The Role of 'Place' in Out-of-Hospital Cardiac Arrest Incidence and Outcome

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BACKGROUND

It is known that patient-level factors significantly affect out-of-hospital cardiac arrest (OHCA) incidence and outcome however, area-level variation is often observed. The aim of this study was to investigate if area-level grouping or area-level characteristics could be identified that influence OHCA incidence and outcome, and their impact quantified.

METHODS

This study used data from existing national and international sources. OHCA cases from the Irish OHCA registry were geocoded to Irish Electoral Division (ED) level and combined with national census data, and area-level deprivation data, and classified by urban-rural category. The impact of urban-rural grouping was quantified using multilevel linear regression. To adjust for the impact of a small number of cases at ED-level, and the spatial properties of EDs, Bayesian conditional autoregression (CAR) was used to estimate the relative risk of OHCA.

Swedish and Irish registry data was compared using logistic regression to identify the predictors of outcome, and to quantify variation measured.

Finally, multilevel logistic regression analyses of outcomes in international airports was performed to allow for a differing effect of predictor variables between countries.

RESULTS

In Ireland, the incidence of OHCA where resuscitation was performed was higher in City and Town EDs (51/100,000 population per year; 95% confidence interval [CI], 46 to 55) than in Rural EDs (35/100,000 population per year; 95% CI, 28 to 42). However, urban-rural grouping accounted for only 2% of variation. Bayesian CAR modelling showed that a one-point increase in relative deprivation was associated with an 11% increased risk of OHCA that occurred at home.

Logistic regression analysis of the Utstein comparator group (adults, bystander-witnessed, initial shockable rhythm, presumed medical cause) explained only 17% of outcome variation between Sweden and Ireland, with a 4-fold 'country effect' in favour of Sweden.

In international airports, 32% of patients survived to hospital discharge. Country-level differences in survival in international airports were also evident, particularly when adjusted for age, gender, and attempted bystander defibrillation (median odds ratio 3.0; 95% credible interval, 1.6 to 14.3]).

CONCLUSIONS

Findings did not support changes in provision of resuscitation services based on area-level differences, and only a small proportion of between-country variation was explained by routinely collected variables. As patient-level factors are likely to explain the greater proportion of variation in OHCA outcome, it is recommended that there is international collaboration to ensure comparability of data collection and data interpretation, and to promote comprehensive case capture and maximise data quality. It is also recommended that more explanatory variables are incorporated into OHCA registry data collection.

Finally, even when OHCA occurred in the 'ideal' place, less than one in three patients survived. Discussion on the inevitability of cardiac arrest as part of life, the prospect of patient survival and, the need for innovative thinking to make sure that pre-hospital resuscitation is initiated efficiently and effectively are all important factors to consider when involving the public in community resuscitation planning.