Long-term trends in survival from out-of-hospital cardiac arrest according to who provided the first shock: a 17-year observational study.

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Purpose

Improvements in survival from out-of-hospital cardiac arrest (OHCA) are often attributed to early defibrillation by first responders or bystanders. However, it is unclear if survival outcomes are also improving over time for patients shocked by first responders and bystanders.

Methods

Between 2000 and 2016, we included consecutive adult (aged ≥ 16 years) OHCA patients from the Victorian Ambulance Cardiac Arrest Registry who presented to emergency medical services (EMS) with an initial shockable rhythm and received a resuscitation attempt. Cases witnessed by EMS were excluded. Unadjusted trends in survival to hospital discharge were assessed using a non-parametric test for trend. Adjusted trends in survival were assessed using multivariable logistic regression.

Results

Sample population

Of the 9,872 initial shockable arrests, 734 (7.4%) and 460 (4.7%) were first shocked by first responders and bystanders, respectively. The baseline characteristics of patients are shown in Table 1. Arrests shocked by bystanders were more often younger, male, occurred in public, were bystander witnessed and received bystander CPR. The proportion of patients first shocked by first responders increased from 4.7% in 2000 to 7.6% in 2016 (p-trend <0.001). First shocks by bystanders also increased over the same period, from 1.3% to 12.3% (p-trend <0.001).

Table 1: Baseline characteristics of OHCA patients according to who provided the first shock.

	Paramedic	First responder	Bystander	p-value
Age, median	67 years	68 years	65 years	0.049
Male sex	80%	82%	86%	0.003
Cardiac aetiology	96%	96%	97%	0.63
Bystander witnessed	76%	77%	88%	<0.001
Bystander CPR	64%	70%	95%	<0.001
Public location	33%	35%	70%	<0.001
EMS response time, median	8 mins	7 mins	8 mins	<0.001
Metropolitan region	73%	95%	76%	<0.001

Figure 1: Unadjusted rates of survival to hospital discharge over time according to who provided the first shock.

Unadjusted survival trends

Overall, unadjusted survival to hospital discharge varied according to who shocked first: 21.0% for paramedics; 31.3% for first responders, and; 44.1% for bystanders ($p<0.001$). Figure 1 shows that between 2000 and 2016, survival increased for all groups: from 15.7% to 29.8% for patients first shocked by paramedics; from 4.8% to 37.0% for patients first shocked by first responders, and; from 16.7% to 52.1% for patients first shocked by bystanders ($p<0.001$ for all trends).

Adjusted survival trends

After adjustment for age, sex, arrest aetiology, witness status, bystander CPR, public location, EMS response time, and metropolitan region, the odds of survival increased by 8.5% per year (OR 1.09, 95% CI: 1.07, 1.10) for patients first shocked by paramedics, 8.4% per year (OR 1.08, 95% CI: 1.04, 1.13) for patients first shocked by first responders, and 11.5% per year (OR 1.11, 95% CI: 1.05, 1.18) for patients shocked by bystanders.

Conclusion

Although early defibrillation by bystanders and first responders is helping to improve overall survival from OHCA, trends in survival are also increasing independent of these initiatives. Patients shocked by bystanders are observing the highest growth in survival outcomes over time. The factors contributing to this growth in survival warrants further investigation.