Modified Rankin Score at Hospital Discharge is Predictive of One Year Neurologic Function in Survivors of Cardiac Arrest

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Disclosure Information

- Presenter: Marv Wayne MD
  - No financial interests in Advanced Circulatory Systems Inc. (ACSI- manufacturer of the study devices)
- Co-authors:
  - No financial interests in ACSI: D. Tupper, R. Frascone, B Mahoney, RA Swor, T Aufderheide, R Domeier & M Olinger received grant funds to their institutions to conduct the study
  - R Holcomb received consulting fees for statistical analysis services
  - C. Setum works as a consultant from ACSI
- Grants/Research Support: NIH SBIR Grant **R44HL06585.** Advanced Circulatory Systems, Inc. (Roseville, MN) Recipient of the NIH award; trial sponsor

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Background

Little is known about the predictive value of the neurological outcome at hospital discharge in survivors of out-of-hospital cardiac arrest (OHCA) on one year survival and neurological function.

Recently, in several large clinical trials, the modified Rankin Scale (MRS) has been used, with survival to hospital discharge (HD), as composite primary endpoints.

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Cerebral Performance Categories
(more conventional scoring system)

SCORE	DESCRIPTION
1	Good cerebral performance: conscious, alert, able to work, might have mild neurological or psychological deficit
2	Moderate cerebral disability: conscious, sufficient cerebral function for independent activities of daily life, able to work in sheltered environment
3	Severe cerebral disability: conscious, dependent on others for daily support because of impaired brain function, ranges from ambulatory state to severe dementia or paralysis
4	Coma or vegetative state: any degree of coma without the presence of all brain death criteria, includes unawareness, even if appears awake (vegetative state) without interaction with environment; may have spontaneous eye opening and sleep/awake cycles, cerebral unresponsiveness
5	Includes brain death (apnea, areflexia, EEG silence) and traditional death

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Modified Rankin Scale
(greater focus on functionality)

SCORE	DESCRIPTION
0*	No symptoms at all
1	No significant disability despite symptoms; able to carry out all usual duties and activities
2	Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
3	Moderate disability; requiring some help, but able to walk without assistance
4	Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
5	Severe disability; bedridden, incontinent and requiring constant nursing care and attention
6	Dead

*Note: if a patient is restored to the same neurological state as prior to the neurological Insult they are given a score of '0'.

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Goal

Develop a surrogate for long-term survival, with good neurological outcome, following OHCA based upon status at HD

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Objective

Using data from a randomized non-traumatic OHCA[1] trial we evaluated the concordance of survival to hospital discharge with Modified Rankin Scale score (MRS) ≤3 (equivalent to favorable neurological outcome) with survival and favorable neurologic status, evaluated by multiple neurological assessments.

[1]*Aufderheide et al. Lancet 2011;377:301-311*

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Hypothesis

The MRS at the time of HD following resuscitation from a non-traumatic OHCA is highly predictive of survival and neurological status one year later.

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Methods

Study populations:

Study population I:

813 patients randomized to S-CPR and 842 randomized to active compression decompression CPR plus an inspiratory impedance threshold device (ACD+ITD). All with presumed cardiac cause.

Study population II:

1201 patients randomized to S-CPR and 1269 randomized to ACD+ITD regardless of the etiology of their arrest.

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Neurological Assessment Tools

Neurological Assessments: administered by research staff blinded to the CPR treatment. Survival data were available for 98% of subjects at one year.

Hospital Discharge:

MRS at HD: Focused on functionality and taking prior deficits into account.

One Year:

Cerebral Performance Category (CPC), Overall Performance Category (OPC), Health Utilities Index (HUI), and Cognitive Abilities Screening Instrument (CASI) (based on responses from consented survivors).

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Statistical Methods

Fisher's Exact Test, Pearson Chi-Square test, Mann-Whitney U test, and t-test for Equality of Means were used, as applicable, for comparisons.

All statistical tests were 2-sided and p-values < 0.05 were regarded as significant.

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Results: Overall Findings

Subjects with a MRS of ≤3 had favorable neurological outcome and could generally function independently.

There was a 98.0% observed agreement (kappa = 0.800, p < 0.001) between MRS at HD with a patient being alive with favorable neurological function, assessed by overall survival, CPC, OPC, HUI, and CASI.

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MRS at HD Predicts CPC at 1 Year

		MRS ≤3 at Hospital Discharge	MRS ≥4 at Hospital Discharge	P value
Cardiac etiology	S-CPR Group: CPC at 1 year	[n=47]	[n=24]	
	CPC<3	45 (95.8%)	7 (29.2%)	<0.001
	CPC≥3	2 (4.3%)	17 (70.8%)	
	ACD+ITD Group: CPC at 1 year	[n=54]	[n=24]	
	CPC<3	50 (92.6%)	12 (50.0%)	<0.001
	CPC≥3	4 (7.4%)	12 (50.0%)	
All patients	S-CPR Group: CPC at 1 year	[n=48]	[n=39]	
	CPC<3	45 (93.8%)	10 (25.6%)	<0.001
	CPC≥3	3 (6.3%)	29 (74.4%)	
	ACD+ITD Group: CPC at 1 year	[n=52]	[n=38]	
	CPC<3	47 (91.9%)	19 (50.0%)	<0.001
	CPC≥3	5 (8.1%)	19 (50.0%)	

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Limitations

A small number of patients in each group lost to follow up

Post-hoc analysis

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Conclusions

In non-traumatic OHCA, neurological score, assessed by MRS at HD, was predictive of one-year survival.

MRS ≤3 at HD was highly predictive of survival, with a favorable neurological outcome, one year after OHCA, for patients treated with both S-CPR and ACD+ITD

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Summary

Based upon these findings, future OHCA survival studies can use the MRS score at the time of HD to predict long-term survival with restoration to baseline neurological function

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Questions?

- Thank you

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