

A Race Against Time: Does Epinephrine Compliance by Emergency Physicians Increase ROSC in Cardiac Arrest Patients

Karen Pho, MS IV, Danniell Stites, MD, Scott Hall, PharmD, University of Arizona College of Medicine – Phoenix, HonorHealth John C. Lincoln Medical Center

Introduction

A recent study of cardiac resuscitation found an overall non-compliance rate of 58.1% with ACLS guidelines. As such, epinephrine is a core resuscitation medication that only has IIb recommendation and is deemed a “may be reasonable treatment.” Despite this, ACLS guidelines still recommends delivering 1mg epinephrine at an interval of 3 - 5 minutes during resuscitation.

Research Question

Do patients who receive epinephrine at intervals recommended by the AHA ACLS guidelines during cardiac resuscitation efforts by emergency physicians have higher rates of return of spontaneous circulation (ROSC)?

Materials and Methods

The study is a retrospective chart review that took place at HonorHealth John C. Lincoln Medical Center in Phoenix, Arizona. Patients with ICD-9 codes of 427.5, 799.1, and ICD-10 codes of I46.2, I46.8, I46.9, and R09.2 between August 2012 – January 2018 were pulled for review. Patients all had to be 18 years of age or older. Exclusion criteria included: patients younger than 18 years of age, traumatic codes, patients who received vasopressin other than epinephrine, and in-hospital cardiac arrests. A sample size of 98, with 49 in each group is needed to see a 20% difference and to achieve a statistical power of 80%. Variables evaluated included: age, race, gender, number of doses, route of delivery, ROSC in the ED, and number of sinus rhythm. Wilcoxon rank sum, and chi square/fisher exact test were used for statistical analysis. All P values were 2 sided, and a P value of < 0.05 is considered statistically significant. IRB was obtained for this study, and was exempt.

Results

The mean age was 62.7 (15.6). There were 44 females and 67 males, most patients were Caucasian (89), and three patients achieved spontaneous return of circulation (ROSC) with sinus rhythm. Three different analyses were done: 1) compliance versus non-compliance (Table 1), 2) any non-compliance versus mean non-compliance (Table 2), and 3) ROSC versus no ROSC (Table 3). A total of 111 patient charts reviewed, and all were analyzed.

Overall, the answer to the study’s question did not reach statistical significance. However, one variable that reached statistical and clinical significance is the *number* of epinephrine doses delivered may have an impact on achieving sinus rhythm. This may be clinically significant to deliver *more* doses of epinephrine, rather than within a constricted timeframe.

Table 1: All P values were greater than 0.05, which indicated that none of these variables reached statistical significance. Of clinical note, all 40 physicians who were compliant did not have patients reaching ROSC. On the contrary, of the 71 physicians who were non-compliant, 3 patients achieved ROSC.

Variables	Overall N=111	Compliant N=40	Any Non-compliance N=71	p-value
Age, years (mean, SD)	62.7 (15.6)	61.5 (15.5)	63.4 (15.9)	0.58
Sex (male, %)	67 (60.4)	27 (67.5)	40 (56.3)	0.25
Race, non-Caucasian (n, %)	22 (19.8)	6 (15.0)	16 (22.5)	0.34
Number of Doses (mean, SD)	4.12 (2.55)	4.50 (2.26)	3.91 (2.69)	0.12
Route (n, %)				1.0
IO	8 (7.21)	3 (7.50)	5 (7.04)	
IV	100 (90.1)	36 (90.0)	64 (90.1)	
Both/Other	3 (2.70)	1 (2.50)	2 (2.82)	
# of Sinus Rhythm (n, %)				0.18
0	108 (97.3)	40 (100.0)	68 (95.8)	
1	2 (1.80)		2 (2.82)	
2	1 (0.90)		1 (13.41)	

Table 2: This table looked at any non-compliances and mean non-compliance. Again, all P values were greater than 0.05, indicating no statistical significance. However, of clinical note, non-Caucasian patients experienced an overall greater non-compliance among physicians than Caucasian patients (61.8% vs 72.7%).

