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Clinical paper

Characteristics and outcomes of young adults who suffered an out-of-hospital cardiac arrest (OHCA)☆,☆☆,★

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ABSTRACT

Background: There is paucity of data examining the incidence and outcomes of young OHCA adults. The aim of this study is to determine the outcomes and characteristics of young adults who suffered an OHCA and identify factors that are associated with favourable neurologic outcomes.
Methods: All EMS-attended OHCA adults between the ages of 16 and 35 years in the Pan-Asian Resuscitation Outcomes Study (PAROS) registry were analysed. The primary outcome was favourable neurologic outcome (Cerebral Performance Category 1 or 2) at hospital discharge or at 30th day post OHCA if not discharged. Regression analysis was performed to identify factors associated with favourable neurologic outcomes.
Results: 66,780 OHCAs were collected between January 2009 and December 2013; 3244 young OHCAs had resuscitation attempted by emergency medical services (EMS). 56.8% of patients had unwitnessed arrest; 47.9% were of traumatic etiology. 17.2% of patients (95% CI: 15.9–18.5%) had return of spontaneous circulation; 7.8% (95% CI: 6.9–8.8%) survived to one month; 4.6% (95% CI: 4.0–5.4%) survived with favourable neurologic outcomes. Factors associated with favourable neurologic outcomes include witnessed arrest (adjusted RR = 2.42, p-value < 0.0001), bystander CPR (adjusted RR = 1.57, p-value = 0.004), first arrest shockable rhythm (adjusted RR = 27.24, p-value < 0.0001), and cardiac etiology (adjusted RR = 3.99, p-value < 0.0001).
Conclusions: OHCA among young adults are not uncommon. Traumatic OHCA, occurring most frequently in young adults had dismal prognosis. First arrest rhythms of VF/VT/unknown shockable rhythm, cardiac etiology, bystander-witnessed arrest, and bystander CPR were associated with favourable neurological

Objective

This study aims to assess the characteristics and outcomes of young adults who had suffered an OHCA and identify factors that are associated with favourable neurologic outcomes in this group of patients.

Methods

Study population

Included in this study were all EMS-attended OHCA patients of 16–35 years old from the Pan-Asian Resuscitation Outcomes Study (PAROS) registry, which is a prospective, population-based registry of OHCA collected from a network of hospitals and EMS across seven countries, covering a population base of 89 million in the Asia Pacific region. A detailed description of methodology of the PAROS had been previously published.[4]

Outcome measures

The primary outcome of this study was a favourable neurological outcome, defined as a Cerebral Performance Category (CPC) scale score of 1 (good cerebral performance) or 2 (moderate cerebral disability) at hospital discharge or at 30th day post OHCA if not discharged. Other CPC scale scores are 3 (severe cerebral disability), 4 (coma, vegetative state) and 5 (death). Neurological outcome was acquired through clinical records, telephone and in-person interviews.

Secondary outcomes included return of spontaneous circulation (ROSC), 1-month survival, and favourable overall performance. 1-month survival was defined as survival to hospital discharge or survival to 30 days post OHCA, if not discharged. Favourable overall performance was defined as an Overall Performance Category scale score of 1 (good CPC with no or little functional disability) or 2 (moderate CPC or moderate functional disability or a combination of both) at hospital discharge or at 30th day post OHCA, if not discharged.

Results

Between January 2009 and December 2012, a total of 66,780 OHCA cases were collected by PAROS, of which 3333 (5%) were young adults. A total of 3244 OHCA cases satisfied eligibility criteria of the study, of which neurological outcome was available in 3214 cases. Fig. 1 shows the patient flow diagram for young OHCA patients with cardiac etiology, witnessed arrest, and first arrest rhythm of ventricular fibrillation (VF).

Event characteristics and pre-hospital resuscitations

More than half (65.1%) of young adult OHCA cases occurred in males. The mean age (SD) was 27.4 (5.3) years. The etiologies and

Table 1
Etiology and characteristics of out-of-hospital cardiac arrest (OHCA).

