Analysis of reasons for emergency call delays in Japan in relation to location: High incidence of correctable causes and the impact of delays on patient outcomes

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Analysis of reasons for emergency call delay in relation to place in Japan: high incidence of correctable causes and the impact of large delay on patient outcomes

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ABSTRACT

Review: The interval between collapse and emergency call influences the prognosis of out-of-hospital cardiac arrest (OHCA). To reduce the interval, it is essential to identify the causes of delay. **Methods** : Basal data were collected prospectively by fire departments from 3746 OHCAs witnessed or recognised by citizens and in which resuscitation was attempted by emergency medical technicians (EMTs) between 1 April 2003 and 31 March 2008. EMTs identified the reasons for call delay by interview. **Results**: The delay, defined as an interval exceeding 2 min (median value), was less frequent in the central region, public places and for witnessed OHCAs. Delay was more frequent in care facilities and for elderly patients and OHCAs with longer response times. Multiple logistic regression analysis indicated that central regions, care facilities and arrest witnesses are independent factors associated with delay. The ratio of correctable causes (human factors) was high at care facilities and home, compared with other places. Calling others was a major reason for delay in all places. Performing CPR and other treatments was another major reason at care facilities. Large delay, defined as an interval exceeding 5 min (upper quartile value) was an independent factor associated with a low 1-year survival rate. **Conclusion**: The incidence of correctable causes of delay is high in the community. Correction of emergency call manuals in care facilities and public relations efforts to facilitate early emergency call may be necessary. The BLS education should be modified to minimize the interval related to making an emergency call.

Key words: out-of-hospital cardiac arrest; emergency call; place; survival; chain of survival

1. INTRODUCTION

The “chain of survival” includes important concepts in the desirable actions related to out-of-hospital cardiac arrest (OHCA), most of which occur at the patient’s home [2.3]. The first three links in the chain of survival (early access, early CPR and early defibrillation) have potential effects on survival from OHCA. There is accumulating evidence that the first link in this chain, i.e., the interval between estimated time of collapse and emergency call for an ambulance, has a large influence on the prognosis of OHCA [7-10]. Particularly, it is of great importance in regions with dispatch-assisted cardiopulmonary resuscitation (CPR) instruction systems as prolongation of this interval may cause a large delay in starting CPR [4, 5].

To reduce the interval between collapse and emergency call, it is essential to identify and analyze the reasons for delay within the community. In the present study, we prospectively identified the reasons for emergency call delay and analyzed whether the delay was correctable without a large public investment. Furthermore, we identified the factors associated with call delay to formulate an effective plan for correction. Finally, we confirmed whether the delay in emergency call is one of the major factors associated with poor outcome of OHCA in our community.

2. METHODS

The data were collected in accordance to the national guideline of ethics for the epidemiological survey (The Ministry of Health, Labor and Welfare in Japan : http://www.mhlw.go.jp/general/seido/kousei/i-kenkyu/index.html). The study was approved by an institutional review board (#841).

Populations and setting

Ishikawa prefecture encompasses an area of 4,185 km^2 on the Sea of Japan coast on Honshu, the main island of Japan, and has a resident population of 1,160,000. The prefecture is divided into four administrative regions: one central or urban and three semi-rural or rural regions. Sixty-two percent of the residents are located in the central (urban) region with an area of 1,432 km^2. An estimated 22% of the residents are over the age of 65. The population age is more advanced in rural areas (28.5% vs. 20.3%).

There are 11 fire departments and 55 registered ambulances in Ishikawa prefecture. All the fire departments have a dispatch system with telephone-assisted CPR instruction. Approximately two

thirds (950/1,625) of instruction attempts were accepted in the study period by callers or bystanders who had not yet performed CPR.

