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Letter to the Editor

Association between railway station characteristics and the annual incidence of automated external defibrillator use in the station: Analysis of data from the Yamanote Line in Tokyo

To the Editor,

Bystander-automated external defibrillator (AED) use is associated with improved clinical outcomes in out-of-hospital cardiac arrest (OHCA).[1] Therefore, AED have been introduced in many public places in developed countries.[2] Nevertheless, they are rarely used, even when readily available; thus, guidelines recommend AED placement in communities with people at risk for OHCA.[3]

The annual incidence of OHCA is lower in public places than in patients' homes, but railway stations are the most prevalent public location of OHCA.[4] The age of individuals affected in stations may be lower than that of those affected in other settings (e.g., residences, office complexes).[5] To our knowledge, no study has evaluated the association between station characteristics and the frequency of AED use to discuss the most efficient AED placement strategy in railway stations. We aimed to examine whether railway station characteristics could predict the annual incidence of AED use in stations, using data from stations in the Yamanote Line in Tokyo, Japan.

We evaluated all instances of AED use in 29 stations in the Yamanote Line between 1 December 2015 and 31 November 2016. We modelled multiple linear regression to predict the annual incidence of AED use by two railway station characteristics: (i) the number of passengers passing through the station daily (as an indicator of human movement into and out of the station) and (ii) the number of lines connecting each station (representing human movement within the station).

During the study period, the number of daily passengers in the 29 stations ranged between 41,736 and 760,043, whereas the number of lines connecting at each station ranged between 0 and 21. Forty-four annual AED uses were observed (Fig. 1).

Multiple linear regression showed that the number of daily passengers and the number of lines connecting at each station significantly predicted the annual incidence of AED use [$\beta = 0.06$ (95% CI, 0.03−0.09; P0.01) and $\beta = 0.27$ (95% CI, 0.15−0.39; $P < 0.001$), respectively]. These two predictors explained 83% of the variation in the annual incidence of AED use ($R^2 = 0.83$).

This is the first study to investigate the association of station characteristics with the frequency of AED use for the most efficient AED placement strategy in railway stations. Two easily obtainable variables—daily passengers and the number of lines connecting to each station—successfully predicted the annual incidence of AED use.

Theoretically, the risk of OHCA should increase with an increasing number of railway passengers. In addition, we found that the number of lines connecting each station played a significant role in predicting the annual incidence of AED use. A potential explanation is that multiple connections increase foot traffic, which subsequently increases the chance of OHCA among at-risk travellers.

In developed countries, including Japan, there are still many trains and underground stations without AED. However, it may not be realistic to place AED in all stations irrespective of station characteristics. Consequently, a more efficient AED placement strategy is needed. Our results suggest that both the number of daily passengers and the number of connections could predict the annual incidence of

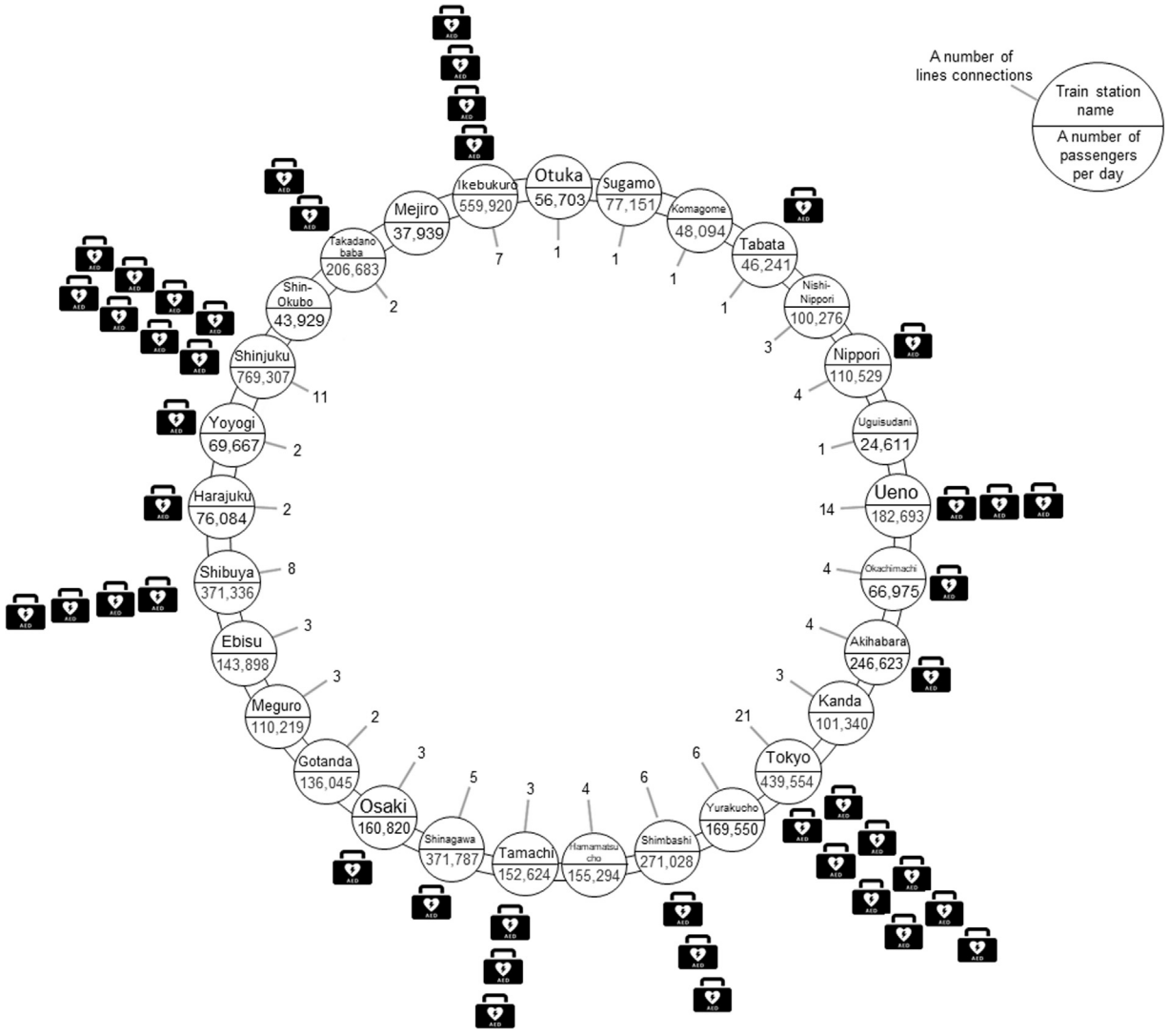

Fig. 1 – Yamanote line stations. Train station names, the number of passengers per day, the number of line connections, and automated external defibrillator (AED) uses per year are illustrated.

AED use in the station, and therefore should be considered when determining AED placement priority.

Conflicts of interest

None.

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