Impact of the number of citizens officially certified for government-organized civilian cardiopulmonary resuscitation courses on the prognosis for patients with out-of-hospital cardiac arrest in Japan

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Background: To improve the prognosis of patients with out-of-hospital cardiac arrest (OHCA), the rate of high-quality cardiopulmonary resuscitation (CPR) and immediate use of automated external defibrillators (AEDs) by citizens must be further increased. Japanese government launched certified CPR courses for citizens throughout Japan in 1994 and the number of citizens certified on the course is increasing. However, the impact of the number of citizens officially certified for the courses on the rate of CPR implementation by citizens and the outcomes in patients with OHCA is unclear.

Methods: From a prospective, nationwide, population-based registry of patients with OHCA in Japan, we identified 350,444 patients from 2005 through 2020 with bystander-witnessed OHCA with 72,069 ventricular-fibrillation (VF) and the other non-VF cardiac arrests. The association between the number of citizens certified for the CPR courses and the rate of CPR implementation by citizens throughout Japan was analyzed by Poisson distribution and Cochran–Armitage test for trend. The primary outcome was survival at 1 month. The secondary outcomes were favorable neurologic outcome at 1 month. The associations between the CPR attempted by citizens [categorized into three (chest-compression-only CPR, chest compression with rescue breathing, and use of AEDs with chest compression and rescue breathing)] and outcomes were determined by multivariable mixed logistic regression analyses.

Results: Cumulative number of citizens certified for the CPR courses increased from 717,808 in 2005 to 34,938,322 in 2020, which reached to 27.8% of total Japanese population. Annual course receivers were also linearly increased during the period (Incidence Rate Ratios 1.03, p<0.001). Similarly, the rate of patients receiving CPR by citizens increased linearly from 40.6% in 2005 to 56.8% in 2020 (P for trend<0.001). In the multivariable mixed logistic regression analyses, higher CPR activity by citizens were significantly associated with better 1-year survival in both VF and non-VF patients even after adjusted for covariates [VF = chest compression: odds ratio (OR) 1.17; 95% confidence interval (CI) 0.98–1.39; P =0.078; chest compression with rescue breathing: OR 1.22; 95% CI 1.02–1.49; P =0.030; use of AEDs with chest compression and rescue breathing: OR 1.54; 95% CI 1.54–1.92; P <0.001 vs no CPR, non-VF = chest compression: OR 1.19; 95% CI 0.76–1.87; P =0.45; chest compression with rescue breathing: OR 2.26; 95% CI 1.34–3.82; P =0.020 vs non-CPR]. Similar results were also found in neurological outcomes in 1 month.

Conclusions: The rate of CPR implementation by citizens throughout Japan has continuously and linearly increased in these 15 years in proportion to the increase in the number of citizens certified for the government-organized CPR courses. Higher CPR activity by citizens were significantly associated with better 1-year survival and favorable functional status in both VF and non-VF patients.