

The future of resuscitation The role of the Cardiac Arrest Centres

Dr. Luis Garcia-Castrillo UESEM President

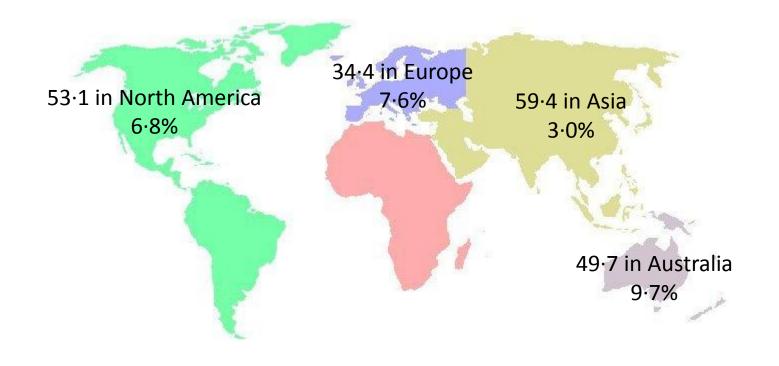


Incidence OHCA and Survival

It is estimated that 275.000 people in Europe have a cardiac arrest treated by EMS per year, with only 29.000 of those surviving to hospital discharge.



Incidence OHCA and Survival



Cases 100.000 hb./year % survival(hosp. discharge)

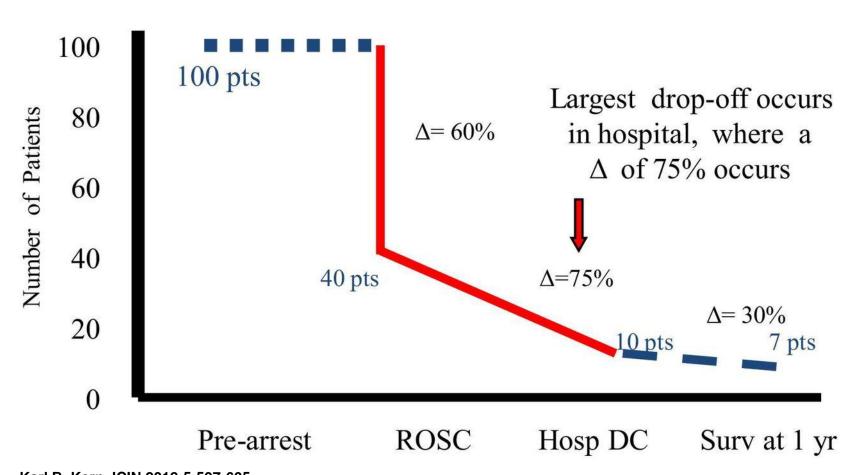


OHCA outcome. Trends 2011-18





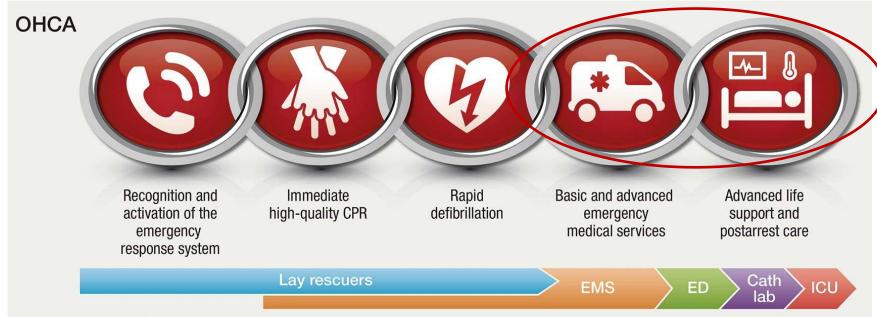
Cardiac Arrest Mortality Distribution





Fourth link





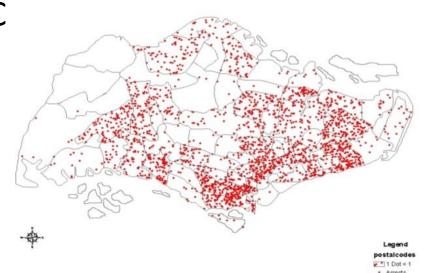
Fourth Link

Content

Cardiac Arrest Centres(CAC)

Regionalization of the CAC

Geographical distribution of cardiac arrests



NOCOI



CAC in Guidelines

AHA 2015 guidelines in regards to regionalized cardiac arrest centres:

 "A regionalized approach to OHCA resuscitation that includes the use of cardiac resuscitation centre's may be considered". (Class IIb, Level of Evidence C-LD)



CAC Guidelines

Resuscitation 95 (2015) 202-222



Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation



European Resuscitation Council and European Society of Intensive Care Medicine Guidelines for Post-resuscitation Care 2015 Section 5 of the European Resuscitation Council Guidelines for Resuscitation 2015*



Cardiac arrest centres

There is wide variability in survival among hospitals caring for patients after resuscitation from cardiac arrest. Many studies have reported an association between survival to hospital discharge and transport to a cardiac arrest centre but there is inconsistency in the hospital factors that are most related to patient outcome.



