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Effects of witness status and time to cardiopulmonary resuscitation by emergency medical services on neurological outcomes in out-of-hospital cardiac arrest patients with non-shockable rhythm

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Background: Data on the effects of witness status and time from an emergency call to initiation of cardiopulmonary resuscitation (CPR) by emergency medical service (EMS) providers on neurological outcome in out-of-hospital cardiac arrest (OHCA) patients with non-shockable rhythm according to the first documented rhythm are limited.

Purpose: We aimed to determine the effects of witness status and time from an emergency call to CPR initiation by EMS providers on neurologically intact survival in OHCA patients according to the type of non-shockable rhythm (pulseless electrical activity [PEA] and asystole).

Methods: We analysed the records of 583,431 adult OHCA patients with non-shockable rhythm (191,905 bystander-witnessed arrest and 391,526 unwitnessed arrest). Data were derived from the prospectively recorded All-Japan OHCA registry between 2011 and 2016. Call to EMS-CPR interval was defined as the time from an emergency call to CPR initiation by EMS providers. The primary outcome was 1-month neurologically intact survival (cerebral performance category 1 or 2; CPC 1–2) and secondary outcome was presence of PEA.

Results: The rates of 1-month CPC 1–2 were 1.21% (2,326/191,905) for bystander-witnessed arrest and 0.24% (959/391,526) for unwitnessed arrest. When divided into 4 groups based on witness status and initial documented rhythm, these rates were 2.42% (1,869/77,190) for bystander-witnessed arrest with PEA (group A), 0.40% (457/114,715) for bystander-witnessed arrest with asystole (group B), 1.51% (679/44,926) for unwitnessed arrest with PEA (group C) and 0.08% (280/346,600) for unwitnessed arrest with asystole (group D). Multivariate logistic regression analysis revealed each 1-min delay of Call to EMS-CPR interval to be significantly associated with decreased chances of 1-month CPC 1–2 for groups A, B and D (adjusted odds ratio [OR]: 0.95, 0.91 and 0.96, respectively; 95% confidence interval [CI]: 0.93–0.96, 0.88–0.94 and 0.93–0.99, respectively). However, for group C, there was no significant relationship between these variables (adjusted OR: 1.00; 95% CI: 0.98–1.02). The proportion of PEA was 40.2% (77,190/191,905) for bystander-witnessed arrest and 11.5% (44,926/391,526) for unwitnessed arrest. Multivariate logistic regression analysis revealed that, as Call to EMS-CPR interval lengthened (per 1-min delay), the number of OHCA patients with PEA decreased for bystander-witnessed arrest (adjusted OR: 0.94; 95% CI: 0.93–0.94) and for unwitnessed arrest (adjusted OR: 0.96; 95% CI: 0.96–0.97).

Conclusions: The 1-month CPC 1–2 rate differed by witness status and initial documented rhythm in OHCA patients with non-shockable rhythm. Shortening of Call to EMS-CPR interval is crucial for improving 1-month CPC 1–2 rate and sustaining PEA, particularly in bystander-witnessed arrest.