

Show Notes - 28: Does IV vs IO Matter with Epi?

Citation

Zhang Y, Zhu J, Liu Z et al. Intravenous versus intraosseous adrenaline administration in out-of-hospital cardiac arrest: A retrospective cohort study. *Resuscitation*. 2020

Abstract

BACKGROUND:

Adrenaline is an important component in the resuscitation of individuals experiencing out-of-hospital cardiac arrest (OHCA). The 2018 Advanced Cardiac Life Support (ACLS) algorithm gives the option of either intravenous (IV) or intraosseous (IO) routes for adrenaline administration during cardiac arrest. However, the optimal route during prehospital resuscitation remains controversial. This study aims to investigate whether IV and IO routes lead to different outcomes in OHCA patients who received prehospital adrenaline.

METHODS: This retrospective analysis included adult patients with OHCA of presumed cardiac origin who had Emergency Medical Services (EMS) CPR, received adrenaline, and were enrolled in the Resuscitation Outcomes Consortium (ROC) Cardiac Epistry version 3 database between 2011 and 2015. We divided the study population into IV and IO groups based on the administration route. Logistic regression analysis was performed to evaluate the association between adrenaline delivery routes and prehospital return of spontaneous circulation (ROSC), survival to hospital discharge, and favorable neurological outcome.

RESULTS: Of the 35,733 patients included, 27,758 (77.7%) had adrenaline administered via IV access and 7975 (22.3%) via IO access. With the IO group as a reference in the logistic regression model, the adjusted odds ratios of the IV group for prehospital ROSC, survival and favorable neurological outcome were 1.367 (95%CI, 1.276-1.464), 1.468 (95%CI, 1.264-1.705) and 1.849 (95%CI, 1.526-2.240), respectively. Similar results were found in the propensity score matched population and subgroup analysis. C

CONCLUSION: Compared with the IO approach, the IV approach appears to be the optimal route for adrenaline administration in advanced life support for OHCA during prehospital resuscitation.

Tables:

Table 1 – Demographics, prehospital characteristics and outcomes of adult OHCA patients of presumed cardiac aetiology with different adrenaline using routes (IV versus IO) in the study population.

Demographics & characteristics & outcomes	Overall (N = 35,733)	IV (N = 27,758)	IO (N = 7975)	P
Age, years, median (IQR)	66(5577)	67(5678)	65(5475)	0.000
Male, n (%)	23,671(66.2)	19,007(68.5)	4664(58.5)	0.000
EMS witnessed, n (%)	3328(9.3)	2596(9.4)	732(9.2)	0.638
Bystander witnessed, n (%)	13,861(38.8)	11,101(40.0)	2760(34.6)	0.000
Bystander CPR, n (%)	15,664(43.8)	12,063(43.5)	3601(45.2)	0.007
Public location, n (%)	5180(14.5)	4270(15.4)	910(11.4)	0.000
EMS response interval, min, median (IQR)	5.1(3.8,6.7)	5.2(3.9,6.8)	4.9(3.6,6.3)	0.000
Initial EMS-recorded rhythm				0.000
Shockable, n (%)	7934(22.2)	6649(24.0)	1285(16.1)	
Non-shockable, n (%)	27,799(77.8)	21,109(76.0)	6690(83.9)	
Cumulative adrenaline dosage, mg, median (IQR)	3.0(2.5,5.0)	3.0(2.0,5.0)	3.0(3.0,5.0)	0.000
Time from dispatch to the first adrenaline dose, min, median (IQR)	16.4(13.2,21.8)	16.7(13.4,21.0)	15.6(12.6,19.7)	0.000
Compression rate at first five minutes, median (IQR)	108(101,117)	108(101,117)	109(102,116)	0.180
Advanced airway placement, n (%)	31,147(87.2)	24,338(87.7)	6809(85.4)	0.000
Prehospital ROSC achieved, n (%)	8230(23.0)	6808(24.5)	1422(17.8)	0.000
Survival to hospital discharge, n (%)	1869(5.2)	1620(5.8)	249(3.1)	0.000
Favorable neurological outcome at discharge (MRS ≤ 3), n (%)	1332(3.7)	1190(4.3)	142(1.8)	0.000

OHCA, out-of-hospital cardiac arrest; IV, intravenous route; IO, intraosseous route; IQR, inter-quartile range; EMS, Emergency Medical Services; CPR, Cardiopulmonary Resuscitation; Shockable, ventricular fibrillation or pulseless ventricular tachycardia; Non-shockable, asystole, pulseless electrical activities, no shock delivered by an automated external defibrillator and unclassifiable rhythm; ROSC, Return of Spontaneous Circulation; MRS, Modified Rankin Scale; n, number; N, total number; min, minute; mg, milligram.

Table 2 – Demographics, prehospital characteristics and outcomes of adult OHCA patients of presumed cardiac aetiology with different adrenaline using routes (IV versus IO) in propensity score matched cohort.

