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Duration of resuscitation efforts and survival after out-of-hospital cardiac arrest: an observational study

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Background: One of the biggest challenges facing emergency medical services (EMS) personnel or clinicians is the decision about when to stop resuscitation efforts for out-of-hospital cardiac arrest (OHCA) patients in the field. The 2010 guidelines for cardiopulmonary resuscitation (CPR) have not directly addressed the appropriate duration of resuscitation efforts before termination of CPR.

Purpose: We aimed to determine the relation between duration of prehospital CPR by EMS personnel and survival after OHCA.

Methods: We analysed the records of 17,238 OHCA patients (age, ≥18 years) who achieved return of spontaneous circulation (ROSC) before arrival at the hospital. Data were obtained from a prospectively recorded national Utstein-style database from 2011 to 2012. The time from initiation of CPR by EMS personnel to prehospital ROSC (CPR-to-ROSC time) was calculated to estimate the appropriate duration of prehospital CPR efforts by EMS personnel. The endpoints were 1-month survival and 1-month favourable neurological outcomes (cerebral performance category scale, category 1 or 2; CPC 1–2).

Results: Of 17,238 OHCA patients, 6347 (36.8%) survived at 1 month after OHCA and 3771 (21.8%) achieved 1-month CPC 1–2. The CPR-to-ROSC time was significantly shorter in 1-month survivors than in non-survivors (median, 10 min [interquartile range (IQR) 6–16] vs. 17 min [IQR 11–24], P<0.0001). Moreover, the CPR-to-ROSC time was significantly shorter in 1-month survivors with CPC 1–2 than in those with CPC 3–5 (median, 8 min [IQR 5–13] vs. 16 min [IQR 10–23], P<0.0001). Logistic regression analyses revealed that the CPR-to-ROSC time was independently associated with 1-month CPC 1–2 in the unadjusted model (unadjusted odds ratio 0.898; 95% confidence interval (CI) 0.893–0.903) and in the adjusted model for prehospital covariates (adjusted odds ratio 0.915; 95% CI 0.909–0.920). Analyses of the cumulative proportion of 1-month survivors by CPR-to-ROSC time showed that 99.1% of all survivors and 99.2% of survivors with CPC 1–2 achieved ROSC within 35 minutes of CPR, 91.3% of all survivors achieved ROSC within 22 minutes, and 90.0% of survivors with CPC 1–2 achieved ROSC within 19 minutes. No patient with a CPR-to-ROSC time of ≥53 minutes survived 1 month after OHCA.

Conclusions: The probability of survival with CPC 1–2 declines with each minute of CPR after OHCA. To obtain a ≥99% cumulative proportion of 1-month survivors with favourable neurological outcomes, at least 35 minutes of prehospital resuscitation efforts by EMS personnel are required.