Patient data

Basal data were collected prospectively by fire departments from OHCAs that were witnessed or recognised by citizens and resuscitation was attempted by emergency medical technicians (EMTs) in the period from 1 April 2003 to 31 March 2008. The collected data were based on the Utstein template [11 – 13] and included region, place, patient's age, patient's gender, arrest witness, cause of arrest, bystander CPR, initial cardiac rhythm, interval between estimated time of collapse or arrest recognition (finding the victim with OHCA) and emergency call, interval between call and arrival (response time), interval between call and arrival at patient, return of spontaneous circulation (ROSC), 1-month survival, 1-year survival and 1-year survival with a favourable neurological outcome (cerebral performance score = 1 or 2). Survival rates at 1 year were determined either when the patient was alive in hospital at 1 year or when they were discharged alive from hospital to home or to care and rehabilitation facilities within 1 year. The primary end point was 1-year survival. The secondary end points were ROSC, 1-month survival and 1-year survival with a favourable neurological outcome. When the interval between estimated time of collapse or arrest recognition and emergency call exceeded 2 min, the estimated median interval in our community, the EMTs were encouraged to identify the reasons for call delay by interviewing the person(s) accompanying the ambulance.

Definition of delay and large delay (grouping of patients)

A delay in emergency call was judged to be present when the interval between estimated time of collapse or arrest recognition and emergency call exceeded the median value during the study period. A large delay was defined as when the interval exceeded the upper quartile value. Patients with OHCA were classified into two (with or without delay) or three (no delay, small delay and large delay) groups.

Analysis of reasons for call delay in relation to place

The reasons for call delay were classified into correctable causes (human factors) and uncorrectable causes (non-human factors). The reasons were analyzed in relation to the place where OHCA occurred. The places were divided into the following 4 groups: care facilities, home, public places and others. Public places included school, road, workplace and sports place. Care facilities included sanatorium type medical care facilities, health care facilities rehabilitation facilities and nursing home.

Statistical analysis

We analyzed the data using JMP ver.7 for Windows (SAS institute, Cary, NC). The chi-square test was applied for monovariate analyses. Kruskal-Wallis test was used for non-parametric comparisons. We used multiple logistic regression analysis to elucidate the factors associated with delay and poor outcome. In all analyses, $P < 0.05$ was considered significant.

3. RESULTS

Distribution of interval between estimated time of collapse or arrest recognition and emergency call (Definition of delay and large delay) in relation to place

As shown in Fig. 1, emergency calls were made before the time of collapse or arrest recognition in approximately 10% of OHCAs. The median interval was 2 min, and the upper quartile value was 5 min. The delay in emergency call was judged to be present when the interval was 3 min or more. A large delay was defined as an interval of 6 min or more. The distribution may be compared among places where OHCAs occurred. The median (Inter Quartile Range) values of interval were 1.5 (0.3 – 3) in public places, 2 (1 – 5) at home, 2 (1 – 6) in care facilities and 2 (1 - 6) in others. Kruskal-Wallis test revealed that the interval was significantly different among the places ($P<0.001$).

Characteristics and backgrounds of patients associated with delay (Table 1)

Table 1 summarizes the differences in characteristics and backgrounds between the 2 groups with and without call delay, as well as among the 3 groups. The delay in emergency call occurred less frequently in the central region, and for witnessed OHCAs. The delay was more frequent in elderly patients and care facilities and for OHCAs with longer response times. Multiple logistic regression analysis for significant factors in the monovariate analysis revealed that the central region, care facilities and unwitnessed arrest were independent factors associated with delay and large delay.

Characteristics and backgrounds of citizens who witnessed or recognized the OHCA (bystanders)

As shown in Table 2, the characteristics and backgrounds of bystanders were not significantly different between the 2 groups with and without delay. However, there were significant differences in the relation to patient, bystanders' age and number of bystanders among the 3 groups (without delay, with small delay and with large delay). Multiple logistic regression analysis elucidated that family, healthcare provider, elderly bystander were significant factors associated with large delay.

The characteristics and backgrounds of bystanders were significantly different among the places where OHCAs occurred. The OHCAs at home were more frequently witnessed or found by elderly citizens (30.8% at home vs.8.2% at other places, $P < 0.0001$) and by female citizens (63.7% at home vs. 49.9% at other places, $P < 00.0001$). The OHCAs at home were more occasionally witnessed by a single

citizen (68.2% at home vs. 33.9% at other places, $P < 0.0001$).

