A factor improving the effect of epinephrine administration

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INTRODUCTION

The epinephrine administration in the pre-hospital setting has been evaluated for its time relation compared with those who were not administered. However, the relation between the effect of bystander cardiopulmonary resuscitation (BCPR) and epinephrine administration time is not discussed.

PURPOSE

The purpose of this study was to demonstrate whether the effect of epinephrine administration is enhanced by the presence of bystander CPR.

MATERIALS

This nationwide population-based observational study using Utstein data from 2011 to 2014 was conducted in Japan. We extracted 19,917 patients with bystander-witnessed out-of-hospital cardiac arrest (OHCA) presumed cardiac origin who administered epinephrine. Database were divided into two groups depending on if patients received BCPR or not. The patients exclusion criteria are shown in Figure 1.

Figure1. Study enrolment

METHODS

The correlation between each group of epinephrine administration time and prognosis at 1 month survival was evaluated. The study outcome: CPC(Cerebral Performance Category) 1-2. Statistical analysis : The adjusted odds ratio(AOR), crude odds ratio (COR) and 95% confidence interval (CI) were estimated.

RESULTS

OHCA patients received BCPR with epinephrine was 9682(48.6%). All patients characteristics shown in table 1.

Table 1. The characteristic of the epinephrine administration with/without BCPR				
	All 19917	BCPR 9682	Non-BCPR 10235	p-Value
Age median (IQR)	77 [66, 85]	78 [66, 86]	77 [67, 84]	<0.001
Sex no(%)				
male	13221 (66.4)	6247 (64.5)	6974 (68.1)	<0.001
Types of bystander no.(%)				
Family	13557 (68.1)	5784 (59.7)	7773 (75.9)	<0.001
Others	6360 (31.9)	3898 (40.3)	2462 (24.1)	
Dispatcher's assist no.(%)	10423 (52.3)	7141 (73.8)	3282 (32.1)	<0.001
Public access defibrillation no.(%)	493 (2.5)	481 (5.0)	12 (0.1)	<0.001
Response interval median (IQR)	9 [7, 11]	9 [7, 11]	8 [7, 10]	<0.001
Initial rhythm no. (%)				
Shockable	4493 (22.6)	2385 (24.6)	2108 (20.6)	<0.001
EMS interventions no. (%)				
EMS shock	6082 (30.5)	3043 (31.4)	3039 (29.7)	0.008
Intubation	2282 (11.5)	1108 (11.4)	1174 (11.5)	NA
Call to epinephrine median (IQR)	23 [18, 28]	22 [18, 28]	23 [19, 28]	0.005
Outcomes no.(%)				
ROSC	3907 (19.6)	1916 (19.8)	1991 (19.5)	0.556
1 month survival	1356 (6.8)	707 (7.3)	649 (6.3)	0.007
Favorable CPC at 1 month	499 (2.5)	280 (2.9)	219 (2.1)	0.001

Figure 2. Univariable logistic regression curve with epinephrine administration time.

Figure 3. Proportion of CPC 1-2 on categorized epinephrine administration time.

EEG; Early epinephrine group(1~18min), IEG; Intermediate epinephrine group(19~24min), LEG; Late epinephrine group(24~49min).

Table 2. Relation between epinephrine time and bystander CPR

Epinephrine administration	1 month survival		CPC1-2 at 1month	
	COR(95%CI)	AOR(95%CI)	COR(95%CI)	AOR(95%CI)
BCPR + EEG	1.11 (0.93-1.32)	1.02 (0.83-1.26)	1.25 (0.97-1.61)	1.08 (0.79-1.47)
BCPR + IEG	1.22 (1.01-1.46)	1.21 (0.97-1.50)	1.14 (0.84-1.54)	1.01 (0.70-1.47)
BCPR + LEG	1.08 (0.86-1.37)	0.89 (0.65-1.17)	2.27 (1.39-3.70)	1.85 (1.05-3.26)

Variables: Age, Sex, Types of bystander (reference: others), Dispatcher assist, Bystander CPR, Public access defibrillation, Response time, EMS defibrillation, Intubation(reference: none, intubation, other airway devices), Call to epinephrine time, Abbreviations: EEG; early epinephrine group(1~18min), IEG; intermediate epinephrine group(19~24min), LEG; late epinephrine group(24~time)

CONSIDERATION

There was statistically no difference between BCPR and non-BCPR effect on epinephrine administration. However, in the early, intermediate and late-epinephrine administration, the effect of BCPR to CPC 1-2 was greater population than the non-BCPR group. Especially, late administration group(25-49min) shows significantly higher CPC 1-2 rate with BCPR apply. Therefore, we believe that an kept cerebral blood flow by BCPR before EMS arrival is highly associated with better neurologic outcome.

LIMITAION

Study was an observational study, the unknown biases could not be considered and the BCPR quality not evaluated.

CONCLUSION

It was found that the combination effect of bystander CPR and epinephrine administration improved the favorable neurologic outcome. However, the implementation rate of BCPR is still not satisfied in Japan. Increasing number of layperson BLS, the effect of EMS advanced life support can be enhanced.