Title
Association of Response Time Interval and Good Neurological Outcome According to Bystander Cardiopulmonary Resuscitation

Permalink
https://escholarship.org/uc/item/4wv1r3ck

Authors
Kim, S
Ryoo, HW
Ahn, JY
et al.

Publication Date
2019

1 Ultrasound for the Diagnosis of Diverticulitis: A Systematic Review and Meta-analysis

Holladay D[1], Fullmer R[2], Peksa G[1], Gottlieb M[1] / [1]Rush University Medical Center, Chicago IL, USA; [2]Swedish Covenant Hospital, Chicago IL, USA

Objective: Diverticulitis is a commonly encountered diagnosis in the emergency department (ED). Computed tomography (CT) of the abdomen and pelvis is the most commonly used imaging modality for diagnosis. However, CT has several disadvantages including radiation, cost, availability, and possible contrast-induced nephropathy. Ultrasound offers a portable, less costly alternative without radiation or contrast.

Design and Method: We conducted a search of PubMed, Embase, Scopus, the Cochrane Database of Systematic Reviews, Cochrane Central Register, CINAHL, and LILACS for prospective trials evaluating the accuracy of ultrasound for diverticulitis. Two physician-investigators independently extracted data from the included studies into a pre-designed data collection form. Studies were independently assessed for quality by two separate physician-investigators using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool.

Results: This systematic review identified seven studies comprising 700 total patients. Overall, ultrasound was found to be 89.9% sensitive (95% confidence interval [CI], 81.8-94.6%) and 92.6% specific (95% CI, 81.6-96.8%) with a positive likelihood ratio of 11.3 (95% CI, 4.4 to 28.6) and a negative likelihood ratio of 0.11 (95% CI, 0.06 to 0.21).

Conclusion: This review demonstrates that ultrasound is sensitive and specific for the diagnosis of diverticulitis and may offer an alternative to computed tomographyCT. Further studies should be performed in the ED population and by emergency medicine providers.
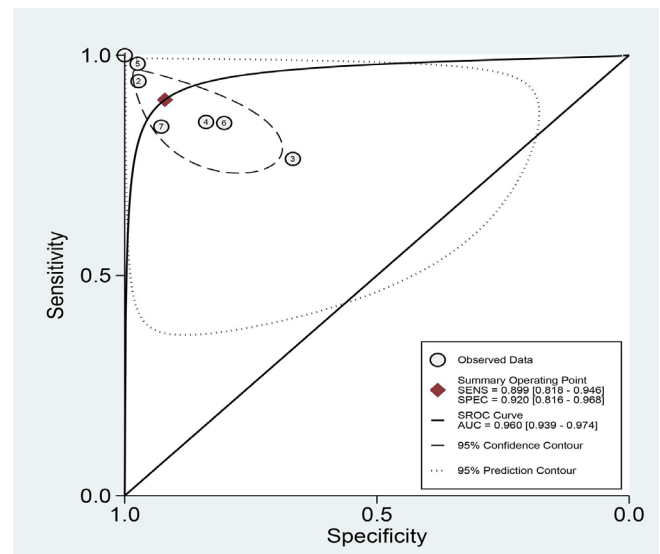
2 Association of Response Time Interval and Good Neurological Outcome According to Bystander Cardiopulmonary Resuscitation

Kim S[1], Ryoo HW[1], Ahn JY[1], Lee JH[1], Lee DE[1], Kim JH[2] / [1]Department of Emergency Medicine, Kyungpook National University Hospital, School of Medicine, Kyungpook National University, Daegu, Korea; [2]Department of Emergency Medicine, Yeungnam University College of Medicine, Daegu, Korea.

Objective: Response time interval (RTI), which refers to the time between the victim's collapse and a response by emergency medical services (EMS), is crucial in determining the initiation of cardiopulmonary resuscitation (CPR) and subsequent patient outcome. Our goal was to determine the different effects of RTI by bystander CPR on good neurological outcome. We hypothesized that bystander CPR would ensure a good score on the cerebral performance categories (CPC) scale and affect RTI.

Design and Methods: We conducted a retrospective, observational study with Pan-Asian Resuscitation Outcome Study data from January 2009–December 2016. Four Asian countries (Japan, Taiwan, South Korea, and Singapore) were selected. We included EMS treated, non-traumatic, witnessed out-of-hospital cardiac arrest cases (OHCA), while excluding cases involving cardiac arrest that occurred in nursing homes, had been witnessed by an emergency medical technician EMT, or was without sufficient data . General demographics, prehospital cardiac arrest details, response time, and clinical outcome were collected and analyzed. Primary outcome was good neurologic outcome.

