

Population Density, Call-response Interval, and Survival of Out-of-hospital Cardiac Arrest

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(1) Aim: The present study investigated the relationship between population density, time between emergency call and ambulance arrival, and survival of out-of-hospital cardiac arrest (OHCA), using the All-Japan Utstein-style registry database, coupled with geographic information system data.

(2) Methods: We examined data from 101,287 bystander-witnessed OHCA patients who received emergency medical services (EMS) through 4,729 ambulatory centers in Japan between 2005 and 2007. Latitudes and longitudes of each center were determined with address-match geocoding, and linked with the Population Census data using ArcGIS version 9.3.1. The endpoints were 1-month survival and neurologically favorable 1-month survival defined as Glasgow-Pittsburgh cerebral performance categories 1 or 2.

(3) Results: Overall 1-month survival was 7.8%. Neurologically favorable 1-month survival was

3.6%. In very low-density (<250/km²) and very high-density (>10,000/km²) areas, the mean call-response intervals were 9.3 and 6.2 minutes, 1-month survival rates were 5.4% and 9.1%, and neurologically favorable 1-month survival rates were 2.7% and 4.3%, respectively. Logistic regression showed that patients in very high-density areas had a significantly higher survival rate (odds ratio (OR), 1.64; 95% confidence interval (CI), 1.44 - 1.87; p<0.01) and neurologically favorable 1-month survival rate (OR, 1.47; 95%CI, 1.22 - 1.77; p<0.01) compared with those in very low-density areas.

(4) Discussion: Living in a low-density area was associated with an independent risk of delay in ambulance response, and a low survival rate in cases of OHCA. Distribution of EMS centers according to population size leads to inequality in health outcomes between urban and rural areas.

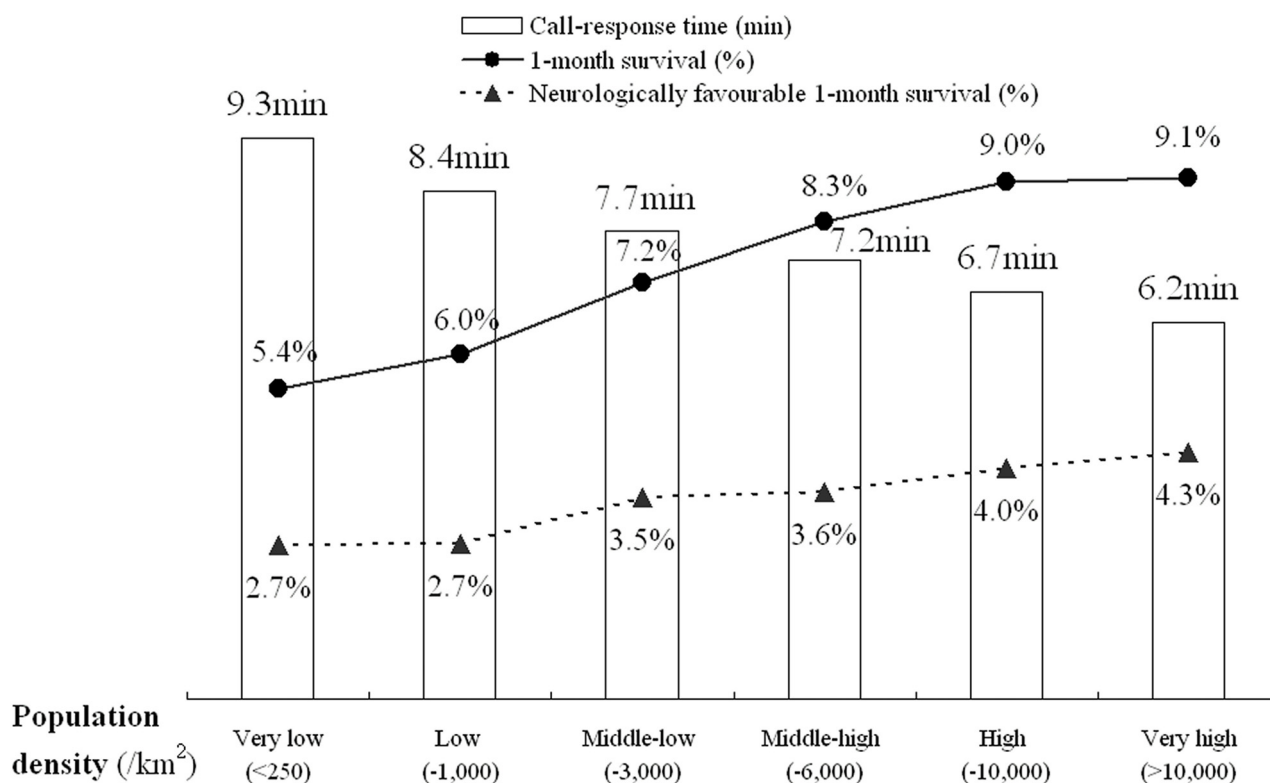


Fig. 1: Population density, call-response interval and survival of out-of-hospital cardiac arrest