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CLINICAL STUDY

Impact of Bystander Cardiopulmonary Resuscitation and Dispatcher Assistance on Survival After Out-of-Hospital Cardiac Arrest Among Adult Patients by Location of Arrest

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Summary

We investigated the impact of bystander-initiated cardiopulmonary resuscitation (CPR), dispatcher assistance (DA), and location of arrest on survival and outcomes after out-of-hospital cardiac arrest (OHCA).

From a nationwide population-based registry of OHCA patients in Japan, we enrolled adult patients with bystander-witnessed OHCA of medical origin between 2013 and 2015. The primary outcome measure was a neurologically favorable outcome, defined by cerebral performance category 1 or 2. Multivariable logistic regression analysis was used to assess the effects of bystander CPR and DA by location of arrest. A total of 104,621 cases were included (15,984 bystander CPR without DA [15.3%], 40,087 bystander CPR with DA [38.3%], and 48,550 no bystander CPR [46.4%]). In public locations, both the bystander-CPR-with-DA group (22.9% [1,068/4,665]; adjusted odds ratio (AOR), 1.62; 95% confidence interval (CI), 1.43-1.85) and the bystander-CPR-without-DA group (25.8% [918/3,557]; AOR, 1.43; 95% CI, 1.24-1.65) had neurologically favorable outcomes compared with the no-bystander-CPR group (9.9% [610/6,133]). In residential locations, the AORs were 1.44 (95% CI, 1.22-1.70) in the bystander-CPR-without-DA group and 1.60 (95% CI, 1.45-1.77) in the bystander-CPR-with-DA group. However, in nursing homes, bystander CPR was not associated with improved outcomes of OHCA, regardless of the implementation of DA.

Bystander CPR with or without DA had better outcomes after OHCA in residential and public locations but not in nursing homes.

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Key words: Population-based registry, Nursing homes, Pre-hospital care, Emergency medical services

Out-of-hospital cardiac arrest (OHCA) is a major cause of death in industrialized countries. Approximately 350,000 patients suffer an OHCA each year in North America,[1)] 350,000 to 700,000 in Europe,[2)] and 120,000 in Japan.[3)] Although immediate cardiopulmonary resuscitation (CPR) by bystanders before the arrival of emergency medical service (EMS) can improve OHCA survival,[4,5)] the proportion of OHCA patients receiving bystander-initiated CPR worldwide is not high.[6-8)] Therefore, to further improve survival rates in OHCA, increasing bystander CPR is essential.

Earlier studies showed that dispatcher assistance (DA) via telephone increased the implementation of bystander CPR.[9)] An observational study in Korea assessed the effect of bystander CPR with and without DA by location of arrest; both were effective for improving neurologic recovery after OHCA in public locations, whereas in residential locations, only bystander CPR with DA was associated with improved neurologic recovery after OHCA.[10)] Thus, the impact of bystander CPR and DA on OHCA outcome is apparently affected by location. Further evidence is needed to verify this variation in effectiveness by location of arrest because characteristics of EMS systems vary among communities.

The All-Japan Utstein Registry, a nationwide, population-based OHCA registry, has collected information on the location of OHCA since 2013 and enrolled over 100,000 cases of bystander-witnessed OHCA of

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medical origin between 2013 and 2015. Using this database, we evaluated the impact of bystander CPR, and of CPR both with and without DA, on survival after OHCA among adult patients by location of arrest.

Methods

Study design, population, and settings: Details of the All-Japan Utstein Registry of the Fire and Disaster Management Agency (FDMA) have been previously described.[11] Briefly, it is a prospective, population-based registry of OHCA that is based on the international standardized Utstein style.[12,13] Japan has approximately 127 million inhabitants, within a geographic area of approximately 378,000 km^2. We enrolled all patients aged ≥ 18 years who had OHCA from January 1, 2013 to December 31, 2015. The inclusion criteria were resuscitation attempted by bystanders and/or EMS personnel, OHCA of medical origin, arrest witnessed only by bystanders, and arrest occurring in prehospital settings before transport to a medical institution. The exclusion criteria were age < 18 years or unknown; no resuscitation attempted or resuscitation status unknown; OHCA of non-medical origin; arrest witnessed by EMS, unwitnessed, or witness status unknown; OHCA in a medical institution or unknown location; first documented heart rhythm unknown; and outcome unknown (Figure).