Variables	Any Non-compliance	p-value	Mean Number of Non-compliances	p-value
Age, years		0.58		0.56
< 55 (n=35)	22 (62.8)		1.14 (1.28)	
≥55-< 70 (n=39)	23 (58.9)		1.05 (1.19)	
≥70 (n=37)	26 (70.3)		1.35 (1.35)	
Sex		0.25		0.93
Female (n=44)	31 (70.5)		1.09 (1.12)	
Male (n=67)	40 (59.7)		1.24 (1.37)	
Race		0.34		0.13
Caucasian (n=89)	55 (61.8)		1.09 (1.23)	
Non-Caucasian (n=22)	16 (72.7)		1.54 (1.40)	
Number of Doses		0.35		0.09
1-2 (n=31)	23 (74.2)		1.64 (1.58)	
3-4 (n=42)	26 (61.9)		1.14 (1.24)	
≥5 (n=38)	22 (57.9)		0.84 (0.88)	
Route		1.0		0.69
IO (n=8)	5 (62.5)		1.75 (2.05)	
IV (n=100)	64 (64.0)		1.13 (1.20)	
Both/Other (n=3)	2 (66.7)		1.33 (1.15)	
# of Sinus Rhythm		0.70		0.34
0 (n=108)	68 (62.9)		1.16 (1.27)	
1 (n=2)	2 (100.0)		1 (0)	
2 (n=1)	1 (100.0)		3 (N/A)	

Variables	No Sinus Rhythm N=108	Sinus Rhythm N=3	p-value
Age, years (mean, SD)	62.3 (15.5)	77.6 (21.9)	0.18
Sex (male, %)	66 (61.1)	1 (33.3)	0.56
Race, non-Caucasian (n, %)	22 (20.4)	3 (100.0)	1.0
Number of Doses (mean, SD)	3.95 (2.06)	10.3 (8.38)	0.04
Route (n, %)			1.0
IO	8 (7.41)		
IV	97 (89.8)	3 (100.0)	
Both/Other	3 (2.78)		
Any Non-Compliance (yes, %)	68 (62.9)	3 (100.0)	0.55
Number of Non-compliances (mean, SD)	1.17 (1.27)	1.67 (1.15)	0.34

Table 3: This table looked at demographics by sinus rhythm and is the only chart with a value of 0.04, meeting statistical significance. This value specifically looked at the number of doses and its correlation to achieving sinus rhythm or not. Of note, when looking at any non-compliance and its correlation to achieving sinus rhythm or not, there is no statistical significance. However, there is clinical significance noted (in green) that the 3 patients who achieved sinus rhythm fell under the non-compliant physicians.

The Wilcoxon rank sum was used to assess the mean number of non-compliance relative to patient characteristics. Chi square and Fisher exact was used to compare frequency of non-compliances. All P values were 2 sided and P < 0.05 was considered statistically significant. All data analysis was used by STATA version 15 (college station, Texas).

Conclusion

The overall conclusion of this study indicated that emergency physician compliance with epinephrine delivery did not have statistical significance on cardiac arrest patients.

However, clinical significance is noted with patients who achieved ROSC during resuscitation all fell under physicians who were non-compliant.

Summary

- Although the overall study did not reach statistical significance, the numbers presented suggests that compliance does not improve ROSC in cardiac arrest patients
- Statistical significance was reached in a subgroup of patients who achieved sinus rhythm within the non-compliant physicians
- Clinical significance is noted that non-Caucasian patients experience more non-compliance among physicians, further signifying health disparity among minority groups

Acknowledgements

I wish to thank my mentors Dr. Danniell Stites, and pharmacist Scott Hall. I would also like to thank Paul Kang for all statistical analysis contributions.