Analysis of reasons and causes for delay in relation to place (Table 3)

The reasons for delay were clarified in 83% (1,259/1,516) of OHCAs with the call delay. The ratio of correctable causes (human factors) to uncorrectable (non-human factor) was highest at care facilities and relatively high at home. When analyzed by a simple 2 X 2 chi-square test, the ratio was significantly higher in care facilities and home than in other places ($P<0.001$). Calling others, including family members, relatives, home doctor, police and supervisor (care homes and public places) was one of the major reasons for delay at all places. Performing CPR and other treatments was another major reason for delay at care facilities. Inability to make a decision to place the emergency call and thinking about what to do were other major reasons at home.

Effect of delay in emergency call on outcome of OHCA

As shown in Fig. 2, the outcomes and incidences of shockable initial rhythm were lowest in the OHCAs with large delay. As shown in Table 4, a large delay in emergency call was one of the independent factors associated with low rate of survival at 1 year. Region, patient age, place (public), arrest witness, aetiology of cardiac arrest and interval between call and arrival at patient were other independent factors related to 1-year survival.

4. DISCUSSION

Consistent with previous reports [7-10], a large delay in emergency call was an independent factor related to the long-term prognosis of OHCA. Although correction of this delay has been suggested to be necessary, effective means for such correction remain to be determined [14 – 16]. To develop a strategy to reduce the interval between collapse and emergency call, it is essential to identify and analyze the factors and reasons associated with delay within a community.

In the present study, we identified the factors related to the call delay. As reported previously [9, 17, 18], OHCAs witnessed by bystanders and those occurring in public places were less commonly associated with call delay. These two factors have been identified as major factors associated with survival of OHCAs, suggesting that emergency call without delay contributes to the good outcome of OHCAs witnessed in public places. Call delay is more common in non-central (rural or semi-rural) regions or for OHCAs with a longer response time. This implies that call delay augments the poor outcome of OHCAs in a region without a standard emergency medical service (EMS) system.

We analysed the reasons for delay in relation to place where OHCA occurred. In OHCAs occurring at care facilities, the major reasons for delay were performing CPR and other treatments, and calling the

supervisor or administrator, doctor and family. A large delay in emergency call was very common and prognosis of OHCA was poor at care facilities (Tables 1 and 4). The majority of delays at care facilities may be corrected by rectifying the institutional manual for emergency calls and by clarifying the indications for emergency calls in relation to the patients' living will. There may be similar issues at some public institutions.

One of the major reasons for call delay in OHCAs at home was calling the home doctor, family, relatives, friends and neighbours. Our recent questionnaire survey showed that approximately 10% of participants in basic life support (BLS) courses answered that they would call others after witnessing OHCA at home, even after completion of the course [19]. The significance of early emergency call was emphasised to a greater extent in the BLS course in relation to dispatch-assisted CPR instruction. Another major reason for delay is the inability to decide what to do. Although the behavioural pattern of laypeople witnessing or finding the OHCA remains to be clarified [20], it is assumed that people are unable to decide what to do when faced with a sudden crisis. A recent report suggested that approximately 45% of laypeople are unable to judge if the victim is in cardiac arrest or not [21]. Public relations efforts emphasising "make an emergency call when someone is unresponsive" and a short education program to mass casualties for the first link of the "chain of survival" may be necessary.

Although information was not obtained from all OHCAs, we analyzed the characteristics and backgrounds of bystanders. We identified family, healthcare provider, aged bystander to be independent factors associated with large call delay. Swor et al. reported that elderly and female citizens are associated with call delay [9], and that OHCAs with cardiac aetiology in a private residence were witnessed mainly by the spouse and children of patients [10]. We showed that backgrounds of bystanders differed among places where OHCAs occurred. The backgrounds of bystanders associated with call delay in each place, particularly at home, should be analyzed in more detail in future studies.

The median interval between collapse or arrest recognition and call was smaller in the present study than in previous reports in the 1990s [22, 23]. Advances and widespread adoption of mobile telephones became prominent at the beginning of the 2000s. Smooth connection between mobile phone and dispatch seems to have contributed to reduction of the call interval [24].

Limitations

Two clocks are present in the present study; one at the scene and the other in the EMS system. The time of collapse and arrest recognition were estimated by interview. Although the EMTs made every effort to obtain precise information during transportation and after arriving at the hospital,

both under- and overestimation of interval may have occurred. Some bystanders were unwilling to respond regarding why they did not make an early emergency call. In some cases at public places and others, the first person who witnessed or found the OHCA was not present when the EMT arrived. However, the number of cases in which the reason was unknown was smaller in the present study than in previous surveys using telephone [9] and direct mail [10].

