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Commentary

Importance of first responder systems in out-of-hospital cardiac arrest raises more questions

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Early high-quality cardiopulmonary resuscitation (CPR) and defibrillation consist of links in the “*chain of survival*” for patients with cardiac arrest [1]. To facilitate these interventions in the prehospital settings, many places implemented first responder systems (e.g., dispatch of firefighters, police officers, or volunteer laypeople) to rapidly initiate prehospital care before medical personnel arrival, and many have reported benefits from this implementation [2–4]. Most prior reports about first responder systems come from a single nation or region [2–4].

In *The Lancet Regional Health – Europe*, Oving et al. described the implementation of first responder systems in multiple European regions and examined the associations between regional implementation of first responder systems and patient outcomes after out-of-hospital cardiac arrest (OHCA) [5]. This study showed that 17 of the included 27 European regions have first responder systems [5]. The key findings were (1) regions with first responder systems had higher rates of prehospital return of spontaneous circulation (ROSC) and survival to hospital discharge compared to regions without first responder systems; (2) regions with more than one first responder systems had higher rates of ROSC and survival to hospital discharge than regions with one first responder system [5]. The findings support prior studies that concluded that first responder systems improved patient outcomes, but are more generalizable because of the geographically diverse European regions included in this study. A recent report from the International Liaison Committee on Resuscitation (ILCOR) showed large variation in patient outcomes (6.6-fold difference in survival to hospital discharge or 30-days survival) across 16 national and regional OHCA registries in the United States, Europe, Asia, and Oceania [6]. The implementation of first responder systems may partly explain this outcome variation across geographic regions.

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This work by Oving et al. introduced several important questions for further study. First, the authors acknowledged as one of limitations that this study used aggregate data without patient-level data and was therefore unable to adjust for patient-level confounding factors (e.g., age, comorbidities, initial rhythms, and receiving layperson CPR) and clustering of patients within receiving hospitals [5]. Future research should investigate the effect size of first responder systems on patient outcomes after OHCA in diverse geographic regions, accounting for these confounding factors and clustering in order to quantify the impact of first responder systems. Second, to evaluate and improve performance of first responder systems, it would be important to quantitatively measure the performance of first responder systems. These potential benchmarks include an interval between dispatch and first responder CPR/shock delivery, proportion of cases with dispatched first responders among emergency medical services (EMS)-assessed OHCA, and proportion of patients who received first responder CPR among EMS-resuscitated OHCA. Development of an international consensus on first responder systems metrics would facilitate evaluation, comparison, and improvement of first responder systems across regions and nations. Third, this study noted that first responder systems are very heterogeneous (i.e., firefighters, police officers, citizen responders, off duty EMS providers, and/or taxi drivers), raising the question whether any specific types of first responder systems are more or less associated with favourable patient outcomes [5]. More importantly, if types of first responder systems matter, the reasons why one system is better than others need to be answered. Fourth, relative differences in prehospital ROSC rate were smaller than differences in rate of survival to hospital discharge between systems [5]. As the authors discussed, this may reflect difference in prehospital acute resuscitation care and post-resuscitation care at receiving hospitals [5]. A recent observational study of in-hospital cardiac arrest using the Get-With-The-Guidelines–Resuscitation registry in the United States reported that hospital-level acute resuscitation survival (ROSC \geq 20 min) is not correlated with hospitals-level post-resuscitation survival (survival to hospital discharge among patients achieving ROSC) [7]. The present data suggest a similar pattern for OHCA; i.e. region-level prehospital ROSC may not be correlated with region-level post-resuscitation survival. This disconnect between short-term and long-term outcomes needs further investigations and unpacking what features of high-performing communities on OHCA are most important to develop optimal systems of care.

In summary, essential elements of regional systems of care for OHCA are multifaceted and include each link in the “*chain of survival*” (laypeople, dispatchers, first responders, EMS providers, and

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receiving hospitals) [1]. This study highlighted the role of first responder systems on OHCA using data from diverse geographic regions in Europe and generated important research questions in field of prehospital resuscitation care.

Declaration of Competing Interests

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