The definition of cardiac arrest was the cessation of cardiac mechanical activity, as confirmed by the absence of circulation signs.[12] The arrest was presumed to be of medical origin unless caused by trauma, drug overdose, drowning, electrocution, or asphyxia, based on the current Utstein-style template.[13] These diagnoses were clinically determined by the physicians in charge of collaboration with EMS personnel.

The Ethics Committees of Kyoto University Graduate School of Medicine and Osaka University Graduate School of Medicine approved this registry (approval No.14147-2). The requirement for written informed consent was waived. The committees determined that the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki.

EMS systems in Japan: Details of the EMS system in Japan have been described previously.[14] EMS is provided by regional governments, and there were 750 fire stations with emergency dispatch centers in 2015.[3] The free emergency telephone number is 119, which may be used to call for an ambulance from anywhere in Japan. Emergency services are provided 24 hours a day. When an emergency call is activated, an ambulance is dispatched from the nearest fire station. Each ambulance has a crew of 3 emergency providers, including at least one emergency life-saving technician (ELST). ELSTs are highly trained emergency care providers who are qualified to insert intravenous lines and adjunct airways and to use semi-automated external defibrillators (AEDs). Specially trained ELSTs are also allowed to intubate and administer adrenaline (epinephrine). OHCA patients receive CPR by EMS providers according to the Japanese CPR guidelines.[5]

In Japan, layperson CPR training programs have mainly been conducted by local fire departments, and the program has been recommended by the FDMA.[5] In 2015, local fire departments trained over 1.4 million citizens in conventional 3-hour CPR training programs consisting of AED application, chest compressions, and rescue breathing.[3] The 45-90-minute chest-compression-only cardiopulmonary resuscitation (CCCPR) training was first recommended in 2013, and approximately 409,000 people among the general public received CCCPR training in 2015.[3] The number of people in the general population who received any CPR training increased to 4,402,343 in 2015.[3]

Do-not-resuscitate orders, or living wills, are not generally accepted in Japan. Therefore, most OHCA patients treated by EMS personnel are transported to a hospital and included in this registry, excluding only victims of decapitation, incineration, decomposition, rigor mortis, or dependent cyanosis.

Dispatcher assistance protocol in Japan: The DA is conducted by dispatchers or EMS personnel while on the way to the scene. They are trained and ordered to give instructions for CPR up until EMS arrival. Under the 2010 Japanese CPR guidelines, when a bystander knows how to perform CPR, dispatchers recommend conventional CPR. When they do not, CCCPR instructions are provided by dispatchers.[5] On the basis of the recommendations of the FDMA, each fire station prepared a uniquely designed protocol for dispatcher CPR guidance, developed by the local medical control council, consisting of emergency-care physicians and experts in each specific area.[15]

Data collection and quality control: Data were prospectively-collected resuscitation-related factors such as date and time, sex, age, cause of cardiac arrest, type of bystander, first documented rhythm, time-course of resuscitation, type of bystander-initiated CPR, DA, public-access defibrillation, adrenaline administration, advanced airway management, prehospital return of spontaneous circulation (ROSC), 1-month survival, and neurological status 1 month after the event. A series of EMS times, including call receipt, contact with the patient, and hospital arrival were recorded by the EMS team. When bystanders provided shocks using a public-access AED, the victims' first documented rhythm was regarded as ventricular fibrillation (VF). Data on the time of collapse and the initiation of bystander defibrillation or CPR were obtained by EMS review of public-access AED records or by interview with bystander(s) at the scene. Importantly, in addition to the previous items included in the international Utstein style,[12,13] the FDMA has started collecting detailed information on the location of OHCA occurrences since January 2013. According to the current Utstein-style template, location of arrest was classified into the following categories: residential locations; recreation/sports-event areas; public areas; streets/highways; healthcare facilities such as clinics; nursing homes; workplaces; educational institutions; and others.[13] The "others" category included areas such as farmlands, seashores, mountains, and unknown.

