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External validation of a field termination-of-resuscitation rule for refractory out-of-hospital cardiac arrests in Japan

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Background: A universal basic life support termination-of-resuscitation (BLS-TOR) rule was developed to identify patients with out-of-hospital cardiac arrest (OHCA) eligible for field termination of cardiopulmonary resuscitation (CPR). In Japan, however, emergency medical service (EMS) providers are not allowed field termination of CPR and must transport all patients with OHCA to hospitals, regardless of return of spontaneous circulation (ROSC). Therefore, we previously developed a Japanese TOR (JP-TOR) rule in the field for refractory OHCAs using data from the All-Japan Utstein registry between 2011 and 2015, when CPR was performed according to the 2010 guidelines. The JP-TOR rule recommends CPR termination when patients meet all the following criteria: initial asystole, unwitnessed arrest, age ≥81 years, no bystander interventions before EMS arrival, and no ROSC after EMS-initiated CPR for 14 min.

Purpose: To validate the JP-TOR rule using more recent data where CPR was performed according to the 2015 guidelines, comparing the relevance of JP-TOR rule with the BLS-TOR rule, which consists of the following criteria: no prehospital ROSC after 6-min EMS-initiated CPR, arrest unwitnessed by EMS providers, and no shock received.

Methods: We analysed the records of 242,184 patients (age ≥18 years) who experienced OHCA treated by EMS providers. Data were obtained from a prospectively recorded Japanese nationwide Utstein-style database from 2016 to 2017. The primary endpoints were specificity and positive predictive value (PPV) for predicting the 1-month mortality after OHCA with the JP-TOR and BLS-TOR rules.

Results: The overall 1-month survival rate was 5.3% (12,847/242,184). The proportions of patients with OHCA fulfilled the JP-TOR and BLS-TOR criteria were 10.4% and 89.3%, respectively. The specificity and PPV of the JP-TOR and BLS-TOR rules for predicting 1-month mortality were 99.5% (95% confidence interval [CI], 99.4%–99.5%) and 99.8% (95% CI, 99.7%–99.8%) and 44.7% (95% CI, 43.8%–45.5%) and 96.7% (95% CI, 96.6%–96.8%), respectively.

Conclusions: The JP-TOR rule for EMS providers treating patients with OHCA in the field was successfully validated using more recent data from a Japanese registry where CPR was performed according to the 2015 guidelines. The JP-TOR rule was superior to the BLS-TOR rule in Japanese EMS systems, having both high specificity and PPV of >99% for predicting 1-month mortality. The JP-TOR rule may help EMS providers decide whether to terminate resuscitation efforts for unresuscitable patients with OHCA in the field. Prospective validation studies and establishment of prehospital EMS protocol are required before implementing this rule in Japan.