ICE: Induced Cooling by EMS

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Disclosure

Financial relationships include
- Alsius Corp. - Speaker
- No Honorarium

Bring Out Your Dead

The Plan

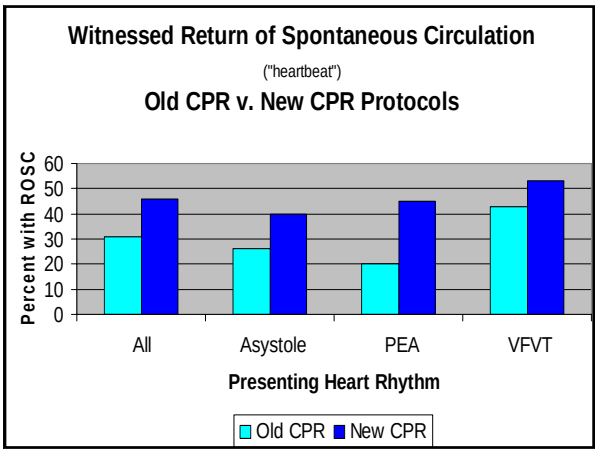
- Why cool?
- When to cool?
- Who to cool?
- How to cool?
- Cool cases!

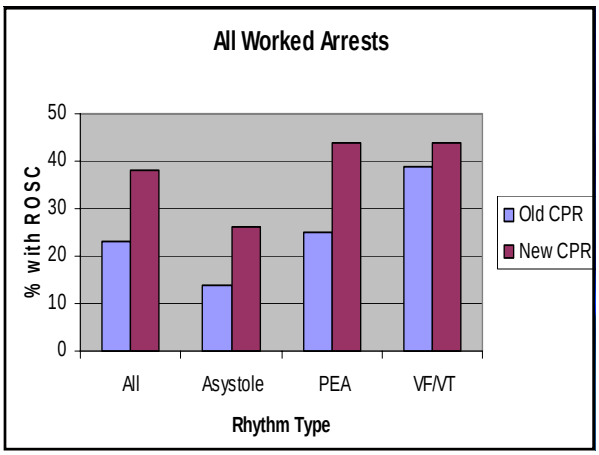
The Plan

- Review the data and guidelines surrounding hypothermia after cardiac arrest
- Does time matter ?
- Our community's experience
- "From dispatch to discharge"

Why Hypothermia?

- Of those who survive to hospital admission but do not survive to discharge:
  - 10% die due to recurrent dysrhythmias
  - 30% die to due to cardiovascular collapse
  - 40% die to neurologic impairment
  - 20% die due to other causes (sepsis, etc.)





Why Induced Hypothermia?

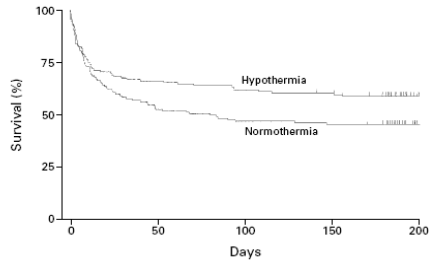
- Pre-hospital ROSC[1]
  - 45%(38%) of v-fib arrests
  - 37% (22%)of all cardiac arrests
- Discharge[1]
  - 12%(10%)
- Post Resuscitation Deaths[3]
  - 10% die due to recurrent dysrhythmias
  - 30% die to due to cardiovascular collapse
  - 40% die due to PRE

Post Resuscitation Encephalopathy

- Initial insult from cardiac arrest
- Period of luxuriant hyperperfusion[3]
- Cell injury[8,11]
  - Oxygen free radical formation
  - Inflammatory cascade
  - Glutamate mediated cell death
- Loss of autoregulation
  - Sludging and hypoperfusion[3,8,11]
  - Perfusion/demand mismatch[8,11]

Optimizing Neurologic Resuscitation

- Mild Induced Hypothermia (IH)
  - Decrease metabolic demand[4,5,6,7]
  - Inhibits inflammatory cascade[12,14,15]
  - IH is time sensitive[8,11,14,15]
- Hemodilution[12,13]
  - Normal saline dilution as part of hypertensive reperfusion strategy
- Hypertensive reperfusion
  - Use of vasopressors to target MAP of 90



No. at Risk					
Hypothermia	137	92	86	83	11
Normothermia	138	74	66	64	9

Figure 2. Cumulative Survival in the Normothermia and Hypothermia Groups. Censored data are indicated by tick marks.

NEJM 2002;346:549-56

Table 5

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results
Bernard SA et al, 1997, Australia	22 adults who remained unconscious after return of spontaneous circulation after out of hospital cardiac arrest Hypothermia group cooled to 33°C for 12 h and rewarmed over 6 h to 36°C	Prospective study with historical control group.	Good neurological recovery (Glasgow outcome scale 1 or 2) Survival	
Yanagawa Y et al, 1998, Japan	13 adults with out of hospital cardiac arrest and return of spontaneous circulation Core temperature 33–34°C for 48 h. Rewarmed to 37°C at 1 °C/day. Control group 15 patients treated before the hypothermia protocol was started	Prospective study	Good neurological recovery (GOS 1) Survival	
Bernard SA et al, 2002, Australia	77 adults who remained unconscious after resuscitation from out of hospital cardiac arrest hypothermia to 33°C for 12 h versus normothermia	Randomised control trial	Good neurological recovery (GOS 1–2) Survival	
The Hypothermia after Cardiac Arrest Study Group, 2002, Europe	275 adults with out of hospital cardiac arrest and return of spontaneous circulation Hypothermia to 32–34°C for 24 h then passive rewarming over 8 h versus normothermia	Randomised controlled trial with blinded assessment of outcome.	Good neurological outcome at 6 months (GOS 1 or 2) Survival at 6 months	