All survivors were followed for up to 1 month after OHCA by the EMS providers in charge. The neurological outcome was determined by the physician responsible for

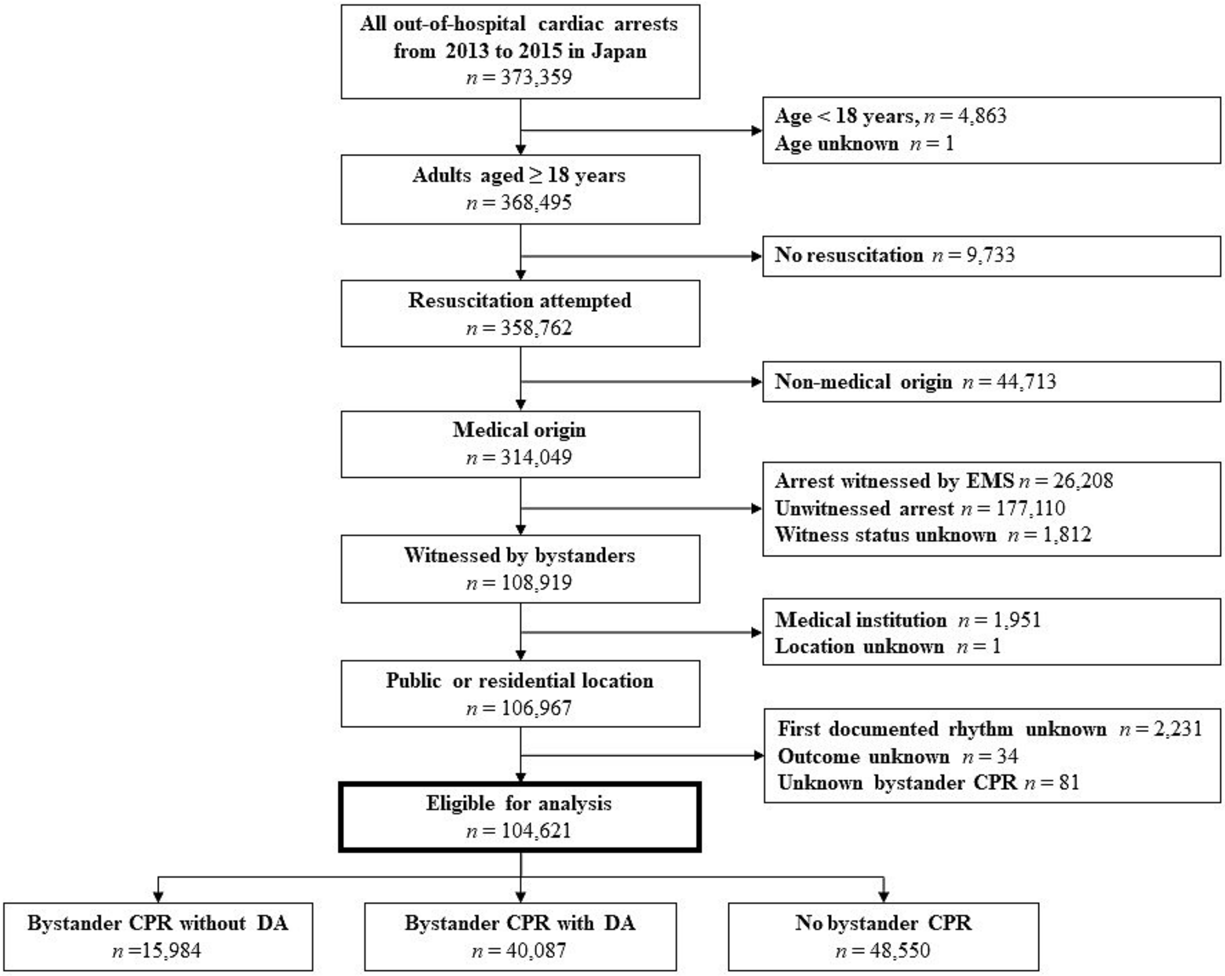

Figure. Patient flow diagram. EMS indicates emergency medical service; CPR, cardiopulmonary resuscitation; and DA, dispatcher assistance.

the patient's care via a follow-up interview 1 month after successful resuscitation, using the cerebral performance category (CPC) scale: category 1, good cerebral performance; category 2, moderate cerebral disability; category 3, severe cerebral disability; category 4, coma or vegetative state; and category 5, death/brain death.[12,13]

The data form was filled out by EMS in cooperation with the physician in charge, and data were stored in the registry system on the FDMA database server. Data were logically checked via the computer system and were confirmed by the FDMA. If the data form was incomplete, the FDMA returned it to the respective fire station, and the data were then corrected.

Outcome measures: The primary outcome was 1-month survival with a neurologically favorable outcome after OHCA, defined as CPC 1 or 2.[12,13] Secondary outcome measures were 1-month survival and prehospital ROSC.

