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ORIGINAL ARTICLE
Epidemiology

Characteristics and Outcomes of Out-of-Hospital Cardiac Arrest in Educational Institutions in Japan
— All-Japan Utstein Registry —

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Background: Although schools are key places that conduct cardiopulmonary resuscitation (CPR) and public-access defibrillation (PAD) programs, out-of-hospital cardiac arrest (OHCA) in educational institutions is poorly understood. This study describes the characteristics and outcomes of such OHCAs.

Methods and Results: Data for OHCAs of any cause occurring in educational institutions between 2013 and 2015 were extracted from the All-Japan Utstein Registry. Patient characteristics and outcomes were documented. Subjects were divided into 6 age groups (0–1, 2–5, 6–11, 12–14, 15–17, and ≥18 years). Among the 783 eligible OHCA patients, most received bystander CPR regardless of age, ranging from 73.9% in those aged ≥18 years to 90.0% in those aged 2–5 years. However, the proportion receiving PAD differed by age group, ranging from 2.9% in those aged 0–1 years to 66.7% in those aged 12–14 years. The proportion of patients with 1-month survival with favorable neurological outcome differed significantly by age group, being extremely low among patients aged 0–1 years (zero for OHCA of cardiac origin), but high among patients aged 6–11, 12–14, and 15–17 years (69.2%, 77.5%, and 70.0%, respectively) for OHCA of cardiac origin.

Conclusions: The outcomes of OHCA occurring in educational institutions, where PAD is available, differed significantly by age.

Key Words: Cardiopulmonary resuscitation (CPR); Educational institution; Epidemiology; Out-of-hospital cardiac arrest

Every year in Japan, approximately 1,800 children experience an out-of-hospital cardiac arrest (OHCA).[1] Although the number of OHCAs in children is smaller than in adults,[1,2] a child's sudden cardiac death has a devastating effect on their family, friends, school personnel, caregivers, witnesses, and the community.

Most OHCAs in children occur at home;[2–4] however, schools, where school-age children spend most of their day, are a potential setting for OHCA. Since the launch of the public-access defibrillation (PAD) program in Japan in 2004, automated external defibrillators (AEDs) have been widely placed in schools. The Japanese Ministry of Education, Culture, Sports, Science and Technology reported that, as of 2015, at least 1 AED had been installed in almost all elementary, junior high, and high schools.[5] Because OHCAs can occur in the educational setting not only in children, but also in adults working or visiting there,[6,7] a better understanding of OHCA in educational institutions would be useful in improving both the PAD program and survival.

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The Fire and Disaster Management Agency (FDMA) of Japan has collected detailed information on the location of occurrences of OHCAs since 2013, and these data have been registered in the All-Japan Utstein Registry. Japan is one of the most developed countries in the world where the PAD program is widespread. The cumulative sales of public-access AEDs have increased rapidly, reaching 688,329 in 2016, excluding those used in medical facilities

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and emergency medical service (EMS) institutions.[8] Although schools are key locations for cardiopulmonary resuscitation (CPR) and PAD programs, OHCAs in educational institutions are poorly understood. Thus, in this study we used nationwide, prospective, population-based observations covering the whole population of Japan[9] to describe the characteristics and outcomes of pediatric and adult OHCAs occurring in all types of educational institutions in Japan.

Methods

Study Design and Settings

Details regarding the All-Japan Utstein Registry of the FDMA have been reported previously.[10] Briefly, the All-Japan Utstein Registry is a prospective population-based OHCA registry based on the international Utstein style[11,12] that covers approximately 127 million people in Japan over a geographic area of approximately 378,000 km^2.

