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New method predicts optimal number and location of AEDs

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A new method to predict the optimal number and location of automated external defibrillators (AEDs) was presented at ESC Congress today by Dr Benjamin Dahan from France. According to the predictive method, Paris needs 350 AEDs located in public places for optimal prevention of out of hospital cardiac arrest (OHCA).

Dr Dahan said: "Out of hospital cardiac arrest is a major public health issue with an annual incidence ranging between 50 and 100 per 100 000 in the general population in Europe and North America. Because the vast majority of OHCA starts with ventricular fibrillation, early defibrillation and cardiopulmonary resuscitation are the only way to save the victim. Every minute of delay prior to defibrillation, decreases survival by 10%."

He added: "Except for a few recent encouraging reports, survival after OHCA remains poor at 7 to 8%. Survival has not improved over time despite decades of research and major financial investments in resuscitation. In the last two decades, public access defibrillation has been developed with a large deployment of AEDs for lay rescuers."

Dr Dahan continued: "However, although the benefits of AEDs are undeniable, public utilisation rates remain very low, and thus the effectiveness of such programmes could be dramatically improved. One of the key issues is the disparity between the location of AEDs and OHCAs. To optimise AED deployment, policy makers have to consider many scientific, geographic, societal and political issues. Systematic

scientific approaches are needed to improve the cost-effectiveness of public access to defibrillation programmes."

The goal of the current study was to determine the optimal number of AED to be deployed in Paris. The researchers conducted a systematic analysis of all OHCA locations during 2000-2010. They then simulated different scenarios to evaluate how useful AEDs would have been to the OHCA cases such as comparing the effect of distance between AEDs, from 200 metres to 2000 metres.

The researchers also tested the scenario of having AEDs in all well known public areas including subway stations, post offices, pharmacies and bike sharing stations. Using road network information and a geographic information system (GIS), they calculated the median distance (in metres) between OHCAs and potential AED locations. The plot distribution was modelled using a non-linear regression model (see figure).

Dr Dahan said: "The inflection point of the trendline in the figure represents the optimal number of AEDs. Benefit for additional AEDs is poorer. We estimated that in Paris, the optimal number of AEDs located in public places was approximately 350."

He added: "Geographic optimisation modelling could be used for many urban areas, taking into account population density, population movements, urbanisation and other demographic data. This approach brings scientific rigour to the process of determining the optimal number of AEDs required in different urban areas."

Dr Dahan continued: "The expense of deploying AEDs is an important issue, with each device costing approximately €1000, plus maintenance. AEDs are underused because lay rescuers do not know where they are. Our approach to modelling the number and location of AEDs should

dramatically improve cost-effectiveness by avoiding an excess number and ensuring they are accessible. Previous research has shown that efficient public access defibrillation programmes may improve the number of OHCA survivors by 100% (1).

He concluded: "In the current financial climate it is essential to avoid wasting resources. Our modelling ensures that the ideal number of AEDs can be deployed at the optimal location. This could be the change needed to improve the survival rates of out of hospital cardiac arrest."

More information: (1) Hallstrom AP, Ornato JP, Weisfeldt M, Travers A, Christenson J, McBurnie MA, Zalenski R, Becker LB, Schron EB, Proschan M; Public Access Defibrillation Trial Investigators. Public-access defibrillation and survival after out-of-hospital cardiac arrest. *N Engl J Med*. 2004;351(7):637-646.

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