5. CONCLUSION

The incidence of correctable causes of delay in making an emergency call is high in our community, particularly at care facilities and at home. Correction of the manual for emergency calls in care facilities and public relations efforts to facilitate early emergency calls may be necessary. The BLS education should be revised to minimise the interval related to making an emergency call.

6. CONFLICTS OF INTEREST STATEMENT

We have no conflicts of interest to disclose.

7. ACKNOWLEDGEMENTS

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8. REFFERENCES

1. Cummins RO, Ornato JP, Thies WH, Pepe PE. Improving survival from sudden cardiac arrest. The “Chain of Survival” concept. A statement for health professionals from the Advanced Cardiac Life Support Subcommittee and the Emergency Cardiac Care Committee, American Heart Association. Circulation 1991;83:1832-47.
2. Tyler V, Bentley JB, Lani C, et al. The Save Hearts in Arizona Registry and Education (SHARE) program: Who is performing CPR and where are they doing it? Resuscitation 2007;75:68-75.
3. Vaillancourt C, Stiell IG, Canadian Cardiovascular Outcomes Research Team (CCORT): Cardiac arrest care and emergency medical services in Canada. Can J Cardiol 2004;20:1081-90.
4. Reinier AW, Jan GP, Rudolph WK.. Bystander initiated actions in out of hospital cardiopulmonary resuscitation: results from the Amsterdam Resuscitation Study (ARREST). Resuscitation 2001: 273-9.
5. Holmberg M, Holmberg S, Herlitz J. Factors modifying the effect of bystander-CPR on survival in

out-of-hospital cardiac arrest patients in Sweden. Eur Heart J 2001;22:511-9.

6. Stiell IG, Wells GA, Field B, et al. Advanced cardiac life support in out-of-hospital cardiac arrest. N Engl J Med 2004; 351:647–56.
7. Herlitz J, Engdahl J, Svensson L, et al. A short delay from out of hospital cardiac arrest to call for ambulance increases survival. Eur Heart J 2003; 24:1750-5.
8. Herlitz J, Svensson L, Engdahl J, et al. Association between interval between call for ambulance and return of spontaneous circulation and survival in out-of-hospital cardiac arrest. Resuscitation 2006;71:40-6.
9. Swor RA, Compton S, Domeier R, et al. Delay prior to calling 9-1-1 is associated with increased mortality after out-of-hospital cardiac arrest. Prehosp Emerg Care 2008;12:333-8.
10. Swor RA, Jackson RE, Walters BL, et al. Impact of lay responder actions on out-of-hospital cardiac arrest outcome. Prehosp Emerg Care 2000;4:38-42.
11. Cummins RO, Chamberlain DA, Abramson NS, et al. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the Utstein Style. A statement for health professionals from a task force of the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council. Circulation 1991;84:960–75.
12. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the 'Utstein style'. Prepared by a Task Force of Representatives from the European Resuscitation Council, American Heart Association, Heart and Stroke Foundation of Canada, Australian Resuscitation Council. Resuscitation 1991;22:1-26.
13. Jacob I, Nadkarni V, Bahr J, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update and simplification of the Utstein templates for resuscitation registries: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian Resuscitation Council, New Zealand Resuscitation Council, Heart and Stroke Foundation of Canada, Inter American Heart Foundation, Resuscitation Councils of Southern Africa). Resuscitation 2004;63:233-49.
14. Hendrika M, Eric MD, Sharon SS, Daniel KH, Mary PL. Call fast_Call 911_a direct mail campaign to reduce patient delay in acute myocardial infarction. Am J Public Health 1997;87:1705-9.
15. Luepner RV. Reducing prehospital patient delays: the REACT Trial. Dallas, TX: Proceedings of the American Heart Association 1998.