Cardiac arrest was determined as the cessation of cardiac mechanical activity and confirmed by the absence of signs of circulation by EMS personnel. The etiology of cardiac arrest was presumed to be of medical origin unless it was caused by trauma, drug overdose, drowning, electrocution, or asphyxia based on the current Utstein-style template.[13] These diagnoses were determined clinically by the physicians in charge, in collaboration with EMS personnel. To assess their outcomes, all OHCA survivors were followed for up to 1 month after the event by the EMS personnel in charge. Data forms were filled in by EMS personnel, in cooperation with the physician in charge of the patient. The information from the input data forms was transferred and integrated into the registration system on the FDMA database server. Data were then checked at data terminals and confirmed by the FDMA. If incomplete data forms were found, EMS personnel in charge were asked to complete them. In addition to international Utstein-style data items,[11,12] the FDMA started collecting detailed information on the location of the occurrence of the OHCA from January 2013. According to the current international Utstein standardized template, locations of arrest are classified as home/residence, industrial/workplace, sports/recreation event, street/highway, public building, assisted living/nursing home, educational institution, other, and unknown/not recorded.[13]

EMS System in Japan

EMS is provided by regional governments, and, as previously described, there were 750 fire departments with dispatch centers throughout Japan in 2015.[10] Emergency life-saving technicians (ELSTs), highly trained emergency care providers, are allowed to insert an intravenous line and an adjunct airway, as well as to use semi-AEDs for OHCA patients. Specially trained ELSTs are allowed to intubate and administer adrenaline. Basically, each ambulance has a crew of 3 emergency providers, including at least 1 ELST. Treatment for cardiac arrest was based on the Japanese CPR guidelines.[14] Generally, prehospital termination of resuscitation by EMS personnel is not allowed because do-not-resuscitate orders (or living wills) are not permitted in Japan. Therefore, excluding cases of decapitation, incineration, decomposition, rigor mortis, or dependent cyanosis, most OHCA patients treated by EMS personnel were transported to hospitals, and pertinent data were recorded in the All-Japan Utstein Registry.

Study Subjects

This study included patients with OHCA of any cause occurring in educational institutions in whom CPR was attempted by bystanders or EMS personnel and who were subsequently transported to medical institutions by EMS personnel. Moreover, this study included all kinds of educational institutions that received approval from the Ministry of Education, Culture, Sports, Science and Technology of Japan or the Ministry of Health, Labour and Welfare. OHCAs with unknown witness status and unknown first documented rhythm were excluded.

Data Collection

The following data were obtained from the All-Japan Utstein Registry between 1 January 2013 and 31 December 2015: season, time of day, day of week, location of arrest, origin of arrest, age, sex, witness of cardiac arrest, first documented rhythm, dispatcher instruction regarding CPR, initiation of bystander CPR, initiation of PAD, time course of EMS response (i.e., time of calling the EMS, patient contact by the EMS, hospital arrival, time from collapse to bystander CPR, and time from collapse to public-access AED defibrillation), and outcomes after OHCA. When bystanders provided defibrillation using a public-access AED, a patient's first documented rhythm was regarded as ventricular fibrillation (VF).

Dissemination of PAD Programs in Schools in Japan

In Japan, the use of AEDs by bystanders in OHCA patients has been legalized since July 2004. The promotion of PAD programs in schools has been given high importance in Japan,[15] and, as of 2015, at least 1 AED has been installed in almost all of the approximately 36,000 elementary, junior high, and high schools (99.9%, 99.9%, and 99.7%, respectively) throughout the country. The proportion of AEDs installed in kindergarteners is 74.6%.[5] Approximately 90% of schools have provided basic life support (BLS) training to teaching staff.[5] BLS training programs have been conducted primarily by local fire departments based on Japanese CPR guidelines.[14]

Endpoints

The endpoints of this study were 1-month survival after OHCA and 1-month survival with favorable neurological outcome. The 1-month neurological status was scored by the physician in charge, using the Glasgow-Pittsburgh cerebral performance category (CPC) scale, as follows: Category 1, good performance; Category 2, moderate disability; Category 3, severe cerebral disability; Category 4, coma/vegetative state; and Category 5, death/brain death. One-month survival with favorable neurological outcome was defined as CPC 1 or 2.[11,12]

Statistical Analyses

We were unable to further divide schools into kindergarteners/nursery, elementary schools, junior-high schools, high schools, and universities/colleges because of the registration format of the All-Japan Utstein Registry. In this study, all analyses were performed separately by 6 age groups (i.e., 0–1 years old, nursery schoolchildren; 2–5 years old, kindergarteners/nursery schoolchildren; 6–11 years old, elementary schoolchildren; 12–14 years old, junior high school students; 15–17 years old, high school students; ≥18 years old, university, college, or junior college students, and people working at educational institutions) based on the

