Neurological And Cardiovascular Outcomes After Cardiac Arrest At Six Regional Interventional Cardiology Centers In The United States 2007-2011

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Introduction

- An aggressive approach to post-reuscitation care has been adopted in many tertiary care centers, and we hypothesized that outcomes have improved accordingly.
- We characterized neurological and cardiovascular outcomes of cardiac arrest (CA) survivors admitted between 2007-2011 at six regional interventional cardiology (PCI) centers in the United States.

Methods

- Six US Interventional Cardiology centers comprising the INTCAR-Cardiology research group retrospectively and prospectively evaluated 754 sequential cardiac arrest survivors admitted between 2007-2011.
- Demographics, clinical features, adverse events, echocardiographic findings, and long term neurological outcomes were de-identified and uploaded into a secure, web-based registry (INTCAR) [1] after local IRB approval.
- Echocardiography at admission and prior to discharge were compared
- A multivariate logistic regression model was developed using SAS® to evaluate the relative associations of demographic and clinical features, treatments, and adverse events with long-term neurological outcomes

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Results

DEMOGRAPHICS	All Cases n=754	Hospital #1 n=112	Hospital #2 n=252	Hospital #3 n=148	Hospital #4 n=36	Hospital #5 n=169	Hospital #6 n=37
Age	60.9 +/- 14.8	60.8 +/- 17.2	63.0 +/- 14.0	56.9 +/- 14.2	60.8 +/- 13.3	61.3 +/- 14.4	60.3 +/- 14.9
Male	68 (513/754)	70.5 (79/112)	70.6 (178/252)	64.9 (96/148)	69.4 (25/36)	64.5 (109/169)	70.3 (26/37)
Transfer from referring hospital	50.3 (371/738)	38.2 (42/110)	70.6 (178/252)	67.1 (98/148)	11.1 (4/36)	27.8 (44/158)	13.9 (5/36)
Comorbid conditions	2.2 +/- 1.6	2.3 +/- 1.5	2.2 +/- 1.7	1.9 +/- 1.6	1.5 +/- 1.7	2.5 +/- 1.7	2.5 +/- 1.2
TTROSC	23.6 +/- 16.5	23.4 +/- 15.2	24.2 +/- 14.9	22.9 +/- 18.3	23.4 +/- 19.1	23.7 +/- 18.5	22.4 +/- 15.2
VT/VF	59.8 (435/727)	46.4 (51/110)	68.7 (169/246)	63.6 (91/143)	79.4 (27/34)	52.2 (82/157)	40.5 (15/37)
Witnessed	82.3 (615/747)	80.7 (88/109)	79.8 (201/252)	85.8 (127/148)	86.1 (31/36)	83.1 (138/166)	83.3 (30/36)
Bystander CPR	52.6 (389/740)	54.1 (59/109)	50.8 (128/252)	48.3 (71/147)	66.7 (24/36)	60.4 (96/159)	29.7 (11/37)
STEMI	26.5 (198/746)	16.2 (18/111)	34.5 (87/252)	18.9 (28/148)	69.4 (25/36)	23.3 (38/163)	5.6 (2/36)
Cause of arrest (Cardiac)	74.8 (550/735)	50 (55/110)	88.9 (224/252)	48.3 (118/147)	97.2 (35/36)	64.9 (100/154)	50 (18/36)
Shock on presentation	31.9 (238/746)	34.5 (38/110)	30.3 (76/251)	28.4 (42/148)	27.8 (10/36)	33.9 (56/165)	44.4 (16/36)
Normal LV fxn	36.5 (228/624)	44.3 (39/88)	34.6 (83/240)	30.4 (28/92)	21.4 (6/28)	42.4 (61/144)	34.4 (11/32)
Moderate LV dysfxn	31.2 (200/624)	35.2 (31/88)	34.2 (82/240)	25 (23/92)	42.9 (12/28)	29.2 (42/144)	31.3 (10/32)
Severe LV dysfxn	31.4 (196/624)	20.5 (18/88)	31.3 (75/240)	44.6 (41/92)	35.7 (10/28)	28.5 (41/144)	34.4 (11/32)

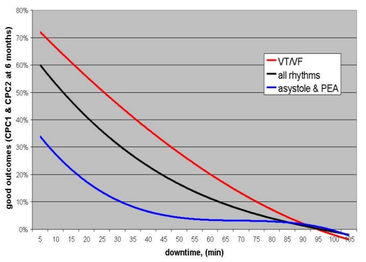
Multivariate Logistic Regression Model of Factors Associated with Good Outcome

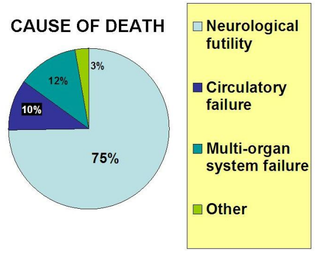
		Odds Ratio for Good Outcome	Confidence	P
Demographics				
	Age	0.993	0.966-1.019	0.5815
	Male Gender	1.470	0.657-3.290	0.3484
	Obesity	0.805	0.245-2.645	0.7203
	IDDM	0.173	0.044-0.671	0.0112
	NIDDM	0.496	0.173-1.418	0.1906
Clinical Factors				
	Witnessed	1.048	0.388-2.830	0.9263
	VT/VF rhythm	2.011	0.839-4.817	0.1172
	Downtime (min)	0.943	0.919-0.967	<.0001
Treatments				
	Delay to cooling	0.994	0.990-0.998	0.0058
	Time to Target	1.004	1.001-1.007	0.0101
	Urgent cath	0.904	0.362-2.258	0.8283
	Urgent PCI	2.983	1.024-8.694	0.0452
	DNR order	0.002	0.001-0.007	<.0001
Adverse Events				
	Pneumonia	2.208	0.929-5.251	0.0731
	Fever	5.248	2.027-13.588	0.0006

CARDIAC FUNCTION DURING HOSPITALIZATION

ECHOCARDIOGRAPHIC FINDINGS	At time of presentation	At hospital discharge	P=
Normal LV function	36.5%(228/624)	50% (229/458)	<0.001
Moderate LV dysfunction	32.1 (200/624)	29% (133/458)	0.28
Severe LV dysfunction	31.4 (196/624)	21% (96/458)	<0.001

GOOD OUTCOMES: CPC 1-2	All centers
All rhythms (n=722)	38.1%
Only VT/VF (n=435)	54.3%





Discussion

- Outcomes of cardiac arrest survivors treated at US PCI centers with therapeutic hypothermia were improved from historical reports, and similar to clinical trial data, despite a sicker case-mix [4].
- Patients with VT/VF did better than patients with PEA/asystole at every "down-time"
- In a multivariable model, better outcomes were independently associated with shorter arrest time, shorter delay to initiation of cooling, and urgent PCI.
- Insulin dependent diabetes and DNR orders were associated with worse outcomes.
- Despite improved outcomes, death after cardiac arrest remains overwhelmingly attributed to neurological futility.

References

1. Peberdy MA et al. **Part 9: Post–Cardiac Arrest Care.** Circulation 2010;122 (suppl 3):S768 –S786.
2. Neumar RW et al. **Post–Cardiac Arrest Syndrome.** Circulation 2008;118:2452–2483
3. http://www.intcar.org
4. HCASG. **Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest.** N Engl J Med 2002; 346:549

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