16. Leslie WS, Urie A, Hooper J, Morrison CE. Delay in calling for help during myocardial infarction: reasons for the delay and subsequent pattern of accessing care. Heart 2000;84:137-41.
17. Iwami T, Hiraide A, Nakanishi N, et al. Outcome and characteristics of out-of-hospital cardiac arrest according to location of arrest: A report from a large-scale, population-based study in Osaka, Japan. Resuscitation 2005;69:221-8.
18. Robert AS, Jackson RE, Compton S, et al. Cardiac arrest in private locations: different strategies are needed to improve outcome. Resuscitation 2003;58:171-6.
19. Enami M, et al. The effects of the new CPR guideline on attitude toward basic life support in Japan. Resuscitation (2010), in press, doi:10.1016/j.resuscitation.2009.12.012
20. Christian V, Jeremy G, Jamie CB, et al. A survey of attitudes and factors associated with successful cardiopulmonary resuscitation (CPR) knowledge transfer in an older population most likely to witness cardiac arrest: design and methodology. BMC Emergency Medicine 2008;8-13
21. Breckwoldta J,, Schloessera S, Arntzb H-R. Perceptions of collapse and assessment of cardiac arrest by bystanders of out-of-hospital cardiac arrest (OOHCA). Resuscitation 2009;80:1108–13.
22. Mikael H, Stig H, Johan H, Bror G. Survival after cardiac arrest outside hospital in Sweden. Resuscitation 1998;36:29-36.
23. Eric I, Micheal LC. Ability of Laypersons to estimate short time intervals in cardiac arrest. Ann emerg med 2000;35:147-54.
24. Iwami T, Nichol G, Hiraide A, et al. Continuous Improvements in “Chain of Survival” Increased Survival After Out-of-Hospital Cardiac Arrests: A Large-Scale Population-Based Study. Circulation 2009;119:728-3

9. Figure legends

Fig1. Cumulative percentages of cases with various intervals of arrest recognition/witness to emergency call in relation to place

Fig2. Effects of call delay on outcomes and incidence of shockable initial rhythm.
＊ significantly different among the 3 groups.

Table 1. Differences in patients' characteristics and backgrounds among the groups.

Characteristics and backgrounds	Group (call delay), n			Statics	
	without delay (2 min or less) n=2230	with delay n=1516		*p* value by monovariate analysis between 2 groups*/ among 3 groups	Odds ratio (95% C.I.) by multiple logistic regression analysis for delay/large delay
		small (3 – 5 min) n=703	large (6 min or more) n=813		
Region – central % (n)	54.9%(1224)	38.5%(271)	36.4%(296)	<0.0001/<0.0001	0.714(0.667-0.764)/ 0.759(0.700-0.824)
Season					
winter % (n)	31.9% (712)	31.6%(222)	29.5%(240)	0.2331/0.3597	excluded
autumn % (n)	22.6%(504)	22.6%(159)	23.1%(188)		
spring % (n)	24.7%(550)	25.8%(181)	28.8%(234)		
summer % (n)	20.8%(464)	20.1%(141)	18.6%(151)		
Patient's age median (25%-75%)	75(62-83)	77(64-85)		0.0003/0.0015	1.001(0.997-1.005)/ 1.001(0.996-1.006)
		77(64-85)	77(65-85)		
Patient's gender – male % (n)	60.4%(1347)	61.2%(430)	58.7%(477)	0.7242/0.5759	excluded
Patient's disability – none % (n)	66.8%(1489)	67.4%(474)	63.4%(515)	0.3305/0.1533	excluded
Place					
care facilities %	10.5%(234)	13.1%(92)	14.0%(114)	<0.0001/<0.0001	1.242(1.041-1.482)/ 1.259(1.027-1.544)
home %	64.7%(1442)	63.4%(446)	69.0%(561)		0.976(0.868-1.096)/ 1.054(0.922-1.029)
public place %	20.6%(459)	19.2%(135)	11.1%(90)		Reference
others %	4.3%(95)	4.3%(30)	5.9%(48)		1.112(0.874-1.415)/ 1.299(0.988-1.692)
Arrest – witnessed	39.5%(880)	35.3%(248)	28.3%(230)	<0.0001/<0.0001	0.861(0.802-0.924)/ 0.818(0.750-0.892)
Aetiology – cardiac	51.7%(1153)	49.6%(349)	49.6%(403)	0.2070/0.4509	excluded
Interval of call to arrival at patient median (25%-75%)	7.0(5.1-9.7)	7.6(6-10)		<0.0001/0.0002	1.005(0.994-1.017)/ 1.004(0.992-1.016)
		7.1(5.5-10.2)	8.0(6.0-10.0)		

* 2 groups with and without delay

Table 2. Differences among the groups in the characteristics and backgrounds of citizens who witnessed or recognized the OHCA.