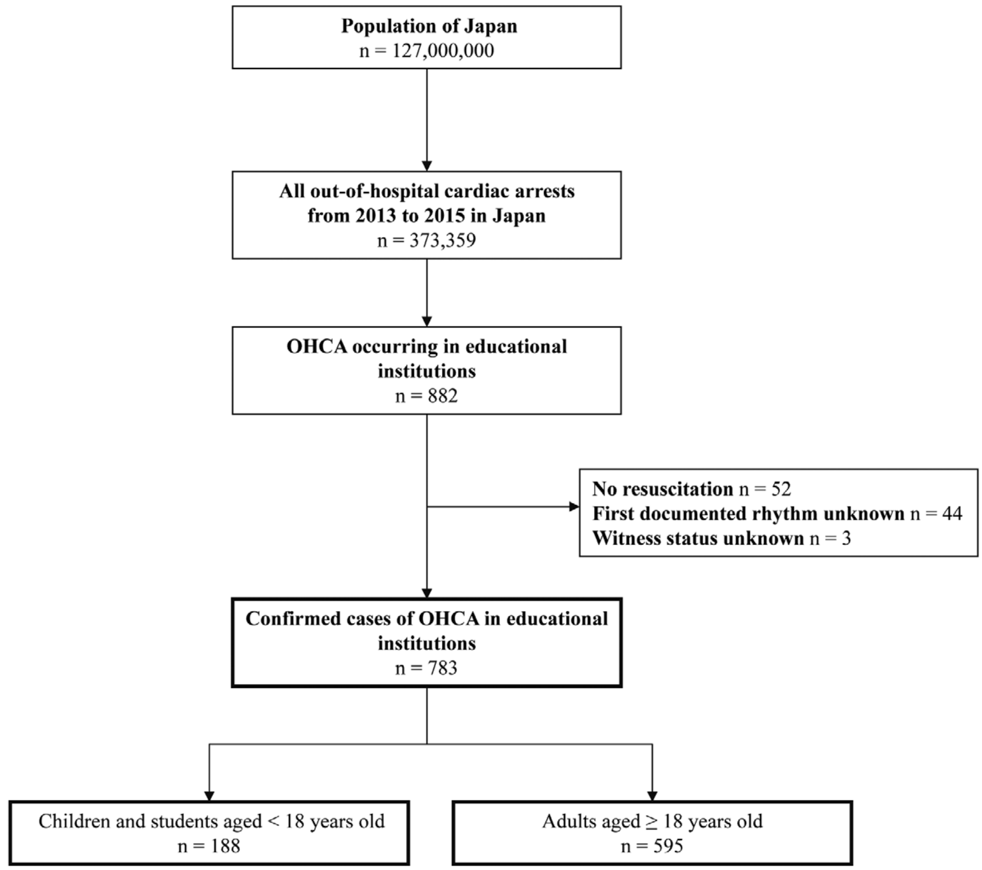

Figure. Flow chart showing the selection of patients with an out-of-hospital cardiac arrest (OHCA) occurring in an educational institution in Japan between 1 January 2013 and 31 December 2015.

School Education Act.[16] Characteristics, bystander intervention, and outcomes after OHCA were compared by age categories using a Chi-squared test for categorical variables and analysis of variance (ANOVA) for numerical variables. Data that were not normally distributed were analyzed by the Kruskal-Wallis test. Outcomes of arrest were also divided according to medical or cardiac origin of the arrest. All tests were 2-tailed, and $P<0.05$ was considered statistically significant. Statistical analyses were conducted using SPSS version 25.0J (IBM Corp., Armonk, NY, USA).

Ethics Approval

The study protocol was approved by the Ethics Committee of Kyoto University (R1538-1). Personal identifiers were removed from the FDMA database. The requirement for informed consent from patients was waived.

