

Case #1: Hypothermia Use in Post-Cardiac Arrest Syndrome

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Disclosure Statement

Affiliation/Financial Interest – Corporate Organizations, Manufacturers, Providers

Consultant	Zoll
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Case: DW

- OOHCA* Cardiac Arrest
- Initial rhythm: VF
- Age: 54
- Est. Downtime: Call to ACLS-7 minutes
- Witnessed: yes
- Co-morbid conditions: IDDM, CAD

What are DW's chances for a good neurologic outcome??

*Out-of-hospital cardiac arrest

OOHCA Data: ROC

- EMS treated
 - 22.9% VF
 - 7.9% survival to D/C
- Initial VF rhythm
 - 21% D/C from hospital
 - Range 7.7% to 39.9%
- Non VF rhythm
 - 4% D/C from hospital

Nichol G et al. JAMA. 2008;300:1423-31.

OOHCA and Neurologic Recovery

• 45,000 arrests: 25,026 presumed cardiac

Initial Rhythm	% of Witnessed	% ROSC	1 Mos Survival %	1 Mos CPC 1-2 %
VF	19.7	49.7	23.3	12.1
PEA	24.9	35.1	5.9	2.3
Asystole	54.5	31.5	3.3	0.8%

Nichol G et al. JAMA. 2008;300:1423-31.

DW: Things Get Sticky

- Within 2 mins of ACLS
 - Defib to NSR with palpable pulse
- 27 mins later lost his pulse
- 13 more mins – ROSC
- NE and dopamine with MAP of 90

What are his chances now??

What else can we do for DW?

Neuroprotection 1955-2000

Trials of Neuroprotection Agents in Stroke

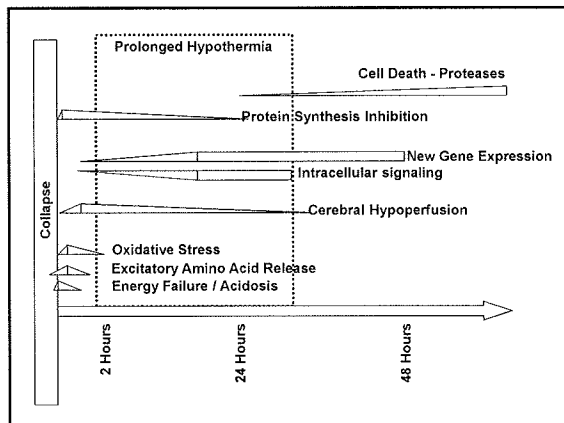
Neuroprotective Agents Tested	49
RCTs Performed	114
Patients Enrolled	21,445
Trials with Positive Results	0

Kidwell CS et al. *Stroke*. 2001;32(6):1349-59.

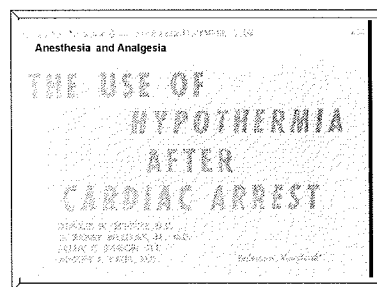
Hypothermia: Potential Mechanisms

Think Hibernation:

- 6% ↓ in metabolic rate per 1°C reduction in brain temperature
- CMR declined to 50% after brain cooling to 32 °C (CBF & CMR coupled)
- Blocks release of excitatory amino acid
- Reduces early calcium rise



There's Nothing New Under the Sun



HACA and Bernard et al.

HACA: CPC 1 or 2

- 75 /136 pts (55%) hypothermia
- 54/137 (39%) in the normothermia group
 - Risk ratio 1.40 (95% CI 1.08 - 1.81)
- NNT to improve neuro outcome= 6 pts
- NNT to prevent 1 death = 7 patients
- NNT to Harm = 14¹

Bernard et al. (77 pts)

- Good outcome = 49% v 26%²

¹Hypothermia After Cardiac Arrest Study Group. *N Engl J Med*. 2002. Feb 21;346(8):549-56.
²Bernard SA et al. *N Engl J Med*. 2002. Feb 21;346(8):567-63.

