Recognition of out-of-hospital cardiac arrest during emergency calls by community level public awareness of cardiopulmonary resuscitation: A multi-level analysis

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Background

In dispatcher-assisted cardiopulmonary resuscitation (CPR) program, dispatchers' recognition of out-of-hospital cardiac arrest (OHCA) is the first step to initiate bystander CPR. This study aimed to investigate whether the community CPR awareness is associated with recognition of arrest, provision of CPR instruction, and bystander CPR

Methods

- A nationwide population-based observational study was conducted with adult OHCA patients with cardiac etiology between 2013 and 2015.
- Exposure was community level awareness of CPR using the national Korean Community Health Survey database categorized into quartile groups. Endpoints were recognition of arrest, provision of CPR instruction, and bystander CPR.
- Multi-level logistic regression analysis was performed for study outcomes.

Results

- A total of 43,875 OHCA cases were included in the final analysis.
- Of those cases, 20,182 cases (46.0%) were recognized during the emergency calls and CPR instructions were given in 17,804 (40.6%) cases.
- Compared with the lowest CPR awareness communities, AORs (95% CIs) for arrest recognition were 1.06 (0.96 to 1.17) in lower, 1.12 (1.02 to 1.23) in higher, and 1.19 (0.99 to 1.22) in the highest CPR awareness communities.
- For CPR instruction, AORs (95% CIs) were 1.13 (1.00 to 1.27) in lower, 1.25 (1.08 to 1.44) in higher, and 1.25 (1.09 to 1.44) in the highest CPR awareness communities.
- Bystander CPR was done in 21,973 cases (50.1%) and the communities with the highest CPR awareness showed higher bystander CPR rate (51.4%) than other communities (higher 50.9%, lower 48.3%, and the lowest 46.4%) ($p < 0.01$).

Conclusions

Although the dispatcher's recognition rate of OHCA was not different according to the community CPR awareness level, dispatchers provided more CPR instruction in communities with higher CPR awareness level. Finally, more bystander CPR was provided to the patients in higher CPR awareness communities.

Table 1. Individual characteristics of study population according to quartile of proportion of residents in community with CPR awareness

		Total		CPR awareness								p-value
				Q1 (39.3-70.5%)		Q2 (70.6-82.2%)		Q3 (82.3-87.7%)		Q4 (87.8-95.0 %)		
		N	%	N	%	N	%	N	%	N	%	
All	N	43875	100.0	5388	100.0	7766	100.0	14842	100.0	15879	100.0	0.90
Gender	Female	14870	33.9	1822	33.8	2608	33.6	5058	34.1	5382	33.9	
	Male	29005	66.1	3566	66.2	5158	66.4	9784	65.9	10497	66.1	
Age, years	19-39	1941	4.4	132	2.4	330	4.2	709	4.8	770	4.8	<0.01
	40-49	3814	8.7	335	6.2	612	7.9	1374	9.3	1493	9.4	
	50-59	7265	16.6	741	13.8	1254	16.1	2502	16.9	2768	17.4	
	60-69	7754	17.7	896	16.6	1402	18.1	2637	17.8	2819	17.8	
	70-79	12646	28.8	1800	33.4	2303	29.7	4176	28.1	4367	27.5	
	80-	10455	23.8	1484	27.5	1865	24.0	3444	23.2	3662	23.1	
	Median(IQR)	71 (57-80)		74 (62-81)		71 (58-80)		71 (57-79)		70 (56-79)		
	Metropolitan area											
Non-metropolitan	24715	56.3	5387	100.0	6059	78.0	7105	47.9	6164	38.8		
Location	Metropolitan	19160	43.7	1	0.0	1707	22.0	7737	52.1	9715	61.2	<0.01
	Public	8303	18.9	914	17.0	1479	19.0	2749	18.5	3161	19.9	
	Residential	34804	79.3	4360	80.9	6162	79.3	11818	79.6	12464	78.5	
	Other	768	1.8	114	2.1	125	1.6	275	1.9	254	1.6	
Witnessed												<0.01
		18902	43.1	2125	39.4	3250	41.8	6445	43.4	7082	44.6	
Past medical history	DM	9087	20.7	807	15.0	1520	19.6	3306	22.3	3454	21.8	<0.01
	HTN	13652	31.1	1255	23.3	2254	29.0	4828	32.5	5315	33.5	<0.01
	Heart disease	6623	15.1	700	13.0	1134	14.6	2261	15.2	2528	15.9	<0.01
	Stroke	3531	8.0	377	7.0	589	7.6	1243	8.4	1322	8.3	<0.01
Primary ECG												<0.01
	Non-shockable	36877	84.1	4751	88.2	6658	85.7	12415	83.6	13053	82.2	
Bystander CPR	Shockable	6998	15.9	637	11.8	1108	14.3	2427	16.4	2826	17.8	<0.01
		21973	50.1	2498	46.4	3754	48.3	7555	50.9	8166	51.4	
EMS response time interval, min												<0.01
	Median(IQR)	7 (5-10)		9 (6-14)		8 (6-12)		7 (5-9)		7 (5-9)		
Outcome	Prehospital ROSC	2614	6.0	135	2.5	351	4.5	965	6.5	1163	7.3	<0.01
	Survival to discharge	2688	6.1	99	1.8	296	3.8	1047	7.1	1246	7.8	<0.01
	Good Neurological recovery	1661	3.8	64	1.2	189	2.4	618	4.2	790	5.0	<0.01
	OHCA detection											<0.01
Dispatcher-provided CPR instruction	Arrest detection	20182	46.0	2587	48.0	3487	44.9	6869	46.3	7239	45.6	<0.01
	CPR instruction	17804	40.6	2038	37.8	3003	38.7	6187	41.7	6576	41.4	