Characteristics and backgrounds of citizens who witnessed or recognized the OHCA	Group (call delay)			Statics	
	without delay	with delay		*p* value by monovariate analysis between 2 groups*/ among 3 groups	Odds ratio (95% C.I.) by multiple logistic regression analysis for large delay
	(2 min or less)	small (3 – 5 min)	Large (6 min or more)		
Gender					
male %(n)	42.0% (631)	41.2% (202)	37.6% (225)	0.1483/	excluded
female %(n)	58.0% (870)	58.8% (288)	62.4% (374)	0.1665	
Relation to patient					
family % (n)	64.0%(1326)	58.1%(374)	64.9%(494)	0.0899/	1.338(1.038-1.737)
friends % (n)	5.2%(107)	5.9%(38)	4.7%(36)	0.0016	1.066(0.638-1.727)
healthcare provider % (n)	8.5%(177)	9.9%(64)	12.1%(92)		2.013(1.438-2.819)
no relation % (n)	22.3%(463)	26.1%(168)	18.3%(139)		Reference
Age					
64 y or less	77.1%(1096)	80.3%(370)	73.8%(405)	0.8192/	Reference
65 y or more	22.9%(325)	19.7%(91)	26.2%(144)	0.0497	1.261(1.003-1.582)
Number of bystanders					
single	56.8%(1113)	51.7%(297)	59.1%(402)	0.5438/	1.015(0.833-1.236)
multiple	43.2%(847)	48.4%(278)	40.9%(278)	0.0244	Reference

Table 3. Analysis of reasons and causes for delay in relation to place

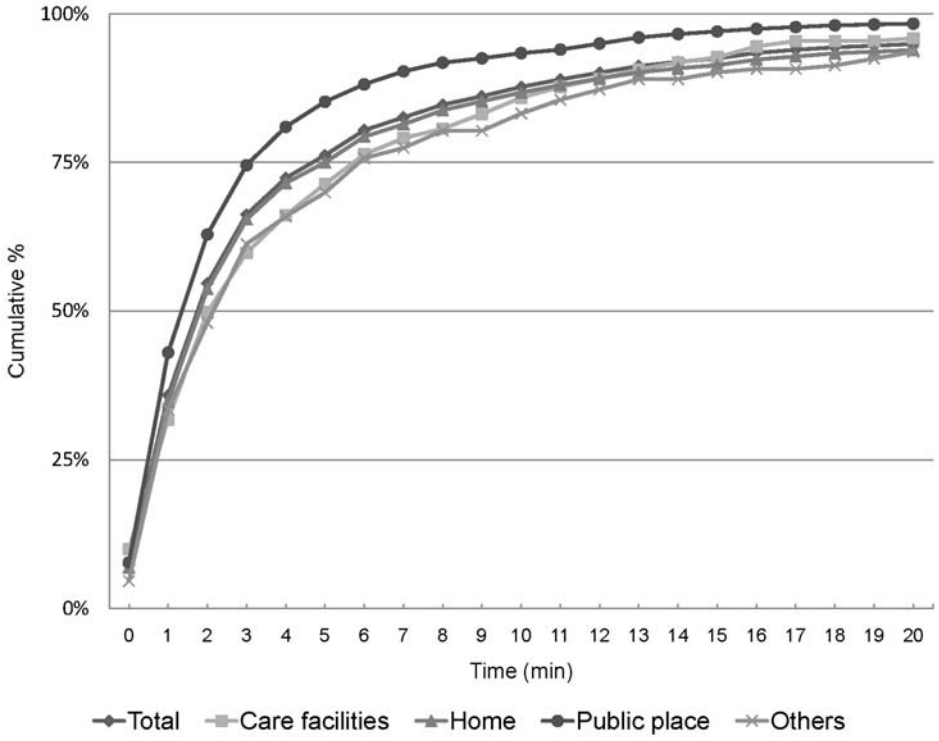
Reasons and causes	Total (n = 1516)	Places			
		care facilities (n=206)	home (n=1007)	public place (n=225)	others (n=78)
Correctable cause % (number)	59.5%(902)	68.9%(142)	64.4%(649)	40.4%(91)	25.6%(20)
call others	26.7%(405)	30.6%(63)	26.4%(266)	27.6%(62)	18.0%(14)
cannot judge or thinking what to do	24.5%(371)	4.9%(10)	33.5%(337)	8.4%(19)	6.4%(5)
performed CPR or other treatments	8.3%(126)	33.5%(69)	4.6%(46)	4.4%(10)	1.3%(1)
Uncorrectable cause % (number)	23.5%(357)	10.2%(21)	18.7%(188)	44.4%(100)	61.5%(48)
move or rescue	12.4%(188)	1.5%(3)	13.4%(135)	15.1%(34)	20.5%(16)
telephone not available	8.7%(132)	8.7%(18)	2.9%(29)	24.0%(54)	39.7%(31)
other difficulties	2.4%(37)	0%(0)	2.4%(24)	5.3%(12)	1.3%(1)
Unknown %	17.0%(257)	20.9%(43)	16.9%(170)	15.1%(34)	12.8%(10)

