

Paramedic CAT (Critically Appraised Topic)

Title: Epinephrine in Cardiac Arrests and Neurological Outcomes Post Return of Spontaneous Circulation.

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Clinical Scenario:

A primary care paramedic (PCP) crew is responding to a house in a city for a 55-year-old male who was found with vital signs absent (VSA). Upon arrival of the PCP crew, a backup advanced life support (ALS) crew arrives on scene at the same time. Cardiopulmonary resuscitation (CPR) is initiated and the first rhythm interpretation shows a rhythm that requires a shock. A shock is delivered and CPR continues. According to ALS directives in this county, the ALS medic decides to give 1 mg epinephrine every 4 minutes until return of spontaneous circulation is achieved. After three rounds of epinephrine the crews obtain a ROSC and quickly transport the patient to hospital.

PICO (Population – Intervention – Comparison – Outcome):

In patients experiencing a cardiac arrest, does the administration of epinephrine cause negative neurological outcomes to patients post ROSC?

Search Outcome/Keywords: 21

[(Paramedic* OR ems OR emergency medical services OR prehospital) AND (cardiac arrest OR out of hospital cardiac arrest OR heart failure) AND (neurological OR cognitive) AND (rosc OR return of spontaneous circulation) AND (epinephrine OR adrenalin*)]

Limiters: Date 2010-2017

CINAHL and MEDLINE were searched simultaneously via EBSCO search engine.

Relevant Papers: 3

Author, Date	Population	Design	Outcomes	Results
Hayashi, Y. et al. 2012	- Patients resuscitated by epinephrine capable EMS n=9024 - Eligible patients who were administered epinephrine n=1013	Observational Study	- ROSC - Survival at admission - Survival at one-month - Neurologically intact one-month survival	- ROSC for epinephrine administration group n=511 (50.4%), P=0.094 - Survival at admission n=432 (42.6%), P=0.385 - Survival at one-month n=137 (13.5%), P=0.245 - Neurologically intact one-month survival n=42 (4.1%), P=0.028 - Neurologically intact one-month survival with epinephrine administration and ventricular fibrillation (n=205) as initial rhythm n=29 (14.1%), P=0.006

<p>Loomba, R. S. et al. 2015</p>	<ul style="list-style-type: none"> - Patients included in the study n=655 853 - Patients who received epinephrine n=48 755 (7.4%) - Patients who did not receive epinephrine n=607 098 (92.6%) 	<p>Systematic Review</p>	<ul style="list-style-type: none"> - Out of hospital ROSC - Survival at 1-month - Survival to discharge - Positive neurologic outcome 	<ul style="list-style-type: none"> - Data from 9 studies (n=41 754 epi, n=598 504 non-epi). Patients who received epinephrine showed greater frequency of ROSC with OR 2.84 (CI 95%, 2.28-3.54, P=<0.001). - Data from 5 studies (n=45 055 epi, n=602 715 non-epi). Patients between both groups did not benefit from being given or withheld epinephrine with OR 1.03 (CI 95%, 0.70-1.34, P=0.85) - Data from 8 studies (n=2566 epi, n=3961 non-epi) showed insufficient evidence of difference between epi and non-epi in survival to discharge. - Data from 9 studies (n=45992 epi, n=598731 non-epi) showed evidence of positive neurological outcomes in non-epinephrine group with OR 0.51 (CI 95%, 0.31-0.84, P=0.008).
<p>Hagihara, A. et al. 2012</p>	<ul style="list-style-type: none"> - Patients included in study n=417 188 - Patients given epinephrine n=15 030 - Patients not given epinephrine n= 402 158 	<p>Prospective Observational Study</p>	<ul style="list-style-type: none"> - ROSC - Survival at one month - CPC of 1 or 2 at one month - OPC of 1 or 2 at one month 	<ul style="list-style-type: none"> - Patients given epinephrine n=2786 (18.4%), OR 3.75 (CI 95%, 3.59-3.91) - Patients given epinephrine that survived to one month n=805 (5.4%), OR 1.15 (1.07-1.23) - CPC 1 or 2 at one month for patients given epinephrine n=205 (1.4%), OR 0.61 (0.53-0.70) - OPC 1 or 2 at one month for patients given epinephrine n=211 (1.4%), OR 0.63 (0.55-0.73)