Demographics & characteristics & outcomes	Overall (N = 11,368)	IV (N = 5684)	IO (N = 5684)	Standardized difference (%)
Age, years, median (IQR)	65(5376)	65(5376)	65(5475)	0.1
Male, n (%)	6735(59.2)	3366(59.2)	3369(59.3)	0.1
EMS witnessed, n (%)	1017(8.9)	499(8.8)	518(9.1)	1.2
Bystander witnessed, n (%)	3873(34.1)	1927(33.9)	1946(34.2)	0.7
Bystander CPR, n (%)	5303(46.6)	2700(47.5)	2603(45.8)	3.4
Public location, n (%)	1341(11.8)	677(11.9)	664(11.7)	0.7
EMS response interval, min, median (IQR)	5.0(3.7,6.3)	5.0(3.7,6.4)	4.9(3.6,6.2)	1.1
Initial EMS-recorded rhythm				1.3
Shockable, n (%)	1983(17.4)	1006(17.7)	977(17.2)	
Non-shockable, n (%)	9385(82.6)	4678(82.3)	4707(82.8)	
Cumulative adrenaline dosage, mg, median (IQR)	3.0(3.0,5.0)	3.0(3.0,5.0)	3.0(3.0,5.0)	0.2
Compression rate at first five minutes, median (IQR)	108(102,116)	108(101,116)	108(102,116)	1.1
Advanced airway placement, n (%)	9708(85.4)	4850(85.3)	4858(85.5)	0.4
Prehospital ROSC achieved, n (%)	2276(20.0)	1296(22.8)	980(17.2)	–
Survival to hospital discharge, n (%)	479(4.2)	285(5.0)	194(3.4)	–
Favorable neurological outcome at discharge (MRS ≤ 3), n (%)	322(2.8)	208(3.7)	114(2.0)	–

OHCA, out-of-hospital cardiac arrest; IV, intravenous route; IO, intraosseous route; IQR, inter-quartile range; EMS, Emergency Medical Services; CPR, Cardiopulmonary Resuscitation; Shockable, ventricular fibrillation or pulseless ventricular tachycardia; Non-shockable, asystole, pulseless electrical activities, no shock delivered by an automated external defibrillator and unclassifiable rhythm; ROSC, Return of Spontaneous Circulation; MRS, Modified Rankin Scale; n, number; N, total number; min, minute; mg, milligram.

Table 3 – Unadjusted and adjusted odds ratios for prehospital ROSC, survival to hospital discharge and favorable neurological outcome of EMS-treated adult OHCA patients of presumed cardiac aetiology with different adrenaline using routes (IV versus IO) in ROC Cardiac Epistry v3 study.

Variable	Prehospital ROSC		Survival to hospital discharge		Favorable neurological outcome (MRS ≤ 3)	
	OR	95% CI	OR	95% CI	OR	95% CI
Primary study cohort						
Unadjusted model	1.498	1.405–1.596	1.923	1.679–2.203	2.471	2.027–2.946
Adjusted model*	1.416	1.321–1.517	1.529	1.316–1.776	1.902	1.570–2.305
Propensity score matched cohort						
Unadjusted model	1.410	1.298–1.531	1.533	1.295–1.816	1.843	1.489–2.282
Adjusted model*	1.444	1.321–1.579	1.506	1.248–1.817	1.834	1.446–2.326

ROSC indicates Return of Spontaneous Circulation; EMS, emergency medical system; OHCA, out-of-hospital cardiac arrest; IV, intravenous route; IO, intraosseous route; ROC, Resuscitation Outcomes Consortium; MRS, Modified Rankin Scale; OR, odds ratio; CI, confidence interval.

*Adjusted by confounding variables including age, gender, witness status, bystander CPR (cardiopulmonary resuscitation), public location, advanced airway placement, initial arrest rhythm, EMS (Emergency Medical Services) response interval, time from dispatch to the first adrenaline dose and cumulative adrenaline dosage.

Table 4 – Unadjusted and adjusted odds ratios for prehospital ROSC, survival to hospital discharge and favorable neurological outcome of EMS-treated adult OHCA patients of presumed cardiac aetiology with different adrenaline using routes (IV versus IO) in sub-group analysis.

Variable	IV, n	IO, n	Prehospital ROSC		Survival to hospital discharge		Favorable neurological outcome (MRS ≤ 3)	
			OR	95% CI	OR	95% CI	OR	95% CI
Shockable rhythm Cohort								
	6649	1285						
Unadjusted model			1.553	1.360–1.774	1.496	1.257–1.779	1.774	1.446–2.175
Adjusted model*			1.508	1.303–1.745	1.416	1.172–1.712	1.698	1.363–2.115
Non-shockable rhythm Cohort								
	21109	6690						
Unadjusted model			1.368	1.272–1.472	1.572	1.236–1.999	2.402	1.618–3.567
Adjusted model*			1.326	1.227–1.434	1.511	1.182–1.932	2.282	1.528–3.409

ROSC indicates Return of Spontaneous Circulation; EMS, emergency medical system; OHCA, out-of-hospital cardiac arrest; IV, intravenous route; IO, intraosseous route; ROC, Resuscitation Outcomes Consortium; MRS, Modified Rankin Scale; OR, odds ratio; CI, confidence interval; n, number.

*Adjusted by confounding variables including age, gender, witness status, bystander CPR (Cardiopulmonary Resuscitation), public location, advanced airway placement, EMS (Emergency Medical Services) response interval, compression rate at first five minutes and cumulative adrenaline dosage.