Results

Selection of OHCA Patients

Figure shows the flowchart for the selection of eligible OHCA patients for the analysis. During the 3-year study period, 373,359 OHCAs were registered in the All-Japan Utstein Registry; of these, 882 (0.2%) were documented in educational institutions, with 783 eligible OHCA patients included in the following analyses (188 children and students aged <18 years, 595 adults aged ≥18 years). During the study period, 144 OHCAs (48 cases per year) occurred in educational institutions among children aged 6–18 years.

Patient Characteristics

The characteristics of OHCA patients included in this study in the different age categories are given in **Table 1**. With regard to the origin of OHCAs, 87.0% were of medical origin and 65.9% were of cardiac origin. The overall proportion of OHCAs witnessed by bystanders was 57.6%, but OHCAs in patients aged 0–1 years were significantly less likely to be witnessed by bystanders (32.4%) than those in other age categories. The proportion of bystander CPR was 88.2%, 90.0%, 77.8%, 79.6%, 74.6%, and 73.9% in those aged 0–1, 2–5, 6–11, 12–14, 15–17, and ≥18 years, respectively, but the proportion of patients receiving PAD differed substantially by age category. OHCA patients aged 0–1 years were much less likely to receive PAD (2.9%) than those aged 12–14 years (66.7%), 15–17 years (50.8%), 6–11 years (40.7%), and ≥18 years (22.9%); 20.0% of those aged 2–5 years received PAD. There were no differences in either the collapse to AED time or the collapse to CPR initiation time among the 6 age groups.

Patient Outcomes After OHCA

The outcomes after OHCA among patients in the different

Table 1. Characteristics of Out-of-Hospital Cardiac Arrest in Educational Institutions in Japan

	Total (n=783)	Age group (years)						P-value
		0–1 (n=34)	2–5 (n=10)	6–11 (n=27)	12–14 (n=54)	15–17 (n=63)	≥18 (adult; n=595)	
Season of collapse								0.091
Spring	189 (24.1)	9 (26.5)	2 (20.0)	5 (18.5)	12 (22.2)	16 (25.4)	145 (24.4)	
Summer	185 (23.6)	5 (14.7)	6 (60.0)	9 (33.3)	10 (18.5)	12 (19.0)	143 (24.0)	
Autumn	198 (25.3)	6 (17.6)	1 (10.0)	11 (40.7)	17 (31.5)	18 (28.6)	145 (24.4)	
Winter	211 (26.9)	14 (41.2)	1 (10.0)	2 (7.4)	15 (27.8)	17 (27.0)	162 (27.2)	
Time of collapse								<0.001
00:00–05:59 hours	44 (5.6)	5 (14.7)	1 (10.0)	0 (0.0)	0 (0.0)	1 (1.6)	37 (6.2)	
06:00–11:59 hours	323 (41.3)	8 (23.5)	4 (40.0)	14 (51.9)	29 (53.7)	19 (30.2)	249 (41.8)	
12:00–17:59 hours	290 (37.0)	17 (50.0)	5 (50.0)	13 (48.1)	22 (40.7)	34 (54.0)	199 (33.4)	
18:00–23:59 hours	126 (16.1)	4 (11.8)	0 (0.0)	0 (0.0)	3 (5.6)	9 (14.3)	110 (18.5)	
Weekday	558 (71.3)	28 (82.4)	10 (100.0)	26 (96.3)	39 (72.2)	53 (84.1)	402 (67.6)	<0.001
Male	604 (77.1)	21 (61.8)	6 (60.0)	17 (63.0)	46 (85.2)	55 (87.3)	459 (77.1)	0.010
Median (IQR) age (years)	45 [18–62]	0 [0–1]	4 [2–5]	9 [8–10]	13 [13–14]	16 [15–17]	53 [40–66]	<0.001
Medical origin	681 (87.0)	31 (91.2)	10 (100.0)	25 (92.6)	42 (77.8)	49 (77.8)	524 (88.1)	0.033
Cardiac origin	516 (65.9)	21 (61.8)	7 (70.0)	13 (48.1)	40 (74.1)	40 (63.5)	395 (66.4)	0.311
Type of educational institution								<0.001
Schools for the disabled	184 (23.5)	0 (0.0)	0 (0.0)	4 (14.8)	4 (7.4)	12 (19.0)	164 (27.6)	
Arrest witnessed								<0.001
By bystanders	451 (57.6)	11 (32.4)	6 (60.0)	16 (59.3)	42 (77.8)	45 (71.4)	331 (55.6)	
By EMS	39 (5.0)	0 (0.0)	0 (0.0)	4 (14.8)	1 (1.9)	5 (7.9)	29 (4.9)	
Not witnessed	293 (37.4)	23 (67.6)	4 (40.0)	7 (25.9)	11 (20.4)	13 (20.6)	235 (39.5)	
VF/VT as first recorded rhythm	324 (41.4)	2 (5.9)	2 (20.0)	12 (44.4)	39 (72.2)	42 (66.7)	227 (38.2)	<0.001
Dispatcher instruction	399 (51.0)	25 (73.5)	7 (70.0)	16 (59.3)	30 (55.6)	27 (42.9)	294 (49.4)	0.038
Bystander CPR	590 (75.4)	30 (88.2)	9 (90.0)	21 (77.8)	43 (79.6)	47 (74.6)	440 (73.9)	0.362
Public-access AED defibrillation	218 (27.8)	1 (2.9)	2 (20.0)	11 (40.7)	36 (66.7)	32 (50.8)	136 (22.9)	<0.001
EMS response time[A] (min)	8.9±3.5	7.6±2.8	7.6±2.0	6.9±1.8	7.9±2.5	8.4±3.0	9.2±3.7	<0.001
Hospital arrival time[B] (min)	32.4±12.9	28.9±17.5	26.6±5.4	30.0±10.6	30.0±14.0	29.2±10.0	33.4±12.9	0.013
Time from collapse to bystander CPR (min)[C]	2.1±3.2	1.2±2.5	1.0±1.4	0.9±1.3	2.1±2.3	2.7±3.9	2.2±3.3	0.440
Time from collapse to public-access AED defibrillation (min)[D]	4.6±3.4	0.0	4.0±2.8	3.5±3.7	4.4±2.9	3.9±2.6	5.0±3.7	0.331