Characteristics, n (%)	N = 3244
Etiology	
Cardiac	939 (28.9)
Traumatic	1554 (47.9)
Non-cardiac, non-traumatic	720 (22.2)
Respiratory	65 (2.0)
Electrocution	5 (0.2)
Drowning	58 (1.8)
Other	592 (18.2)
Unknown	31 (1.0)
Time call received at dispatch centre	
Day time (06:00–17:59 hours)	1694 (52.2)
Night time (18:00–06:00 hours)[a]	1550 (47.8)
OHCA occurred at home	745/1582 (47.1)
Witness status	
Not witnessed	1844 (56.8)
Witnessed by EMS	233 (7.2)
Witnessed by bystander	1059 (32.6)
Unknown	108 (3.3)
First documented rhythm	
VF/VT	292 (9.0)
PEA	407 (12.5)
Asystole	1705 (52.6)
Unknown shockable rhythm	58 (1.8)
Unknown unshockable rhythm	665 (20.5)
Unknown	117 (3.6)

VF: ventricular fibrillation; VT: ventricular tachycardia; PEA: pulseless electrical activity.

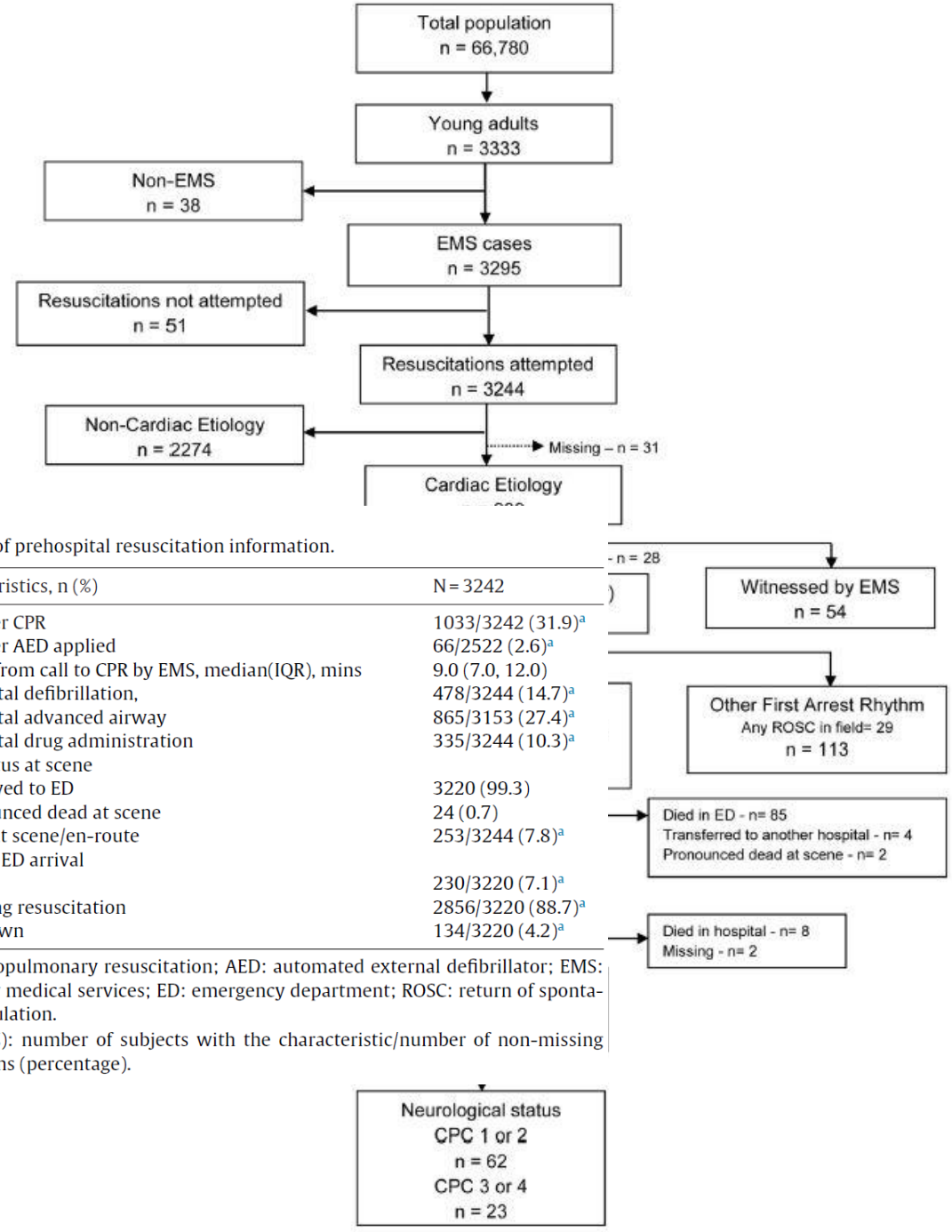

Table 2
Summary of prehospital resuscitation information.