Comments:

In this CAT the PICO question was targeted towards the effects of epinephrine on neurological outcomes. During the search for articles it was observed that there were common outcomes in most articles. Hayashi et al. (2012) noted that there was a greater chance of positive neurological outcomes and ROSC with epinephrine in ventricular fibrillation as a presenting rhythm in OHCA. In the systematic review done by Loomba et al., it was noted throughout the article that the administration increased the chance of ROSC in OHCA (2015). It is important to note there is a possible selection bias due to the fact that not all articles were accessed. There are many other articles that contradict the results that were found. Included in the references is an article of a RCT that is currently being performed in the UK. This article by Perkins et al. (2016) is looking at the efficacy of adrenaline in OHCA. Five ambulance services in the UK are going to be randomized with adrenaline and placebo drug kits for use in OHCA. The trial registration number for this study is ISRCTN73485024.

Clinical Bottom Line:

There is no clear evidence of the efficacy of epinephrine in OHCA. There is however evidence that supports that negative neurological outcomes at one month survival result from the use of epinephrine in OHCA. There is a need for more research to be done on this topic and more RCT to follow in order to conclude that the benefits outweigh the risks.

References

- Hayashi, Y., Iwami, T., Kitamura, T., Nishiuchi, T., Kajino, K., Sakai, T., ... & Kai, T. (2012). Impact of early intravenous epinephrine administration on outcomes following out-of-hospital cardiac arrest. *Circulation Journal*, *76*(7), 1639-1645.
- Hagihara, A., Hasegawa, M., Abe, T., Nagata, T., Wakata, Y., & Miyazaki, S. (2012). Prehospital epinephrine use and survival among patients with out-of-hospital cardiac arrest. *Jama*, *307*(11), 1161-1168.
- Loomba, R. S., Nijhawan, K., Aggarwal, S., & Arora, R. R. (2015). Increased return of spontaneous circulation at the expense of neurologic outcomes: Is prehospital epinephrine for out-of-hospital cardiac arrest really worth it? *Journal of Critical Care*, *30*(6), 1376-1381.
- Perkins, G. D., Quinn, T., Deakin, C. D., Nolan, J. P., Lall, R., Slowther, A. M., ... & Finn, J. (2016). Pre-hospital assessment of the role of adrenaline: measuring the effectiveness of drug administration in cardiac arrest (PARAMEDIC-2): trial protocol. *Resuscitation*, *108*, 75-81.

Search Strategy Results

#	Query	Limiters/Expanders	Last Run Via	Results
S19	S14 AND S15 AND S16 AND S17 AND S18	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	21
S18	S12 OR S13	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	1,988
S17	S10 OR S11	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	8,811
S16	S8 OR S9	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	293,763
S15	S5 OR S6 OR S7	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	139,812
S14	S1 OR S2 OR S3 OR S4	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	51,762
S13	return of spontaneous circulation	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	1,617
S12	rosc	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	1,124
S11	epinephrine	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	8,621
S10	adrenalin*	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	2,319
S9	cognitive	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	189,685
S8	neurological	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	115,362
S7	out of hospital cardiac arrest	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	4,165
S6	heart failure	Limiters - Published Date: 20100101- 20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	126,408

S5	cardiac arrest	Limiters - Published Date: 20100101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	14,921
S4	prehospital	Limiters - Published Date: 20100101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	8,898
S3	emergency medical services	Limiters - Published Date: 20100101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	36,977
S2	ems	Limiters - Published Date: 20100101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	12,027
S1	paramedic*	Limiters - Published Date: 20100101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Basic Search Database - MEDLINE;CINAHL	4,437