Results: We analyzed 13,245 OHCA cases. Primary shockable electrocardiogram and prehospital defibrillation rate were higher in bystander CPR cases compared to the no-bystander CPR group (28.9%, 34.5% vs 21.1%, 26.8%). Prehospital advanced airway and epinephrine were more performed in the non-bystander CPR group (41.9%, 17.8% vs 47.1%, 20.2%). Median RTI by EMS was about six minutes. Survival discharge and good neurological recovery were higher in the bystander CPR group (15.5%, 10.2% vs 8.5%, 4.1%). Adjusted odd ratio for good neurologic outcome with RTI > 6 minutes compared to < 6 minutes was 0.62 (95% confidence interval [CI], 0.53-0.74) for the non-bystander CPR group but 0.71 (95% CI, 0.59-0.86) for the bystander CPR group. Dividing RTI time ranges by three-minute intervals, we found that good neurological outcome and survival discharge were only significant within three to six minutes in the non-bystander CPR group, but the significant RTI time range in the bystander CPR group was three to nine minutes.

Conclusion: Good neurologic outcome after cardiac arrest was higher in cases with bystander CPR. We also found that as the response time interval increased, slower deterioration of good neurologic recovery outcome was shown in cardiac arrest patients with bystander CPR performed.

Table 1. Flowchart.

Total PAROS OHCA cases	65413	Total Excluded	
		Age < 18	928
Age > 17 (18 or older)	64485		
		Noncardiac	24642
Cardiac cause	39843		
		Bystander unknown	35
Bystander CPR	39808		
		Unwitnessed	23270
		Nursing home	593
		EMT witnessed	2701
		Found in ambulance	11
		No arrest time	23
Total included	13245		

PAROS, Pan-Asian Resuscitation Outcomes Study; *OHCA*, out-of-hospital cardiac arrest; *EMT*, emergency medical technician; CPR, cardiopulmonary resuscitation.

Table 2. Demographics by bystander CPR.

	All		Bystander CPR				P-value
			No		Yes		
	N	%	N	%	N	%	
All	13245	100	7234	100	6011	100	
City							<0.0001
Tokyo	4345	32.8	2451	33.9	1894	31.5	
Osaka	2585	19.5	1581	21.9	1004	16.7	
Aichi	2541	19.2	998	13.8	1543	25.7	
Seoul	2246	17.0	1135	15.7	1111	18.5	
Taipei	466	3.5	291	4.0	175	2.9	
Singapore	1062	8.0	778	10.8	284	4.7	
Gender							0.518
Female	4595	34.7	2492	34.4	2103	35.0	
Male	8650	65.3	4742	65.6	3908	65.0	
Age group							
Adult	3960	29.9	2024	28.0	1936	32.2	
Elderly	9285	70.1	5210	72.0	4075	67.8	
Median (q1-q3)	74(62-83)		74(63-83)		74(60-84)		0.1416
Place							
Private	4729	35.7	2942	40.7	1787	29.7	
Public	1254	9.5	660	9.1	594	9.9	
Unknown	7262	54.8	3632	50.2	3630	60.4	
ECG							
Shockable	3261	24.6	1524	21.1	1737	28.9	
Non-shockable	9781	73.8	5597	77.4	4184	69.6	
Unknown	203	1.5	113	1.6	90	1.5	
RTI group							
Short	7238	54.6	4051	56.0	3187	53.0	
Long	6007	45.4	3183	44.0	2824	47.0	
Median (q1-q3)	6(5-8)		6(5-8)		6(5-8)		<0.0001
EMS DEF							<0.0001
No	9232	69.7	5295	73.2	3937	65.5	
Yes	4013	30.3	1939	26.8	2074	34.5	
Airway							<0.0001
Advanced	5919	44.7	3403	47.0	2516	41.9	
Basic	7004	52.9	3665	50.7	3339	55.5	
Unknown	322	2.4	166	2.3	156	2.6	
EMS epinephrine							0.0005
No	10718	80.9	5776	79.8	4942	82.2	
Yes	2527	19.1	1458	20.2	1069	17.8	
Outcomes							
Survival	1549	11.7	617	8.5	932	15.5	<.0001
Good CPC	909	6.9	298	4.1	611	10.2	<.0001

PAROS, Pan-Asian Resuscitation Outcomes Study; *OHCA*, out-of-hospital cardiac arrest; *RTI*, response time interval; *ECG*, electrocardiogram; *EMS*, emergency medical services; *CPR*, cardiopulmonary resuscitation; *CPC*, cerebral performance categories scale.

Table 3. Demographics by response time interval of six minutes.