Characteristics, n (%)	N = 3242
Bystander CPR	1033/3242 (31.9)[a]
Bystander AED applied	66/2522 (2.6)[a]
Interval from call to CPR by EMS, median(IQR), mins	9.0 (7.0, 12.0)
Prehospital defibrillation,	478/3244 (14.7)[a]
Prehospital advanced airway	865/3153 (27.4)[a]
Prehospital drug administration	335/3244 (10.3)[a]
Final status at scene	
Conveyed to ED	3220 (99.3)
Pronounced dead at scene	24 (0.7)
ROSC at scene/en-route	253/3244 (7.8)[a]
Status at ED arrival	
ROSC	230/3220 (7.1)[a]
Ongoing resuscitation	2856/3220 (88.7)[a]
Unknown	134/3220 (4.2)[a]

CPR: cardiopulmonary resuscitation; AED: automated external defibrillator; EMS: emergency medical services; ED: emergency department; ROSC: return of spontaneous circulation.

[a] n/m (%): number of subjects with the characteristic/number of non-missing observations (percentage).

[#] Data not available from Tokyo & Aichi

Table 3
Summary of outcomes after out-of-hospital cardiac arrest (OHCA) by etiology.

Outcomes	Cardiac (N = 939)	Traumatic (N = 1554)	Non-cardiac non-traumatic (N = 720)	Total (N = 3244[a])
Hospital admission, n (%), 95% CI	212 (22.6) (20.0, 25.4)	79 (5.1) (4.1, 6.3)	137 (19.0) (16.3, 22.1)	429 (13.2) (12.1, 14.4)
1-month survival, n (%), 95% CI	157 (16.7) (14.5, 19.2)	38 (2.4) (1.8, 3.3)	58 (8.1) (6.3, 10.3)	253 (7.8) (6.9, 8.8)
Favourable neurologic outcome, n (%), 95% CI	111 (11.8) (9.9, 14.0)	15 (1.0) (0.6, 1.6)	24 (3.3) (2.3, 4.9)	150 (4.6) (4.0, 5.4)
Favourable overall performance, n (%), 95% CI	78 (8.3) (6.7, 10.3)	11 (0.7) (0.4, 1.3)	21 (2.9) (1.9, 4.4)	110 (3.4) (2.8, 4.1)

ROSC: return of spontaneous circulation.
[a] Etiology was unknown for 31 cases.

Table 4
Regression analysis of favourable neurological outcomes.

Factors	Unadjusted relative risk (95% CI)	p-value	Adjusted relative risk (95% CI)	p-value
Witness status				
Not witnessed[a]	1 (–, –)	–	1 (–, –)	–
Witnessed by EMS	2.54 (1.21, 5.32)	0.013	1.60 (0.78, 3.28)	0.204
Witnessed by bystander	6.77 (4.50, 10.19)	<0.0001	2.42 (1.59, 3.68)	<0.0001
Unknown witness status	2.46 (0.88, 6.89)	0.086	1.88 (0.72, 4.92)	0.198
Bystander CPR	3.39 (2.46, 4.67)	<0.0001	1.57 (1.15, 2.15)	0.004
First arrest rhythm				
Asystole[a]	1 (–, –)	–	1 (–, –)	–
VF/VT/Unknown shockable rhythm	77.09 (34.05, 174.49)	<0.0001	27.24 (11.66, 63.61)	<0.0001
Others[b]	11.71 (5.03, 27.26)	<0.0001	10.52 (4.51, 24.51)	<0.0001
Etiology				
Traumatic[a]	1 (–, –)	–	1 (–, –)	–
Cardiac	12.27 (7.20, 20.91)	<0.0001	3.99 (2.22, 7.18)	<0.0001
Non-cardiac,non-traumatic	3.45 (1.82, 6.54)	0.0001	2.44 (1.29, 4.64)	0.006

VF: ventricular fibrillation; VT: ventricular tachycardia.

[a] Reference level in each factor.

[b] Other first arrest rhythms include PEA, unknown unshockable rhythm, and unknown rhythm.