Table 2 : Logistic regression analysis on arrest recognition and CPR instruction by CPR awareness level

		Total	Outcome		Unadjusted			Adjusted		
		N	%	OR	95%CI		OR	95%CI		
Arrest recognition										
Total		43875	20182	46.0						
Awareness	Q1 (lowest)	5388	2587	48.0	1.00			1.00		
	Q2	7766	3487	44.9	1.04	0.95	1.14	1.06	0.96	1.17
	Q3	14842	6869	46.3	1.10	1.00	1.20	1.12	1.02	1.23
	Q4 (highest)	15879	7239	45.6	1.07	0.96	1.19	1.10	0.99	1.22
CPR instruction										
Total		43875	17804	40.6						
Awareness	Q1 (lowest)	5388	2038	37.8	1.00			1.00		
	Q2	7766	3003	38.7	1.11	0.98	1.24	1.13	1.00	1.27
	Q3	14842	6187	41.7	1.23	1.07	1.41	1.25	1.08	1.44
	Q4 (highest)	15879	6576	41.4	1.22	1.06	1.40	1.25	1.09	1.44
Adjusted for location, witnessed										

Table 3. Logistic regression analysis on bystander CPR by CPR awareness level

	Total	Outcome		Adjusted I			Adjusted II		
		N	%	OR	95%CI		OR	95%CI	
Total	43875	21973	50.1						
CPR awareness									
Q1 (lowest)	5388	2498	46.4	1.00			1.00		
Q2	7766	3754	48.3	1.04	0.97	1.12	1.04	0.97	1.11
Q3	14842	7555	50.9	1.11	1.00	1.22	1.10	1.01	1.21
Q4 (highest)	15879	8166	51.4	1.16	1.03	1.30	1.14	1.02	1.28
Adjusted1 for age, gender									
Adjusted2 for age, gender, place, witnessed

Fig.1 Study population

Table 4. Multilevel logistic regression analysis and odds ratio for outcomes per 10% increment in community CPR awareness

	AOR	95% CI	
Arrest recognition	1.05	1.00	1.11
CPR instruction	1.11	1.06	1.17
Bystander CPR*	1.07	1.03	1.11

Adjusted for place, witnessed

***Bystander CPR: adjusted for age, gender, place, witnessed**