	All		RTI				P-value
			Short		Long		
	N	%	N	%	N	%	
All	13245	100.0	7238	100.0	6007	100.0	
City							<0.0001
Tokyo	4345	32.8	2638	36.4	1707	28.4	
Osaka	2585	19.5	1464	20.2	1121	18.7	
Aichi	2541	19.2	1132	15.6	1409	23.5	
Seoul	2246	17.0	1408	19.5	838	14.0	
Taipei	466	3.5	331	4.6	135	2.2	
Singapore	1062	8.0	265	3.7	797	13.3	
Gender							0.133
Female	4595	34.7	2552	35.3	2043	34.0	
Male	8650	65.3	4686	64.7	3964	66.0	
Age group							0.2369
Adult	3960	29.9	2133	29.5	1827	30.4	
Elderly	9285	70.1	5105	70.5	4180	69.6	
Median (q1-q3)	74(62-83)		74(62-83)		74(61-83)		0.2291
Place							0.7818
Private	4729	35.7	2565	35.4	2164	36.0	
Public	1254	9.5	688	9.5	566	9.4	
Unknown	7262	54.8	3985	55.1	3277	54.6	
ECG							0.0001
Shockable	3261	24.6	1867	25.8	1394	23.2	
Non-shockable	9781	73.8	5244	72.5	4537	75.5	
Unknown	203	1.5	127	1.8	76	1.3	
Bystander CPR							0.0006
No	7234	54.6	4051	56.0	3183	53.0	
Yes	6011	45.4	3187	44.0	2824	47.0	
EMS DEF							0.0034
No	9232	69.7	4968	68.6	4264	71.0	
Yes	4013	30.3	2270	31.4	1743	29.0	
Airway							
Advanced	5919	44.7	2952	40.8	2967	49.4	<0.0001
Basic	7004	52.9	4084	56.4	2920	48.6	
Unknown	322	2.4	202	2.8	120	2.0	
EMS Epinephrine							
No	10718	80.9	6033	83.4	4685	78.0	<0.0001
Yes	2527	19.1	1205	16.6	1322	22.0	
Outcomes							
Survival	1549	11.7	982	13.6	567	9.4	<0.0001
Good CPC	909	6.9	593	8.2	316	5.3	<0.0001

RTI, response time interval; *ECG*, electrocardiogram; *EMS*, emergency medical services; *CPR*, cardiopulmonary resuscitation; *CPC*, cerebral performance categories scale.

Table 4. Odds ratio of outcome by response time interval (by six minutes) and bystander cardiopulmonary resuscitation.

	Total	Positive		Crude			Adjusted		
	N	N	%	OR	95% CI		OR	95% CI	
Good CPC									
Total	13245	909	6.9						
Short	7238	593	8.2	1.00			1.00		
Long	6007	316	5.3	0.62	0.54	0.72	0.65	0.56	0.76
Survival									
Total	13245	1549	11.7						
Short	7238	982	13.6	1.00			1.00		
Long	6007	567	9.4	0.66	0.60	0.74	0.69	0.61	0.77
	Total	Positive		Crude			Adjusted		
	N	N	%	OR	95% CI		OR	95% CI	
Good CPC									
Total	13245	909	6.9						
No	7234	298	4.1	1.00			1.00		
Yes	6011	611	10.2	2.63	2.28	3.04	2.18	1.87	2.54
Survival									
Total	13245	1549	11.7						
No	7234	617	8.5	1.00			1.00		
Yes	6011	932	15.5	1.97	1.77	2.19	1.68	1.49	1.89

CPC, cerebral performance categories scale; *CI*, confidence interval; *RTI,* response time interval; *OR*, odds ratio.

Table 5. Interaction analysis of response time interval and bystander-performed cardiopulmonary resuscitation outcomes.

		Bystander CPR (-)			Bystander CPR (+)		
Outcomes	RTI	AOR	95% CI		AOR	95% CI	
Good CPC							
	RTI>=6 vs. RTI <6	0.62	0.53	0.74	0.71	0.59	0.86
	3<RTI<=6 vs. RTI =<3	1.42	1.17	1.73	2.02	1.62	2.52
	6<RTI<=9 vs. RTI =<3	1.16	0.96	1.42	1.82	1.48	2.25
	9<RTI<=12 vs. RTI =<3	0.88	0.68	1.14	1.20	0.89	1.62
	12<RTI<=60 vs. RTI =<3	0.46	0.27	0.77	0.86	0.53	1.40
Survival							
	RTI>=6 vs. RTI <6	0.83	0.78	0.88	0.84	0.78	0.91
	3<RTI<=6 vs. RTI =<3	1.31	1.15	1.51	1.66	1.41	1.96
	6<RTI<=9 vs. RTI =<3	1.05	0.91	1.20	1.43	1.22	1.67
	9<RTI<=12 vs. RTI =<3	0.89	0.75	1.07	1.06	0.84	1.34
	12<RTI<=60 vs. RTI =<3	0.45	0.32	0.62	0.63	0.43	0.93

CPR, cardiopulmonary resuscitation; *CPC*, cerebral performance categories scale; *RTI*, response time interval; *AOR*, adjusted odds ratio; *CI*, confidence interval.