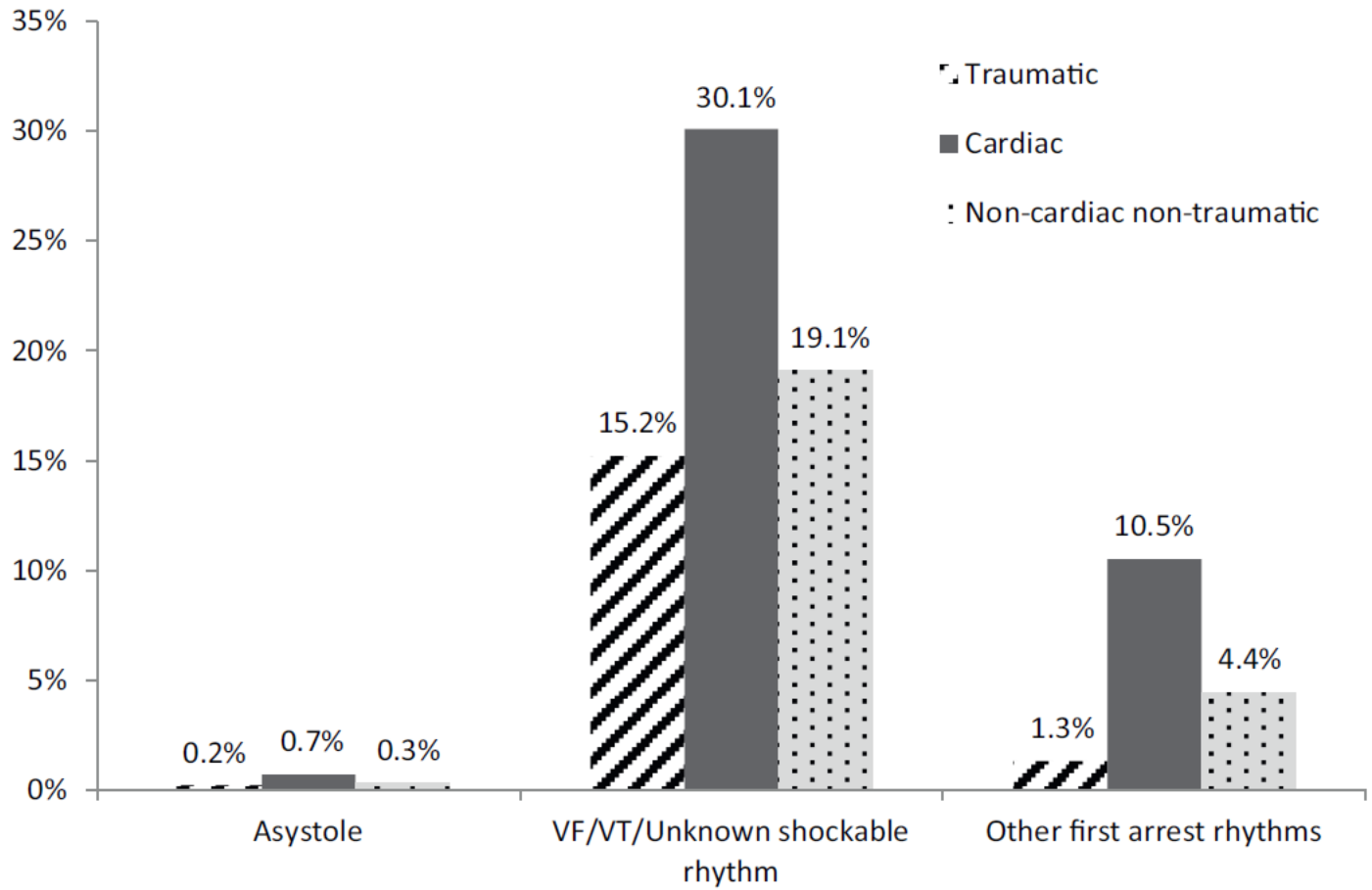

Fig. 2. Proportions of out-of-hospital cardiac arrest (OHCA) with favourable neurologic outcome by etiology and first arrest rhythm. VF: ventricular fibrillation; VT: ventricular tachycardia.

Conclusion

OHCA among young adults are not uncommon. Traumatic OHCA, occurring most frequently in young adults amongst all etiologies, had a very dismal prognosis. It would be worthwhile to increase efforts in resuscitating traumatic OHCA presenting with first arrest rhythm of VF/VT/unknown shockable rhythm as this group of patients had better favourable neurological outcomes. First arrest rhythms of VF/VT/unknown shockable rhythm, cardiac etiology, bystander-witnessed arrest, and bystander CPR were factors associated with favourable neurological outcomes among young adults with OHCA.