Statistical methods: In this study, bystander CPR was classified into the following 3 categories: bystander CPR without DA; bystander CPR with DA; and no bystander CPR. Patient and EMS characteristics of bystander-witnessed OHCAs of medical origin and their outcomes were compared among the above 3 groups, using analysis of variance for numerical variables and chi-square test for categorical variables. This study focused on locations, dividing them into 4 groups: residential locations; public locations (including recreation/sports event areas, public areas, streets/highways, workplaces, and education institutions); nursing homes; and others. Multivariable logistic regression analysis was applied to assess the contribution of bystander CPR to the OHCA outcomes for bystander-witnessed OHCA of medical origin, and adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were calculated. As potential confounders, biological essential factors considered to be associated with clinical outcomes were taken into account for the multivariable analyses, based on a previous study.[16] These variables were: age; sex; time of day (0:00-6:00, 6:00-12:00, 12:00-18:00, 18:00-24:00), day of week (weekday, weekend), witness relationship to patient (family members, non-family members), first documented rhythm (shockable, non-shockable), public-access defibrillation (yes, no), location of arrest (above 4 categories), and EMS response time (time interval from collapse to first contact with patient). Furthermore, to determine differences in the effect of bystander CPR on neurologic outcome among the 4 loca-

Table I. Patient Characteristics for Bystander-Witnessed Out-of-Hospital Cardiac Arrest by Bystander CPR Situation

Characteristics	Total (*n* = 104,621)	Bystander CPR without DA (*n* = 15,984)	Bystander CPR with DA (*n* = 40,087)	No bystander CPR (*n* = 48,550)	*P**
Age, years (SD)	76.7 (14.3)	77.2 (15.3)	77.2 (14.5)	76.1 (13.8)	< 0.001
Elderly, aged ≥ 75 years, *n* (%)	66,930 (64.0)	10,490 (65.6)	26,325 (65.7)	30,115 (62.0)	< 0.001
Men, *n* (%)	61,832 (59.1)	8,749 (54.7)	22,758 (56.8)	30,325 (62.5)	< 0.001
Time of day, *n* (%)					< 0.001
0:00 - 5:59	13,917 (13.3)	1,614 (10.1)	5,153 (12.9)	7,150 (14.7)	
6:00 - 11:59	33,408 (31.9)	5,367 (33.6)	12,603 (31.4)	15,438 (31.8)	
12:00 - 17:59	31,136 (29.8)	5,576 (34.9)	11,979 (29.9)	13,581 (28.0)	
18:00 - 23:59	26,160 (25.0)	3,427 (21.4)	10,352 (25.8)	12,381 (25.5)	
Weekday, *n* (%)	73,343 (70.1)	11,189 (70.0)	27,925 (69.7)	34,229 (70.5)	0.023
Witnessed by family members, *n* (%)	66,591 (63.6)	4,908 (30.7)	24,530 (61.2)	37,153 (76.5)	< 0.001
Location of arrest, *n* (%)					< 0.001
Residential location	62,482 (59.7)	4,604 (28.8)	23,446 (58.5)	34,432 (70.9)	
Public location	14,355 (5.5)	3,557 (22.3)	4,665 (11.6)	6,133 (12.6)	
Nursing home	19,983 (19.1)	6,496 (40.6)	9,469 (23.6)	4,018 (8.3)	
Other	7,801 (15.7)	1,327 (8.3)	2,507 (6.3)	3,967 (8.2)	
VF as first documented rhythm, *n* (%)	17,212 (16.5)	3,607 (22.6)	7,304 (18.2)	6,301 (13.0)	< 0.001
Public-access defibrillation by bystanders, *n* (%)	3,042 (2.9)	1,578 (9.9)	1,451 (3.6)	13 (0.0)	< 0.001
Time from collapse to CPR by bystanders or EMS personnel, mins, mean (SD)	7.4 (8.0)	2.3 (4.6)	4.1 (5.9)	11.8 (8.0)	< 0.001
Time from collapse to contact with the patient by EMS personnel, mins, mean (SD)	12.0 (7.6)	11.5 (7.3)	12.8 (7.1)	11.5 (7.9)	< 0.001
Time from collapse to hospital arrival, mins, mean (SD)	36.3 (13.9)	35.6 (13.9)	36.6 (13.7)	36.3 (14.1)	< 0.001

CPR indicates cardiopulmonary resuscitation; DA, dispatcher assistance; CCRB, chest compression and rescue breathing; CC-only, chest compression-only; VF, ventricular fibrillation; EMS, emergency medical service; and SD, standard deviation. *ANOVA used for comparison of the 3 groups for numeric variables and chi-square testing for categorical variables.

tions, we also conducted an analysis by location. All analyses were conducted with R version 3.3.2 (R Project, Vienna, Austria). All tests were 2-tailed, and *P* values < 0.05 were considered statistically significant.