The ratio of correctable to uncorrectable causes is significantly different among the 4 groups (2 x 4 chi-square analysis $p < 0.0001$).

The ratio of correctable to uncorrectable causes is significantly higher in care facilities and home, compared with other places (2 x 2 chi-square analysis $p < 0.0001$).

Table 4. Effects of call delay and other factors on 1-year survival

Factors analyzed	1-year survival % (number)	Statics	
		p value by monovariate analysis	Odds ratio (95% C.I.) by multiple logistic regression analysis for survival
Call delay			
no delay	3.5% (79/2230)	0.0003	Reference
small delay (3 -5 min)	3.7% (26/703)		1.234(0.755-1.959)
large delay (6 min or more)	1.1% (9/813)		0.482(0.221-0.934)
Region			
central	4.3% (77/1791)	<0.0001	1.524(1.007-2.339)
non-central	1.9% (37/1955)		Reference
Season			
winter	3.2% (38/1174)	0.9700	excluded
autumn	2.9% (25/851)		
spring	2.9% (28/965)		
summer	3.0% (23/756)		
Patient's age [median (25%-75%)]	63.5(52.8-75.3)	<0.0001	1.028(1.018-1.038)
Patient's gender			
male	3.6% (81/2254)	0.0140	1.175(0.770-1.828)
female	2.2% (33/1492)		Reference
Patient's disability			
none	3.7%(92/2478)	0.0005	1.401(0.864-2.361)
mild to severe	1.7% (22/1268)		Reference
Place			
care facilities	1.1% (5/440)	<0.0001	0.698(0.236-1.665)
home	2.7% (65/2449)		Reference
public place	5.7% (39/684)		1.326(0.852-2.040)
others	2.9% (5/173)		1.483(0.490-3.635)
Arrest - witnessed			
witnessed	5.9%(80/1358)	<0.0001	4.256(2.812-6.577)
unwitnessed	1.4% (34/2388)		Reference
Aetiology			
cardiac	3.8%(72/1905)	0.0072	1.915(1.273-2.919)
non-cardiac	2.3% (42/1841)		Reference
Interval of call to arrival at patient [median (25%-75%)]	6.0(4.7-7.4)	<0.0001	1.188(1.105-1.286)


