers to focus more closely on patients and their needs, versus coordinating performance of CPR
G) The process provides the ability to continue CPR for an extended amount of time, giving medications additional time to work, family time to arrive to say good-bye to their loved one, or maintain adequate circulation to preserve organs and tissues as needed for organ donation

2. Throughout the evaluation process, we provided input we believe might prove valuable for consideration as the next generation of devices is developed. After a review of the prototype, we are encouraged at the apparent inclusion of many of our recommendations in the retooling process. Limitations identified included:

A) The straps are subject to move and position must be verified periodically to insure proper function
B) The failure to attach the pillow to the shoulder strap decreased unit success and compliance
C) There is a population of patients who are either too large or too frail for current configuration
D) The requirement for compressed air for operation initially presented challenges due to lack of piped medical air in many areas of our facility
E) The noise level associated with function of device was problematic

3. During the evaluation period, we identified several factors which impacted our ability to use the device. Below are those factors where the device was taken but not used. (frequency and number of patients included in parentheses) :

A) ROSC achieved prior to placement (98)
B) Physician refused (36)
C) Unknown downtime in ED patients (16)
D) Patients' body too frail for device (10)
E) Patient had recent surgery (8)
F) Code was called prior to placement (8)
G) Patient made DNR during code (7)
H) Patients' girth exceeded strap capacity (6)
I) Patient was bleeding profusely (6)
J) Patient had flail chest (2)

K) Patient was < 18 y/o (1)
L) Patient was having active heart cath (1)
M) Device had wrong air connector (1)

TOTAL – 200 arrests where device was taken but not used (includes ED patients)

From the clinician's perspective, we have witnessed some "game-changers". We had one patient who arrested multiple times and was managed initially with the device for approximately 45 minutes. The second deployment exceeded one hour before a return of pulse was obtained. At this point, the patient was made a DNR by the family. However, the patient stabilized through the night and improved so significantly that the following day the patient rescinded his own DNR status!

It was not unusual to witness systolic blood pressures in the 120's – 140's (normal range), and to observe QRS complexes on the EKG tracing approaching normal as well when the device was deployed. Tangible results such as these are where we have been successful in garnering physician support for the device.

Without the device, the ability to demonstrate these types of clinical results would prove quite problematic if not impossible to achieve at most hospitals. Practitioner fatigue, a sense of futility, physician impatience or other factors typically preclude these levels of success. However, we have attempted to encourage our providers to allow additional time for the therapy and medications we are trying so desperately to get on board to work. It is our conviction that the data we have gathered supports adoption of this deliberate, sustained approach.

During the evaluation period, we recorded the following data:

Data Using Device:

43 Unique patients

29 Male (67%): Average age - 64 years

14 Female (33%): Average age - 69 years

Case Mix: 36 Non-ED patients / 7 ED patients (all ED were unwitnessed arrest – No ROSC obtained)

Patients achieving initial ROSC:	**(20/36)**
ROSC Rate:	**(56%)**
Total ROSC/Total Arrests (patients arresting multiple times/uses)	**(23/52)**
Total ROSC Rate:	**(44%)**
Survival to Discharge: 4/20 Initial ROSC Patients	**(20%)**

In-Hospital cardiac arrest patients (excluding Emergency Department): **(212)**
(Includes Patients with and without device)

Patients achieving initial ROSC: **(171/212)**

ROSC Rate: **(80.66%)**

Total ROSC/Total Arrests (patients arresting multiple times) **(220/245)**

Total ROSC Rate: **(89.8%)**

Conclusions:

After extensive evaluation, we have determined that this device, when applied properly, has proven to be a valuable tool in providing our patients the best possible chance for the outcomes typically desired – that being successful survival to discharge and should be carefully considered by any organization with the established goal of improving that important metric.

It is our opinion that the next generation will only serve to enhance the ease of use, willingness to apply by caregivers, and degree of acceptance by providers. More importantly it should improve patient outcomes when utilized both inside and outside the Hospital.

REFERENCES:

1) "American Heart Association Heart Disease and Stroke Statistics – 2013 Update" – www.heart.org

2) "Breaking the 30% Survival Rate Window: Impact of the 2010 American Heart Association Guidelines on In-Hospital Cardiac Arrest Survival with Favorable Neurological Function" – Thigpen, Simmons, James, Neely CIRCULATION , 2013, Volume 128, A164