Results

The Figure shows an overview of eligible OHCA patients based on an abridged Utstein-style template: 373,359 OHCA cases were registered during the study period. Of these, 358,762 adult patients received resuscitation attempts. Among 108,919 bystander-witnessed patients with OHCA of medical origin, excluding 1,951 cases occurring in medical institutions, one case with unknown location, 2,231 cases with unknown first documented rhythm, 34 cases with unknown outcome, and 81 cases with unknown bystander CPR status, a total of 104,621 cases were eligible for our analysis. These comprised 15,984 bystander-CPR-without-DA (15.3%), 40,087 bystander-CPR-with-DA (38.3%), and 48,550 no-bystander-CPR (46.4%).

Table I shows the patient characteristics by bystander CPR situation. Mean age, the proportion of elderly, time of day, weekday, and mean EMS resuscitation time courses were almost identical among the 3 groups. However, the proportions of first documented VF and public-access defibrillation were highest and the time from collapse to CPR by bystanders or EMS personnel was shortest in the CPR-without-DA group. The proportions of cases occurring in residential locations and those witnessed by family members were highest in the no-CPR group.

Table II denotes the survival outcomes by bystander-CPR situation. The proportion of neurologically favorable outcomes was significantly higher in the bystander-CPR-without-DA group (8.3% [1,330/15,984]) and the bystander-CPR-with-DA group (6.0% [2,398/40,087]) than in the no-bystander-CPR group (3.4% [1,663/48,550]); the AORs were 1.45 (95% CI, 1.32-1.60) in the bystander-CPR-without-DA group and 1.58 (95% CI, 1.47-1.70) in the bystander-CPR-with-DA group. Evaluating secondary outcomes, the results showed similar trends. There was not a statistically significant difference in neurologically favorable outcome between the bystander-CPR-without-DA group and bystander-CPR-with-DA group (AOR 0.92; 95% CI, 0.84-1.01).

The proportions of neurologically favorable outcomes by bystander CPR situation according to location are noted in Table III. The proportion of OHCA cases was 7.4% (4,604/62,482) in the bystander-CPR-without-DA and 37.5% (23,446/62,482) in the bystander-CPR-with-DA; 24.8% (3,557/14,355) were in residential locations and 32.5% (4,665/14,355) in public locations. In residential locations, the proportion of neurologically favorable outcomes was 4.7% (217/4,604), 4.6% (1,077/23,446), and 2.7% (919/34,432) in the bystander-CPR-without-DA group, the bystander-CPR-with-DA group, and the no-bystander-CPR group, respectively, and the AORs were 1.44 (95% CI, 1.22-1.70) in the bystander-CPR-without-DA group and 1.60 (95% CI, 1.45-1.77) in the bystander-CPR-with-DA group, both compared to the no-bystander-CPR group. In public locations, the proportion of neu-

Table II. Survival Outcomes by Bystander CPR Situation

	n / *N*	(%)	Unadjusted		Adjusted*	
			OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Neurologically favorable survival						
Bystander CPR without DA	1,330/15,984	(8.3)	2.56 (2.38-2.76)	1.42 (1.33-1.52)	1.45 (1.32-1.60)	0.92 (0.84-1.01)
Bystander CPR with DA	2,398/40,087	(6.0)	1.79 (1.68-1.91)	Reference	1.58 (1.47-1.70)	Reference
No bystander CPR	1,663/48,550	(3.4)	Reference		Reference	
1-month survival						
Bystander CPR without DA	1,992/15,984	(12.5)	2.88 (2.54-3.26)	1.23 (1.16-1.30)	1.14 (1.06-1.22)	0.88 (0.82-0.95)
Bystander CPR with DA	4,171/40,087	(10.4)	2.65 (2.38-2.97)	Reference	1.28 (1.21-1.35)	Reference
No bystander CPR	3,813/48,550	(7.9)	Reference		Reference	
Prehospital return of spontaneous circulation						
Bystander CPR without DA	2,964/15,984	(18.5)	1.31 (1.26-1.38)	1.06 (1.01-1.11)	1.07 (1.00-1.13)	0.85 (0.81-0.90)
Bystander CPR with DA	7,078/40,087	(17.7)	1.24 (1.20-1.29)	Reference	1.22 (1.17-1.27)	Reference
No bystander CPR	7,143/48,550	(14.7)	Reference		Reference	