CAC Requirements

- General intensive care, including mechanical ventilation, (TTM).
- Acute cardiac care including coronary angiography and percutaneous coronary intervention (PCI).
- 24-h radiology service.
- Delayed, multi-modality and standardised.
 neuroprognostication.
- Minimum number of cases.
- Regionalization of the CAC.





Rational for CAC

National sample of US hospitals:

A total of 109,739 OHCA patients were identified. General In-hospital mortality was 70.6%.

Size of Hospitals

Urban hospitals	OR 0.63,	P = 0.004
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- Teaching hospitals OR 0.58,
$$P = 0.001$$



Rational for CAC

3981 OHCA;23.6% ROSC arrived at 151 hospitals.

33.1% survived. (North America)

PCI (19.2%), reperfusion (17.7%), induced hypothermia (39.3%).

Survival were higher in hospitals treating more subjects per year.

Odds Survival (Per 5 pat. /year) OR 1.06; (95%ci: 1.04–1.08)

Factors:

Early coronary angiographyOR 1.69; 95%CI 1.06–2.70

Coronary reperfusion
 OR 1.94; 95%CI 1.34–2.82

Induced hypothermiaOR 1.36; 95%CI 1.01–1.83



CAC volume effect

- Schober et al. Admission of OHCA to a High Volume Cardiac Arrest Centre is Linked to Improved Outcome.
 - Retrospective study from 2013-2015 in Vienna involving 861 patients, 7 hospitals.
 - Survival examined in relation to hospital admission rate of CA patients/year, multivariable analysis

Survival to discharge

- Admission >100 CA OR of 5.2 (1.2 –7) p= 0.025



CAC volume effect

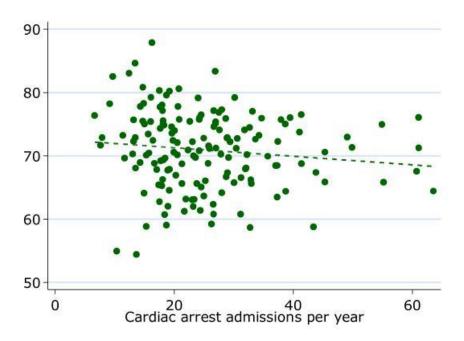
National Cardiac Arrest Audit UK ICU Volume and outcome

ICU cases/year	OI mortality
<20	1.00
20-34	0.78
35-50	0.71
> 50	0.62

Volume – outcome relationship? ICNARC data

Carr BG.

US 4674 patients from 39 hospitals Adjusted Mortality Ranks from 46-68%.



Rational for CAC Interventions

- <u>Stub et al</u>. Association between hospital post-resuscitative performance and clinical outcomes after out-of-hospital cardiac arrest.
 - Retrospective study of ROC PRIMED cohort from 2007-2009 involving over 3000 patients in US and Canada
 - Survival examined in relation to how adherent hospitals were with respect to 3 factors:
 - 1) Coronary angiography within 24h
 - 2) TTM
 - 3) Prognostication after 72hrs

Survival to discharge

High performers 35.1%0-2 Rankin 26%

Low performers 16.2% 0-2 Rankin 8,4%



CAC Rational PCI

- Hollenbeck et al. Early cardiac catheterization is associated with improved survival in comatose survivors of cardiac arrest without STEMI.
 - 269 patients; all VF/VT arrests, USA
 - Early cath (on arrival or initiation of TTM) vs late cath (during admission)

Mortality:

Early cath 34.3% vs

No early cath 51.4 % (P<0.01)

Cerebral Performance Category (CPC) 1-2:

Early cath 60.7%

No early cath 44.5% (P<0.01)



CAC Transport Risks

2015



28.0 %
of the
EU's population
live in a rural
area



CAC Transport Risks

People living in rural areas have longer travel times to the nearest hospital

Average minutes of car travel time to nearest hospital by community type for ...



Source: Survey of U.S. adults conducted Sept. 24-Oct. 7, 2018, and Homeland Infrastructure Foundation-Level data.