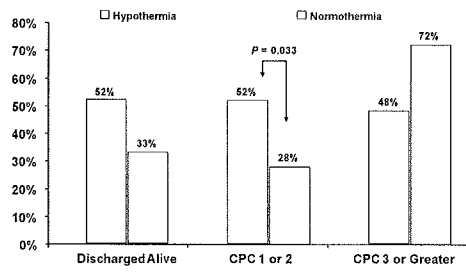
Hypothermia: The Beaumont Experience

Inclusion

- Patients with witnessed out of hospital cardiac arrest of presumed cardiac origin
- Any initial rhythm that had ACLS within 15 minutes
- Restoration of spontaneous circulation, (ROSC) within 60 mins of collapse
- Able to obtain informed consent by representative/family member were enrolled
- No prolonged hypoxia
- SBP > 90 on no > 2 pressors

Truong DV et al. Hypothermia Versus Normothermia After Out-of-Hospital Cardiac Arrest: Survival to Discharge and Neurologic Outcomes. *Annals of Emergency Med*. 2006;48: S1.

Mortality and Neurological Outcomes



Truong DV et al. Hypothermia Versus Normothermia After Out-of-Hospital Cardiac Arrest: Survival to Discharge and Neurologic Outcomes. *Annals of Emergency Med.* 2006;48: 51.

Impact of Resuscitation Centers on Survival After Cardiac Arrest from Ongoing Clinical Trial of Pre-hospital CPR Devices in 3 Different Test Sites

Site	% Patients Receiving Resuscitation Center Treatment	# Transported to Hospital	# Discharged Alive	% Discharged Alive	# with Normal Brain Function
1	~50%	34	8	24%	5
2	~90%	32	11	34%	8
3a	0%	18			
3b	0%	6			
3c	0%	17	1	6%	
3d	~50%	55	9	16%	7
3e	0%	35	3	9%	1

K Lurie et al. Data from the Res-Q trial Presented at AHA/ Resuscitation Symposium. Abstract P187. *Circulation*, Oct 2008;118:S_1485 - S_1486.

Is Faster Better???

- Basic science says yes
 - Cooling prior to injury results in no damage
- *What methods are best for cooling faster?*
- *What are the effects of variance in temp?*

RESCUE Trial:

- Ice bags and standard cooling blankets
- Arctic Sun®: Gel cooling pads

Heard K et al. RESCUE Study Group. Abstract 2411. *Circulation*. Oct 2007;116:II 529.

RESCUE: Target < 4 hours

	Percent <4 hours (95% CI)	
Arctic Sun	70.6% (52.5 to 84.9%)	<i>P</i> = 0.13
Control	50.0% (31.3 to 68.7%)	

Difference = 20.6 % (-3.4 to 44.6%)

Heard K et al. RESCUE Study Group. Abstract 2411. *Circulation*. Oct 2007;116:II 529.

Time to Target

Group	Median (25-75 th)	
Arctic Sun	193 min (136 to 255 min)	<i>P</i> < 0.001
Control	244 min (180 to 360 min)	

Heard K et al. RESCUE Study Group. Abstract 2411. *Circulation*. Oct 2007;116:II 529.

Temp Out of Range: High

Group	Percent > 33.9°C (95% CI)	
Arctic Sun	31.2% (16.1 to 50.0%)	<i>P</i> < 0.001
Control	79.3% (60.2 to 90.0%)	

Heard K et al. RESCUE Study Group. Abstract 2411. *Circulation*. Oct 2007;116:II 529.

CPC Category 1 or 2: 6 Months

Presenting Rhythm

Group	VF or VT		PEA or Asystole	
Arctic Sun	61.0% (38.6 to 80.3%)	<i>P</i> = 0.76	11.1% (.3 to 48.3%)	<i>P</i> = 1.0
Control	55.5% (30.7 to 78.5%)		9.0% (.2 to 41.3%)	

Heard K et al. RESCUE Study Group.
Abstract 2411. *Circulation*. Oct 2007;116:II 628.

DW: Things Get Worse

- Reached target temp 8:45 mins
- Now on 3 pressors. NE, dopamine & PE
 - Map 40-50 mmHg
- After 13 hours into cooling - DW arrests x 2
- Resuscitated
- Cooled for 11 more hours

What are DW's chances for a good outcome NOW??

1 Year Outcome for DW

- CPC 1: fully to pre-arrest levels
 - DW states he is smarter than he was
- DW states was life-changing event
 - Also changed him spiritually

DW beat all the odds:

Stated he is playing the LOTTO and craps,
if he can beat death he can beat anything!!

Conclusions

- Post-ROSC neurologic resuscitation:
 - Needs to improve
 - We have the tools
- Therapeutic Hypothermia:
 - Currently only proven therapy
 - Cheap
 - Easy
 - Risk / benefit ratio is huge (NNT 6 vs. 14)

Therapeutic Hypothermia

Just Do IT!!