*Adjusted for age, sex, time of day, day of week, witness status, location of arrest, public-access defibrillation, first documented rhythm, and time from collapse to contact with the patient by EMS personnel. CPR indicates cardiopulmonary resuscitation; OR, odds ratio; CI, confidence interval; SD, standard deviation; and DA, dispatcher assistance.

Table III. Neurologically Favorable Survival by Bystander CPR Situation and Location

	Residential locations			Public locations			Nursing homes			Others		
	n / *N*	(%)	Adjusted OR (95% CI)	*n* / *N*	(%)	Adjusted OR (95%CI)	*n* / *N*	(%)	Adjusted OR (95%CI)	*n* / *N*	(%)	Adjusted OR (95%CI)
Bystander CPR without DA	217/4,604	(4.7)	1.44 (1.22-1.70)	918/3,557	(25.8)	1.43 (1.24-1.65)	90/6,496	(1.4)	0.87 (0.60-1.26)	105/1,327	(7.9)	1.49 (1.03-2.15)
Bystander CPR with DA	1,077/23,446	(4.6)	1.60 (1.45-1.77)	1,068/4,665	(22.9)	1.62 (1.43-1.85)	114/9,469	(1.2)	0.79 (0.55-1.13)	139/2,507	(5.5)	1.59 (1.16-2.16)
No bystander CPR	919/34,432	(2.7)	Reference	610/6,133	(9.9)	Reference	50/4,018	(1.2)	Reference	84/3,967	(2.1)	Reference

*Adjusted for age, sex, time of day, day of week, witness status, first documented rhythm, public-access defibrillation by bystanders, and time from collapse to EMS. CPR indicates cardiopulmonary resuscitation; OR, odds ratio; CI, confidence interval; SD, standard deviation; and DA, dispatcher assistance.

rologically favorable outcomes was 25.8% (918/3,557), 22.9% (1,068/4,665), and 9.9% (610/6,133) in the bystander-CPR-without-DA group, the bystander-CPR-with-DA group, and the no-bystander-CPR group, respectively. The AORs compared with the no-bystander-CPR group were 1.43 (95% CI, 1.24-1.65) in the bystander-CPR-without-DA group and 1.62 (95% CI, 1.43-1.85) in the bystander-CPR-with-DA group. However, the proportions of neurologically favorable outcomes in nursing homes were 1.4% (90/6,496), 1.2% (114/9,469), and 1.2% (50/4,018) in the bystander-CPR-without-DA group, the bystander-CPR-with-DA group, and the no-bystander CPR group, respectively, and the adjusted ORs did not differ among the 3 groups.

Discussion

From the OHCA database of the All-Japan Utstein Registry, we demonstrated that patients receiving CPR from bystanders (with or without DA) had better outcomes after bystander-witnessed OHCA of medical origin, in both residential and public locations compared with those receiving no bystander CPR. However, in nursing homes, bystander CPR was not associated with improved outcome after OHCA, regardless of the provision of DA. Thus, our findings suggested that the effects of bystander CPR on OHCA survival differ by location. This population-based national registry, with its location data, enabled us to evaluate the impact of bystander CPR with or without DA by location of arrest in real-world settings, and this study may provide support for the strategy of improving survival after OHCA by consistently implementing DA for bystanders.

