Initial blood pH as an independent predictor of neurological outcome in patients with out-of-hospital cardiac arrest

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Purpose:

Metabolic acidosis is observed in 98% of patients with Out-of-hospital cardiac arrest (OHCA). The longer the no-flow or low-flow duration, the more severe the acidosis is in these patients. This study aim to demonstrate the blood pH on arrival at emergency department (ED) could be an independent predictor of neurological prognosis in patients with OHCA.

Material and methods

We retrospectively recruited patients with OHCA from January 2012 to June 2017. Patients with blood gas analyses performed upon arrival at the ED simultaneously with CPR were enrolled into this study. Those aged younger than 20 years, those who with cardiac arrest consecutive to trauma, and those with do-not-resuscitate orders were excluded. Patient's data were collected according to the Utstein-style template. The primary outcome of this study was neurological status at hospital discharge.

Table 2 Logistic regression for factors associated with neurological prognosis after out-of-hospital cardiac arrest

Factors	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
**Age	1.05 (1.03-1.06)	<0.001	1.04 (1.02-1.06)	<0.001
Male	0.36 (0.18-0.73)	0.004	0.64 (0.31-1.36)	0.246
**First rhythm				
non-Shockable	8.89 (5.10-15.50)	<0.001	4.14 (2.24-7.64)	<0.001
**pH	0.01 (0.01-0.04)	<0.001	0.02 (0.01-0.11)	<0.001
**Non-witness	5.37 (3.04-9.50)	<0.001	3.67 (1.95-6.89)	<0.001
Bystander CPR	0.50 (0.28-0.88)	0.016	1.03 (0.53-2.01)	0.934

Results

A total of 1711 patients with OHCA were enrolled into this study. The majority was males (61.89%) with an average age of 67.8 ± 17.0 years. OHCA was witnessed in 458 cases, and CPR was performed before the arrival of the paramedics in 371 (22.3%) cases. 207 (12.1%) patients had a shockable rhythm. Age, shockable rhythm, witness, and pH from initial ED blood gas analysis remained independent predictors of neurological outcome after multivariate regression.

Table 1 Subgroup comparison of pH

Subgroup	pH	P-value
First rhythm		
non-Shockable (N=1504)	6.97 ± 0.16	<0.001
Shockable (N=207)	7.06 ± 0.17	
Location		
Home (N=1315)	6.97 ± 0.16	<0.001
Public place (N=396)	7.01 ± 0.17	
Witness		
No (N=1253)	6.97 ± 0.16	<0.001
Yes (N=458)	7.03 ± 0.17	
Bystander CPR		
No (N=1340)	6.98 ± 0.17	0.744
Yes(N=371)	6.99 ± 0.17	

Figure 1 ROC curve and best cutoff

Conclusions:

Initial blood pH on arrival of ED, **age**, **shockable rhythm** and **witness** of collapse were independent prognostic factors of neurological outcome after OHCA. Blood gas analysis upon arrival of ED may provide additional information about prognosis of patients with OHCA.