PEW RESEARCH CENTER



CAC Transport Risks

- Re-arrest rate estimated at 18% for VF/VT during transport to hospital
- <u>Cudnik et al.</u> A geospatial assessment of transport distance and survival to discharge in out of hospital cardiac arrest patients: Implications for resuscitation centres.
 - Secondary analysis of ROC study, 7540 patients (2005 -2007)

Those taken to further hospital had better survival for VF/VT 32.8% vs 25.6% p<0.001.

Distance (per km) OR 1.00 (0.99 – 1.01)

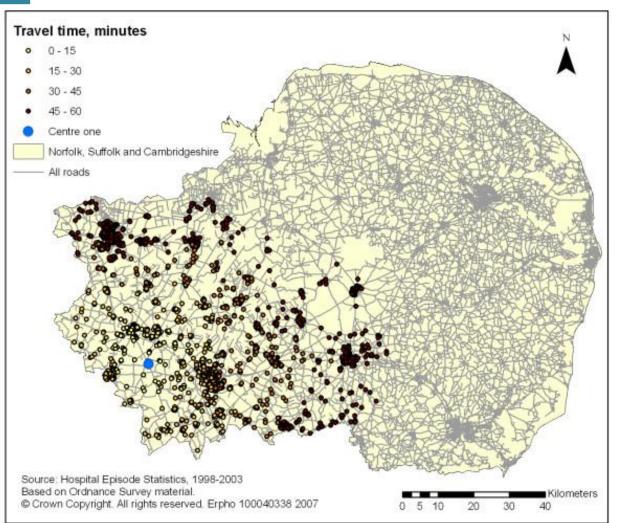
Transport to closest hospital OR 0.82 (0.69 – 0.97)

Limitations: Overall transport distances were modest



Rational for CAC Similar approaches

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Do Out-of-Hospital Cardiac Arrest Patients Have Increased Chances of Survival When Transported to a Cardiac Resuscitation Center? A Systematic Review and Meta-Analysis

Demis Lipe, MD, MSc; Al Giwa, MD, MBA; Nicholas D. Caputo, MD, MSc; Nachiketa Gupta, MD, PhD; Joseph Addison, BS, NRAEMT; Alexis Cournoyer, MD

			Cardiac centers	Non-cardiac centers		Odds Ratio		Odd	s Ratio	
Study or Subgroup	log[Odds Ratio]	SE	Total	Total	Weight	IV, Random, 95% CI	Year	IV, Rand	om, 95% CI	
1.2.1 Good neurologic	c outcome at hosp	ital disc	harge							
Wnent 2012	1.144	0.375	264	170	5.5%	3.14 [1.51, 6.55]	2012		_ 	_
Tsai 2017	0.895	0.741	474	72	1.6%	2.45 [0.57, 10.46]	2017	_		\longrightarrow
Casey 2018	0.371	0.059	27826	10337	31.6%	1.45 [1.29, 1.63]	2018		-	
Subtotal (95% CI)			28564	10579	38.7%	1.95 [1.09, 3.49]				
Heterogeneity: Tau ² = (0.15; Chi ² = 4.61, df	f = 2 (P =	0.10); $I^2 = 57\%$							
Test for overall effect: 2	Z = 2.26 (P = 0.02)									
1.2.2 Good neurologic	outcome at 30 da	ays								
Kajino 2010	0.899	0.102	2881	7502	25.5%	2.46 [2.01, 3.00]	2010		-	
Matsuyama 2017	0.513	0.0105	15118		35.8%	1.67 [1.64, 1.71]	2017			
Subtotal (95% CI)			17999	32349	61.3%	2.00 [1.37, 2.92]			-	
Heterogeneity: Tau ² = (0.07; Chi ² = 14.17, (df = 1 (P	$= 0.0002$); $I^2 = 93$	%						
Test for overall effect: 2	Z = 3.60 (P = 0.000)	3)								
Total (95% CI)			46563	42928	100.0%	1.84 [1.52, 2.21]			•	
Heterogeneity: Tau ² = 0	0.03; Chi ² = 23.21, o	df = 4 (P	= 0.0001); I ² = 83	%			Ļ	1 00 05	 	
Test for overall effect: 2	Z = 6.36 (P < 0.000)	01)					(0.1 0.2 0.5 Non-cardiac centers	Cardiac centers	10
Test for subgroup differ	rences: Chi ² = 0.00,	df = 1 (F	$P = 0.95$), $I^2 = 0\%$					14011-Gardiac Gerilers	Cardiac Ceriters	





