Measuring the Effect of a Resuscitation Academy on Out of Hospital Cardiac Arrest Resuscitation Rates

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Abstract

According to the American Heart Association (AHA), rates of successful resuscitation after out of hospital cardiac arrest (OHCA) vary across the country. Amongst 132 counties in the United States, the rates of CPR survival to hospital discharge ranges between 3.4%-22.0%, and the rates of CPR survival with functional recovery ranges from 0.8%-20.1%.[1] This large degree of variability between regions has been improved through programs that educate Emergency Medical Service (EMS) departments on ways to improve outcomes through an evidence-based lens. The Medic One EMS department in Seattle and King County, Washington developed a resuscitation academy (RA) that improved cardiac arrest survival from 26% in 2002 to 62% in 2013.[2] In 2015, The New Castle County, Delaware EMS (NCCEMS) department modeled a RA after the Medic One EMS department. This study measured its effect on the number of patients experiencing return of spontaneous circulation (ROSC) and the cerebral performance category (CPC) scores for discharged patients. Data from 599 atraumatic out-of-hospital cardiac arrests (OHCA) was collected from 2009-2019, and 99 cases met Utstein inclusion criteria. Next, this study categorized if at least one RA was implemented prior to these cases to determine the RA's effect. Implementation of one RA on ROSC outcomes yielded a significant improvement (p = .028), with a small to medium strength of effect (Cramer's V=0.221); this indicates that the administration of at least one RA had a moderate and significant effect on increasing ROSC in patients suffering from OHCA. Administration of at least one RA did not demonstrate a significant effect on eventual patient outcomes as indicated by discharge CPC score (p = .488). This indicates that there was no statistically significant effect on the cerebral performance of patients who suffered OHCA upon discharge.

Methods

- Obtain CARES (Cardiac Arrest Registry to Improve Survival) data from St.Francis EMS. This will include:
  - Number of cardiac arrest calls for service
  - Number of patients experiencing Return of Spontaneous Circulation (ROSC)
  - Number of patients discharged from hospital (with Cerebral Performance Category scores)
  - Data will be broken down year by year
  - Will analyze data from 3 years before implementation of Resuscitation Academy to present
- Rates of ROSC, Discharge, and CPC1&2 (good outcomes) will be calculated year by year.
- Year to year data will be compared to determine if a statistically significant change in outcomes occurred after the implementation of the resuscitation academy.
- A recommendation will be made regarding the implementation of a Resuscitation Academy like program in a second location.

Resuscitation Academy Model

History of Resuscitation Academy (RA)

- Pioneers of RA: Medic One EMS in Seattle & Kings County, Washington
- Instituted a RA that improved cardiac arrest survival from 26% in 2002 to 62% in 2013.

Goals of Resuscitation Academy

- Learn how to define the cardiac arrest survival rate
- Understand the principles of the Utstein template and how to report data
- Develop and implement a concrete plan of action to improve survival
- Measure the effect of the plan of action on cardiac arrest survival

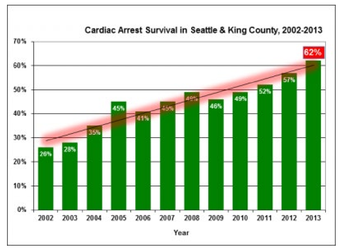

Figure 1: Cardiac Arrest Survival in Seattle & Kings County 2002-2013

Curriculum of the Delaware Resuscitation Academy

Didactics	Hands-On
• Physiology of cardiac arrest • Dispatcher considerations (rapid dispatch and telephone CPR) • Inter-agency cooperation • High-Performance CPR (AKA Pit Crew CPR) • Resuscitation "choreography" • Measurement of Professional Resuscitation • "Culture of Excellence"	• Live action demonstration of 2,3,&4 rescuer CPR • CPR quality assurance with feedback mannequins • Training with LUCAS 2 Device • Interagency practice simulations