Unless indicated otherwise, data are given as n (%) or as the mean±SD. [A]Time from the emergency call to contact with patients. [B]Time from the emergency call to arrival at hospital. [C]Using data for out-of-hospital cardiac arrests (OHCAs) that were witnessed (n=10 in patients aged 0–1 years; n=5 in patients aged 2–5 years; n=15 in patients aged 6–11 years; n=34 in patients aged 12–14 years; n=37 in patients aged 15–17 years; n=278 in patients aged ≥18 years). [D]Using data for OHCAs that were witnessed (n=1 in patients aged 0–1 years; n=2 in patients aged 2–5 years; n=8 in patients aged 6–11 years; n=31 in patients aged 12–14 years; n=29 in patients aged 15–17 years; n=112 in patients aged ≥18 years). AED, automated external defibrillator, CPR, cardiopulmonary resuscitation; EMS, emergency medical service; IQR, interquartile range; VF, Ventricular fibrillation; VT, ventricular tachycardia.

age categories are given in **Table 2**. The proportion of patients with favorable outcomes (1-month survival and neurological outcome at 1 month) was extremely low among patients aged 0–1 years (2.9% for OHCAs of all origins; 3.2% for those of medical origin and 0% for cardiac arrest). In contrast, the proportion of patients aged 12–14 years surviving at 1 month and with favorable neurological outcomes was significantly higher (61.1% for OHCAs of all origin; 76.2% for those of medical origin and 77.5% for those of cardiac origin). The 1-month survival with favorable neurological outcome for OHCAs of cardiac origin was 70.0%, 69.2%, and 31.9% for patients aged 15–17, 6–11, and ≥18 years, respectively, compared with 14.3% for those aged 2–5 years.