This study underscored that bystander CPR with or without DA had similar effects on increasing neurologically favorable outcome after OHCA. Previous studies showed bystander CPR without DA has a better outcome compared with bystander CPR with DA,[17-19] whereas, in other studies, bystander CPR with DA has the same or better effects than bystander CPR without DA.[10,20,21] Thus, the effect of bystander CPR with DA and without DA remains controversial. The reason for the different results may be explained by the quality of DA and/or the dissemination of CPR training in communities.[4-6] DA is conducted by dispatchers or by EMS personnel en route to the scene who suspect cardiac arrest when bystanders have not yet performed CPR. Its purpose is to enhance the probability of bystander CPR. Our findings reinforce the importance of increasing bystander CPR and subsequent survival by implementing both DA and CPR training for OHCA patients in real-world settings.[9]

The proportion of bystander-CPR-with-DA cases was high for residential locations. A previous study in Korea also reported the same tendency.[10] Importantly, about two-thirds of OHCAs occurred in residential locations,[22,23] and bystanders during OHCA in residential locations were more likely to be elderly family members.[24] They were less likely to have received CPR training and generally had little understanding of CPR,[25] which could be one reason that bystander-CPR-with-DA and no-bystander-CPR were higher in residential locations. DA initiation for family bystanders is often difficult because they tend to panic.[24] Therefore, an important component of DA protocols should be skills to calm emotional family members. In addition, CPR training for family members of high-risk persons, such as those with past ischemic heart disease, is important.[26]

On the other hand, this study showed that the proportion of bystander-CPR-without-DA and subsequent neurologically favorable outcomes after OHCA was high in public locations, suggesting that bystanders in public locations were more likely to have sufficient skills to perform CPR, as was also described in a previous study.[27] To further improve survival after OHCA in public locations, new approaches should also be tested, in addition to the dissemination of public-access defibrillation programs for the general public. For example, the smartphone-application system, which informs registered local volunteers of the occurrence and location of OHCA so they can perform CPR and use an AED, is of considerable help, especially in public locations.[28]

Recently, the number of OHCA in nursing homes has increased rapidly in Japan.[29] In this study, approximately 20% of OHCAs occurred in nursing homes, and bystander CPR was not associated with improved OHCA outcomes, irrespective of the implementation of DA. A previous study demonstrated that the proportion of bystander CPR in these locations was high, but the survival rate was very low[30] because almost all OHCA patients were ≥ 80 years old and only 1/4 of them had good activities of daily living before cardiac arrest.[30] Therefore, nursing homes might be inappropriate settings to evaluate the effect of bystander CPR on OHCA patients. In Japan, since there are no protocols constraining the termination of resuscitation (TOR) by on-scene EMS personnel, EMS personnel are essentially not permitted to terminate resuscitation in prehospital settings.[31] However, TOR is considered appropriate according to CPR guidelines, to make effective use of limited medical resources.[32] Therefore, while considering the needs of OHCA patients or their family members, the time has come for advance directives or prehospital TOR rules to be introduced in Japan, especially in nursing homes.

In this study, 50% of patients with bystander-witnessed OHCA of medical origin did not receive bystander CPR. If bystander CPR rates increase by implementing DA, the proportion of OHCA patients with shockable rhythm and subsequent survival rates would improve, because bystander CPR can sustain a shockable rhythm.[33] A previous study reported the frequency of dispatchers correctly identifying cardiac arrest at 65%, and only 58% of OHCAs received DA,[34] which points both to the difficulty of OHCA recognition and to the practical barriers to initiating DA via telephone.[35] Therefore, widespread efforts to revise DA protocols are needed to further increase DA implementation for OHCA patients. Systematic resuscitation education and dissemination of CPR training are also important to improve survival after OHCA.

Limitations: This study has some inherent limitations: First, this registry obtained no information on bystander CPR quality or type of bystander, i.e., trained off-duty medical professionals versus untrained laypersons. In addition, there were no data indicating why the dispatcher did or did not instruct the laypersons in each case. Second, detailed DA protocols in Japan are uniquely managed and implemented in each medical-control area. Therefore, these differences in protocol between local medical-control areas could influence DA implementation for OHCA patients. However, the Japanese FDMA advises all medical-control authorities to prescribe CPR instruction protocols based on uniform DA recommendations.[15] Third, prior/concomitant medical history and estimated diagnosis as well as information about hospital care[36,37] after transfer to the emergency department of hospitals among OHCA patients were not included in the All-Japan Utstein registry of FDMA. Fourth, there might be unrecognized confounding factors affecting the association between bystander CPR implementation with or without DA, location of arrest, and survival outcome after OHCA.

Conclusions

In this population, bystander CPR both with and without DA had better outcomes after bystander-witnessed OHCA of medical origin than those in the absence of bystander CPR in residential and public locations. However, in nursing homes, bystander CPR was not associated with improved outcome after OHCA, regardless of the implementation of DA.

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Disclosure

Conflicts of interest: None.

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