100%
75%
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Time (min)
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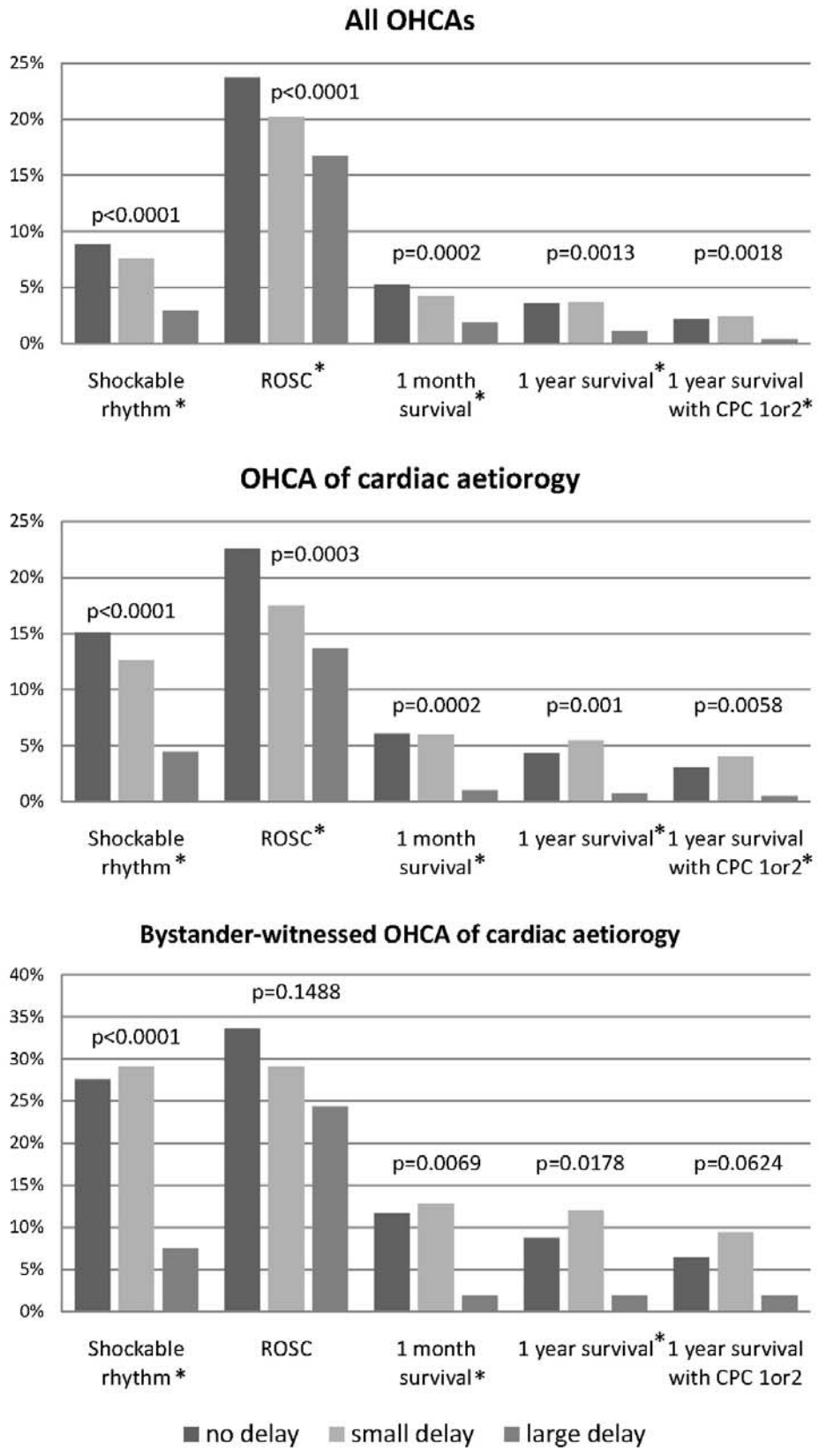
Home
Public place
Others


All OHCAs
25%
20%
15%
10%
5%
0%
p<0.0001
p<0.0001
p=0.0002
p=0.0013
p=0.0018
Shockable rhythm *
ROSC*
1 month survival*
1 year survival*
1 year survival with CPC 1or2*
OHCA of cardiac aetiorogy
25%
20%
15%
10%
5%
0%
p<0.0001
p=0.0003
p=0.0002
p=0.001
p=0.0058
Shockable rhythm *
ROSC*
1 month survival*
1 year survival*
1 year survival with CPC 1or2*
Bystander-witnessed OHCA of cardiac aetiorogy
40%
35%
30%
25%
20%
15%
10%
5%
0%
p<0.0001
p=0.1488
p=0.0069
p=0.0178
p=0.0624
Shockable rhythm *
ROSC
1 month survival*
1 year survival*
1 year survival with CPC 1or2
no delay
small delay
large delay