Discussion

From a nationwide, population-based OHCA registry, we investigated bystander CPR, AED use, and outcomes of OHCA occurring in educational institutions. The study findings are consistent with those of previous studies[6,7,17,18] that demonstrated that OHCAs are rare events in educational institutions. Of the OHCAs occurring in educational institutions, 24% occurred in individuals aged ≤17 years, with the rest occurring in those aged >18 years. The 1-month survival with favorable neurological outcome after OHCA

Table 2. Outcomes of Out-of-Hospital Cardiac Arrest at Educational Institutions in Japan

	Total	Age group (years)						P-value
		0–1	2–5	6–11	12–14	15–17	≥18 (adult)	
All origins								
n	783	34	10	27	54	63	595	
1-month survival	250 (31.9)	6 (17.6)	3 (30.0)	15 (55.6)	36 (66.7)	36 (57.1)	154 (25.9)	<0.001
1-month survival with favorable neurological outcome	207 (26.4)	1 (2.9)	1 (10.0)	12 (44.4)	33 (61.1)	30 (47.6)	130 (21.8)	<0.001
Medical origin								
n	681	31	10	25	42	49	524	
1-month survival	245 (36.0)	5 (16.1)	3 (30.0)	13 (52.0)	35 (83.3)	35 (71.4)	154 (29.4)	<0.001
1-month survival with favorable neurological outcome	204 (30.0)	1 (3.2)	1 (10.0)	10 (40.0)	32 (76.2)	30 (61.2)	130 (24.8)	<0.001
Cardiac origin								
n	516	21	7	13	40	40	395	
1-month survival	221 (42.8)	2 (9.5)	3 (42.9)	10 (76.9)	34 (85.0)	31 (77.5)	141 (35.7)	<0.001
1-month survival with favorable neurological outcome	195 (37.8)	0 (0.0)	1 (14.3)	9 (69.2)	31 (77.5)	28 (70.0)	126 (31.9)	<0.001

Unless indicated otherwise, data are given as n (%).

differed significantly by age group, being 0% in patients aged 0–1 years and only 1 in 10 for patients aged 2–5 years. In contrast, 70% of patients aged 6–17 years and 30% of those aged ≥18 years had 1-month survival with favorable neurological outcome. These differences in outcomes may arise from patient characteristics and the resuscitation process, and the prospective nation-wide OHCA registry in Japan enables us to describe improvements in both the resuscitation process and outcomes in educational institutions.

The data showed that the 1-month survival with favorable neurological outcome for OHCA among patients aged 6–17 years was greater than for those aged 0–1 and 2–5 years, regardless of the origin of the OHCA. One possible explanation for the better outcomes among older patients is that VF during an OHCA occurs more frequently in children and adolescents than in infants,[19] and the data in the present study indicated that 44–72% of patients among these age groups had VF. In addition, OHCAs in students in the elementary school, junior high school, and high school age groups were more likely to have been witnessed, received bystander CPR and shocks from an AED, and have better physiologic capacity to survive.[20] Moreover, with increasing AED use in the school setting year on year in Japan,[21] both 1-month survival and 1-month survival with favorable neurological outcome were much higher than in a previous report from Japan.[22] These patient characteristics and bystander interventions may be associated with better outcomes. Because the sudden cardiac death of young students occurring at school deeply affects family, classmates, teachers, and community, our final goal will be zero OHCA-related deaths in school settings by installing AEDs in schools based on the "Aiming for Zero Deaths; Prevention of Sudden Cardiac Death in Schools" statement published by the Japan Circulation Society.[15] To achieve this goal, because schoolchildren, in addition to teachers (adults), may witness a cardiac arrest in the school setting, providing CPR training to schoolchildren is a promising approach. According to a survey by the Japanese Ministry of Education, Culture, Sports, Science and Technology,[5] only 4% of all public elementary schools, 28% of junior high schools, and 27% of high school provide BLS training to all schoolchildren and students. Because BLS training to junior high and high school students will increase following amendments to the school curriculum from 2020,[23] we are planning to evaluate bystander CPR, AED use, and survival rate in the school setting.

