The importance of AED placement and accessibility on chance of bystander defibrillation of out-of-hospital cardiac arrest

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BACKGROUND: Despite a marked increase in the dissemination of publicly available automated external defibrillators (AEDs), defibrillation of out-of-hospital cardiac arrests (OHCAs) prior to arrival of the EMS has remained low, around 2%–4%. AEDs are frequently inaccessible when most OHCA occur (e.g. outside normal working hours), however, knowledge of the impact of inaccessibility of AEDs on bystander defibrillation and survival remains sparse.

PURPOSE: To examine how AED placement and AED accessibility affect bystander defibrillation and survival in OHCA.

METHODS: We identified all OHCAs registered by the physician manned Copenhagen Mobile Emergency Care Unit (2008-2016), and all publicly available registered AEDs in Copenhagen (2007-2016) from the Danish AED Network. All OHCAs and AEDs were geocoded, and the route distances between OHCAs and AEDs were calculated. A covered OHCA was defined as an OHCA with an AED located $\leq 200\text{m}$, and AED accessibility was assessed for every AED at the time of OHCA. AED coverage according to type of AED location as well as the likelihood of bystander defibrillation and 30-day survival were examined.

RESULTS

- 1830 registered AEDs (2008 through 2016)
- Of 2500 OHCAs, 22.6% (n=566) were covered by an AED $\leq 200\text{m}$ route distance

Table 1. Loss of AED coverage, due to limited AED accessibility, according to AED location

AED location	All OHCAs located $\leq 200\text{m}$ of an AED, n (%)	OHCAs located $\leq 200\text{m}$ of accessible AEDs, n (%)	Coverage loss due to AED inaccessibility, n (%)
Total	566 (100.0)	276 (48.8)	290 (51.2)
Transportation facility	12 (2.1)	10 (83.3)	2 (16.7)
Residential settings	38 (6.7)	31 (81.6)	7 (18.4)
Church/community centre	5 (0.9)	4 (80.0)	1 (20.0)
Hotels and conference venues	13 (2.3)	9 (69.2)	4 (30.8)
Sports facility	73 (12.9)	42 (57.5)	31 (42.5)
Other	37 (6.5)	20 (54.1)	17 (46.0)
Shopping malls/shops/banks	45 (8.0)	24 (53.3)	21 (46.7)
Attractions/recreational areas	21 (3.7)	11 (52.4)	10 (47.6)
Companies/offices	105 (18.6)	52 (49.5)	53 (50.5)
Public building	36 (6.4)	16 (44.4)	20 (55.6)
Union/association	35 (6.2)	12 (34.3)	23 (65.7)
School/education facility	75 (13.3)	25 (33.3)	50 (66.7)
Health clinics	71 (12.5)	20 (28.2)	51 (71.8)

Figure 1. Bystander defibrillation and 30-day survival among OHCAs covered by an accessible AED vs. an inaccessible AED

(A) all OHCAs (n=566). *P < 0.05 for bystander defibrillation. †P < 0.05 for 30-day survival; however, 38 OHCAs had missing information on survival status; therefore, the percentages for survival data are based on n=258 for accessible AEDs, and n=270 for inaccessible AEDs. (B) a subgroup of witnessed OHCAs with shockable heart rhythm (n=147). ‡P < 0.05 for bystander defibrillation. §P < 0.05 for 30-day survival; however, 10 OHCAs had missing information on survival status; therefore, the percentages for survival data are based on n=78 for accessible AEDs, and n=59 for inaccessible AEDs.

CONCLUSIONS

AED accessibility was highly dependent on AED location. The chance of bystander defibrillation was tripled, and 30-day survival almost doubled, when the nearest AED was accessible, compared to inaccessible, at the time of OHCA.