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				Odds Ratio		Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
1.3.1 Survival to hosp	ital discharge					
Stub 2011	0.336	0.112	21.3%	1.40 [1.12, 1.74]	2011	-
Hunter 2016	0.315	0.295	15.7%	1.37 [0.77, 2.44]	2016	
Kragholm 2017	1.084	0.09692	21.7%	2.96 [2.44, 3.57]	2017	
Cournoyer 2018	0.359	0.135	20.8%	1.43 [1.10, 1.87]	2018	
Subtotal (95% CI)			79.5%	1.72 [1.10, 2.69]		
Heterogeneity: Tau ² = 0).18; Chi ² = 33.84,	df = 3 (P <	< 0.00001); I ² = 91%		
Test for overall effect: Z	Z = 2.37 (P = 0.02)					
1.3.2 Survival at 30 da	ys					
Kajino 2010	0.067	0.145	20.5%	1.07 [0.80, 1.42]	2010	-
Subtotal (95% CI)			20.5%	1.07 [0.80, 1.42]		•
Heterogeneity: Not app	licable					
Test for overall effect: Z	Z = 0.46 (P = 0.64)					
Total (95% CI)			100.0%	1.56 [1.03, 2.36]		
Heterogeneity: Tau ² = 0	0.20; Chi ² = 47.70,	df = 4 (P <	< 0.00001); I ² = 92%	F	1 1 1 1 1
Test for overall effect: Z = 2.11 (P = 0.04)						0.1 0.2 0.5 1 2 5 10 Non-cardiac centers Cardiac centers
Test for subgroup differ	ences: Chi² = 3.09	, df = 1 (P	= 0.08), I2	² = 67.6%		Non-cardiac centers Cardiac centers





Resuscitation



journal homepage: www.elsevier.com/locate/resuscitation

Review

Does care at a cardiac arrest centre improve outcome after out-of-hospital cardiac arrest? — A systematic review*



J. Yeung^{a,*}, T. Matsuyama^b, J. Bray^c, J. Reynolds^d, M.B. Skrifvars^e

			CAC	Other hospital		Odds Ratio	Odds	Ratio
Study or Subgroup	log[Odds Ratio]	SE	Total	Total	Weight	IV, Random, 95% C	IV, Rando	om, 95% CI
2.1.1 Observational s	tudies with adjust	led analy	/ses					
Kragholm 2017	0,793	0.1429	1359	148	76.2%	2.21 [1.67, 2.92]		•
Spaile 2014 Subtotal (95% CI)	0.8154	0.2554	1727 3086		23.8% 100.0%	2.26 [1.37, 3.73] 2.22 [1.74, 2.84]		•
Heterogeneity: Tau² = Tost for overall effect:		-	= 0.94)	; 12 = 0%				
2.1.2 Observational s	studies with unadj	usted an	alysos	3				
Couper 2018	0.5262	0.0307	7800	9804		1.69 [1.59, 1.80]		
Soholm 2015	0.8935	0.1423	586	492		2.44 [1.85, 3.23]		-
Resuscitation	2019;137:102	2-115					0.01 0.1 Favours Other hospital	i 10 100 Favours CAC

Fig. 3 - Survival to hospital discharge with favourable outcome. Higher odds ratio favours CAC.



Resuscitation



journal homepage: www.elsevier.com/locate/resuscitation

Review

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			CAC non-CAC Odds Ratio			Ratio				
Study or Subgroup	log[Odds Ratio]	SE	Total	Total	Weight	IV, Random, 95% CI	IV, Rando	m, 95% CI		
1.2.1 Observational studies with adjusted analyses										
Soholm 2013	0.2776	0.0977	563	457	56.4%	1.32 [1.09, 1.60]				
Hamod 2013	1.3863	0.4074	435	1238	43.6%	4.00 [1.80, 8.89]				
Subtotal (95% CI)			998	1695	100.0%	2.14 [0.73, 6.29]	-	•		
Heterogeneity: Tau2 =	Heterogeneity: Tau ² = 0.53; Chi ² = 7.00, df = 1 (P = 0.008); I ² = 86%									
Test for overall effect:	Z = 1.38 (P = 0.17)									
1.2.2 Observational s	tudies with unadj	usted an	alysis							
Seiner 2018	0.5108	0.308	61	147		1.67 [0.91, 3.05]	1	•		
Elmer 2018	0.5892	0.0755	920	4297		1.80 [1.55, 2.09]		•		
Matsuyama 2017	0.9749	0.0425	15118	24847		2.65 [2.44, 2.88]				
Tranborg 2017	1.3297	0.1112	900	1300		3.78 [3.04, 4.70]		•		
Resuscitation 201	9;137:102-11	5					0.01 0.1	10 100		
							Favours non-CAC			

Fig. 4 - Survival to 30 days. Higher odds ratio favours CAC.



To take Home

- It is reasonable to implement CAC with a define caching area to improve CA survival.
- More orientated design research is need to clarify the level of recommendation.
- Transport time is not a limitation for the regionalization.















2nd SOUTHEAST

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