In the present study, the proportion of 1-month survival with favorable neurological outcome of 31.9% for OHCA of cardiac origin among people aged ≥18 years is much better than the average for overall OHCA outcomes in Japan.[24] The reason for this difference in survival can be attributed to the fact that OHCA patients in the school setting were younger than those across all of Japan. In addition, the nationwide effort to implement AED in schools and the provision of BLS training to school staff likely increased bystander CPR and AED use, leading to better outcomes. Although implementation of public-access AED improved outcomes after OHCA in school-age children,[25] these school-based efforts may greatly benefit not only schoolchildren, but also adults, such as school staff members or school visitors.

Consistent with previous studies,[2,4] even in educational institutions where staff are well-trained in CPR and AEDs have been installed, the lowest proportion of 1-month survival with favorable neurological outcomes was seen in patients aged 0–1 years, regardless of the cause of the OHCA. This group had the second-highest proportion of bystander CPR despite having the lowest proportion of witnessed OHCA, which indicates that resuscitation efforts were performed in most cases, even when the OHCA was not witnessed. This finding is not surprising; because cardiac arrest in children aged 0–1 years can occur at night, recognition of the early signs of OHCA is more difficult in this age group compared with the other age groups. Although OHCAs in 61% of patients have a cardiac etiology, the 0–1 years age group was less likely to have VF as their initial rhythm and receive defibrillation by AED. We believe that this may be attributable to sudden infant death syndrome (SIDS), which frequently occurs before an infant reaches 6 months of age.[19,26] Because OHCA with an unknown pathogenesis was categorized as being of medical origin, including cardiac origin, based on the latest Utstein Resuscitation Registry Templates for Out-of-Hospital Cardiac

Arrest,[12,13] SIDS or unexplained sudden death may have been classified as being of presumed cardiac origin. This classification could explain the high proportion of OHCAs of cardiac origin. Thus, it is important for people working in educational institutions such as kindergarteners or nursery schools to receive education on safe infant sleep and implement safe sleep practices.[27]

Although patients aged 2–5 years were more likely to have witnessed arrest, have received bystander CPR, and to have a shorter time from the emergency call to hospital arrival, their 1-month survival with favorable neurological outcomes was the second worse in this study. These results are in line with previous studies indicating worse outcomes among preschool children from Denmark[28] and Sweden.[20] Bagnall et al reported that among autopsied children aged 1–5 years, 76% of sudden cardiac deaths were classified as unexplained sudden cardiac death.[29] In the present study, we have no clear explanation for the low survival rate among children aged 2–5 years in the school setting. Unfortunately, autopsy was not performed in all cases of sudden cardiac death cases; in 2014, the reported autopsy rate for all deaths in Japan was only 2.4%.[30] In general, the prevalence of cardiac arrest drops in early childhood and begins to rise again in adolescence,[31,32] and similar tendencies were observed in our data. Because the number of OHCAs in early childhood is small, further investigations using autopsy examinations and genetic testing[29] may be needed to reveal the cause of sudden cardiac death. From another point of view, the likelihood of AED use may be related to the number of AEDs installed, so that the implementation rate of AED in kindergarten, which was lower than that in elementary schools, junior high schools, and high schools, may affect the survival rate. Because we have no data on AED pads applied to the patients, further studies are required to investigate the use of AED.

This study has several limitations. First, we were unable to obtain information about several factors associated with the occurrence and/or prognosis of cardiac arrests, such as activity at the time of arrest, past medical history, medication, quality of bystander-initiated CPR, and life habits before the arrest. The potential variability in postarrest care was not addressed in this Utstein-based registry. Second, because we did not obtain information about whether public-access AED was applied to OHCA patients, the findings may have limited policy relevance. Third, we were unable to further divide schools into elementary schools, junior high schools, high schools, universities, and colleges owing to the registration format of the All-Japan Utstein Registry. As a result, we were unable to calculate the incidence rates of cardiac arrest and compare them with those in previous studies.

Conclusions

Using a nationwide population-based registry, we demonstrated that outcomes of OHCA in children and adults that occurred in educational institutions implementing public-access AEDs differed considerably by age. School-based CPR training and installation of public-access AEDs would have great benefits not only for schoolchildren and students, but also adults, such as staff members or school visitors.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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