Figure 2: Resuscitation Academy Curriculum

Data

- From 2009-05-01 to 2019-12-31, 599 patient records were obtained, representing all atraumatic OHCA presenting to the participating hospital
- Of the 599 cardiac arrest patients, 99 met Utstein-style inclusion criteria (a witnessed out-of-hospital cardiac arrest found in a "shockable" rhythm upon patient arrival).
- These 99 patients were tabulated based on Return of Spontaneous Circulation (ROSC) at any point in resuscitation and Cerebral Performance Category (CPC) score on discharge.
- Patients coded in the category of "No" experienced OCHA prior to the first RA on 2015-10-31, while patients coded "Yes" experienced OCHA after the first RA.

CPC 1	CPC 2	CPC 3	CPC 4	CPC 5
Good cerebral performance, able to care for self with little to no deficits.	Moderate cerebral disability, able to care for self with some deficits.	Severe cerebral disability. Conscious, dependent on others. May be ambulatory.	Coma or vegetative state. No interaction with the environment.	Brain death, areflexia, apnea, or death.

Figure 3: Categorization of CPC Score

		CPC 3-5	CPC 1&2	Total	% CPC 1&2
Had at least one RA been conducted?	No	38	21	59	36 %
	Yes	23	17	40	42 %
Total		61	38	99	

Figure 4: Tabulation of RA and CBC scores

		ROSC was not achieved	ROSC was achieved	Total	% achieved ROSC
Had at least one RA been conducted?	No	26	33	59	56 %
	Yes	9	31	40	78 %
Total		35	64	99	

Figure 5: Tabulation of RA and ROSC Scores

Results

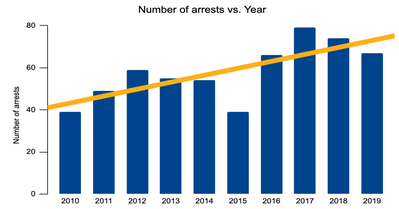

Figure 6: Out of Hospital Cardiac Arrests in New Castle County, DE

Effect of RA on ROSC

- **a significant improvement** was found in ROSC outcomes **(p = .028),** with a small to medium strength of effect (Cramer's V=0.221).
- This indicates that the administration of at least one RA had a **moderate and significant effect on increasing ROSC** in patients suffering from OHCA.

Effect of RA on CPC Score

- At least one Resuscitation Academy **did not** demonstrate a significant effect on eventual patient outcomes as indicated by discharge CPC score **(p = .488).**
- no statistically significant effect on the cerebral performance of patients who suffered OHCA upon discharge

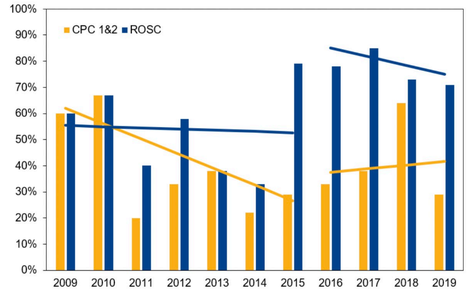

Figure 7: CPC and ROSC Outcomes By Year

Conclusion

The cardiac arrest Chain of Survival will only be as strong as the weakest link in the chain - so as each link in the chain improves in strength, so does the overall mission's performance. The focus of quality improvement programs and education in EMS have been focused on a "time is brain" model, encouraging high efficiency operations, expeditious, coordinated response and appropriate delivery of best practice resuscitation techniques. The New Castle County Paramedics in New Castle County, DE approached this mission with the implementation of the Resuscitation Academy, modeled in partnership with the King County Medic One RA Program developed by Dr. Mickey Eisenberg. The data pool available for this study was underpowered due to lack of participation, however we did observe an association between the training model employed in NCC DE and an improvement in ROSC rates post-implementation. There was no significant effect on CPC 1 and CPC 2 survival observed. It may be higher yield to leverage CPC 1 and 2 survival from a different "link" in the chain of survival (ie. TTM, post arrest management, and new treatment paradigms).

References

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