



Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation



EUROPEAN
RESUSCITATION
COUNCIL

Letter to the Editor

Can drones improve survival rates in mountain areas, providing automated external defibrillators?

Sir,

Timely cardiopulmonary resuscitation (CPR) and defibrillation by first responders or bystanders is strongly associated with survival. A recently published retrospective analysis of adult primary out-of-hospital cardiac arrest (OHCA) in the State of Victoria (Australia) reported that between 2000–2002 and 2015–2017 9129 of 10,451 (87.4%) patients with an initially shockable rhythm were defibrillated by paramedics, 796 (7.6%) were initially defibrillated by first responders and 526 (5.0%) by bystanders. Between the two time periods the proportion of initially shockable arrests defibrillated by first responders and bystanders increased from 3.8% to 8.2% and from 2.0% to 11.2%, respectively ($p < 0.001$), whilst the proportion of cases initially shocked by paramedics declined.¹ During the same time period, survival to hospital discharge increased from 11.6% to 28.8% for patients initially defibrillated by paramedics, from 10.5% to 37.8% for patients defibrillated by first responders, and from 6.7% to 55.5% for patients defibrillated by bystanders (p -trend < 0.001 for all). These results underline that timely CPR and defibrillation are essential for improving chances of survival from primary OHCA.

The main reason for this excellent result may lay in the fact that Victoria disposes of a two-tiered emergency medical system (EMS) with basic life support (BLS) trained first responders and advanced life support paramedics, which are supported by an impressively tight public network of estimated 19,000 automated external defibrillators (AED).

In contrast to this study, a retrospective survey of primary OHCA patients in the Austrian Alps (2005–2015) showed that only 136 of 781 (17%) received CPR with an AED.² Mountains and remote areas are not suitable for a tight public network of AED and timely response to OHCA is rare due to sparsely populated areas, few bystanders and AEDs.³ Only few survivors from primary OHCA have been reported in literature and mortality from primary OHCA in mountains and remote areas may remain high with present day logistics.

In 2017, Boutilier et al. hypothesized that drones may deliver an AED to the site of an OHCA for bystander use. An optimized drone network designed with the aid of a mathematical model could substantially reduce the AED delivery time.⁴ Specifically, in this study it was estimated that the AED arrival time could be reduced by almost 7 min in an urban region and by more than 10 min in a rural area of Toronto (Canada).

Defibrillators have been advocated for popular ski areas, busy mountain huts, and for mass-events. The European Resuscitation Council recommends to establish an AED in location where an OHCA

is likely to happen on average every five years. Strengthening the chain of survival in OHCA further by intensifying BLS training and establishing a drone network will likely improve CPR initiated by first responders and bystanders and reduce time to first defibrillation. Drone networks for AEDs may be a gamechanger for primary OHCA in sparsely populated areas and have the potential to improve neurologically intact survival in mountain but also in urban areas.

Conflict of interest

None of the authors have a conflict of interest regarding this letter.

REFERENCES

1. Nehme Z, Andrew E, Bernard S, Haskins B, Smith K. Trends in survival from out-of-hospital cardiac arrests defibrillated by paramedics, first responders and bystanders. *Resuscitation* 2019;143:85–91.
2. Ströhle M, Vögele A, Neuhauser P, Rauch S, Brugger H, Paal P. Sudden cardiac arrest and cardiopulmonary resuscitation with automated external defibrillator in the austrian mountains: a retrospective study. *High Alt Med Biol* 2019Oct; doi:<http://dx.doi.org/10.1089/ham.2018.0134> [Epub ahead of print] PMID: 31618064.
3. Ströhle M, Paal P, Strapazzon G, Avancini G, Procter E, Brugger H. Defibrillation in rural areas. *Am J Emerg Med* 2014;32:1408–12.
4. Boutilier JJ, Brooks SC, Janmohamed A, et al. Optimizing a drone network to deliver automated external defibrillators. *Circulation* 2017;135:2454–65.

Anna Vögele

*Institute of Mountain Emergency Medicine, EURAC Research,
Drususallee 1, 39100 Bolzano, Italy*

Mathias Ströhle*

*Department of General and Surgical Critical Care Medicine, Medical
University of Innsbruck, Anichstraße 35, 6020 Innsbruck, Austria*

Peter Paal^{a,b}

^a*Department of Anaesthesiology and Intensive Care, Hospitallers
Brothers Hospital, Paracelsus Medical University, Kajetanerplatz 1,
5020 Salzburg, Austria*

^b*The International Commission of Mountain Emergency Medicine
(ICAR MEDCOM), 8302 Klotten, Switzerland*

Simon Rauch
*Institute of Mountain Emergency Medicine, EURAC Research,
Drususallee 1, 39100 Bolzano, Italy*

Hermann Brugger^{a,b}

^a*Institute of Mountain Emergency Medicine, EURAC Research,
Drususallee 1, 39100 Bolzano, Italy*

^b*The International Commission of Mountain Emergency Medicine
(ICAR MEDCOM), 8302 Klotten, Switzerland*

* Corresponding author.

E-mail addresses: anna.voegele@eurac.edu (A. Vögele)
mathias.stroehle@tirol-kliniken.at (M. Ströhle)
peter.paal@icloud.com (P. Paal) simon.rauch@eurac.edu
(S. Rauch) hermann.brugger@eurac.edu (H. Brugger).

Available online xxx

<http://dx.doi.org/10.1016/j.resuscitation.2019.11.017>

© 2019 Elsevier B.V. All rights reserved.