Neurologic 50% vs 14%

Neurologic 23% vs 7%

Survival 50% vs 23%

Survival 54% vs 33%

Neurologic 49% vs 26%

Neurologic 55% vs 39%

Survival 48% vs 32%

Survival 59% vs 45%

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50% vs 14%

vs 7%

50% 23% vs 7%

vs 33%

49% 49% vs 26%

48% 55% vs 39%

vs 45%

Metaanalysis

- Short term benefit ratio
  - 1.68;95% CI 1.29-2.07
- 6 mos benfit ratio
  - 1.44 95% CI 1.11-1.76
- NNT 6 CI (4-13)
- Other NNT
  - ASA (MI) 25
  - Beta blocker 42
  - Cath facility 15

ILCOR Advisory Statement

ILCOR Advisory Statement

Therapeutic Hypothermia After Cardiac Arrest

An Advisory Statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation

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Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association
Learn and Live.

Post Resuscitation Recommendations

- Induced hypothermia
- Prevention of hyperthermia
- Tight glucose control
- Prevent hypocapnia
- Maintain elevated MAP

Side Effects of IH

- Holzer & Bernard[4,21]
  - No difference in complication rates in normothermic and hypothermic cohorts
- Potassium shifts
  - Intracellular shift with induction
  - Extracellular shift with warming
- Fluid status
  - Cooling causes diuresis
  - Warming causes hypovolemia
- Respiratory Alkalosis
  - Temperature corrected ABG allows changes in minute ventilation to support normal PaCO2
- Hyperglycemia
  - HACA grp and Bernard found that high blood glucose after cardiac arrest is associated with poor neurologic outcomes but did not find any improvement with tight glucose controls. [4,5]

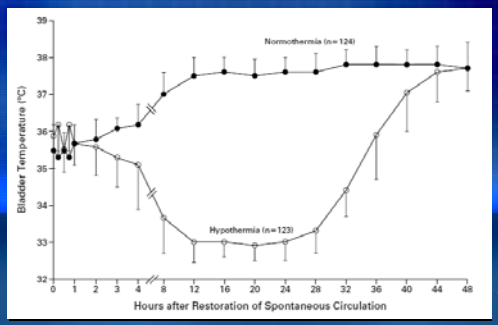
Complications of IH in Other Applications

- Neutropenia
  - Neutropenia and increased incidence of pneumonia seen in patients exposed to prolonged hypothermia (>24hrs) in other applications
- Coagulopathy[18,19,20]
  - May alter clotting cascade, platelet function
- Cardiac dysrhythmias
  - Little risk for clinically significant dysrhythmias if temperatures are maintained >30°C[17]

Hypothermia

- All guidelines flow from essentially two studies:
  - Bernard
  - HACA
- These studies were published in 2002
- Many remain unconvinced of the data
  - Small numbers of patients
  - Potential confounders

HACA Study Group



HACA Study Group

Table 2. Neurologic Outcome and Mortality at Six Months.

Outcome	Normothermia	Hypothermia	Risk Ratio (95% CI)*	P Value†
	no/total no. (%)			
Favorable neurologic outcome‡	54/137 (39)	75/136 (55)	1.40 (1.08–1.81)	0.009
Death	76/138 (55)	56/137 (41)	0.74 (0.58–0.95)	0.02

Bernard Study Group

Table 5. Outcome of Patients at Discharge from the Hospital.

Outcome*	Hypothermia (N=43)	Normothermia (N=34)
	number of patients	
Normal or minimal disability (able to care for self, discharged directly to home)	15	7
Moderate disability (discharged to a rehabilitation facility)	6	2
Severe disability, awake but completely dependent (discharged to a long-term nursing facility)	0	1
Severe disability, unconscious (discharged to a long-term nursing facility)	0	1
Death	22	23

RISK :BENEFIT

"Although we await further studies
With great interest,
We recommend the use of mild
Induced hypothermia
In survivors of cardiac arrest –
As early as possible and for
At least 12 hours"

-- Peter Safar and Patrick Kochanek, NEJM 2002;346(8):612-3

Editorial Comments

- "The reason hypothermia has not become the standard of care for post-resuscitation is simple. Emergency and EMS physicians have failed to make it so."
  - Mennegazzi and Callaway, PEC 2005

Editorial Comments

Wolters Kluwer Health | Lippincott Williams & Wilkins

Critical Care Medicine

OFFICIAL JOURNAL OF THE SOCIETY OF CRITICAL CARE MEDICINE

- "This therapy should now be considered standard of care for these patients"
  - Bernard S, Critical Care Med 2006

Lack of Money
Is the Root
Of all Evil

-- George Bernard Shaw

Hypothermia is Free

- Cost for our EMS System:
  - $5000 total start up cost
  - ~$4 per patient
- Cost in-hospital:
  - ~$100,000 start up costs
  - $1,000 per patient
- Institutional budget dust

Questions Now

- When should we start?
  - During CPR
  - Immediately after ROSC
  - In the Emergency Department
  - In the ICU
- Who should receive the treatment?
  - PEA/Asystole
  - Trauma, stroke, head injury, MI

When to cool?

Delay in cooling negates the beneficial effect of mild resuscitative cerebral hypothermia after cardiac arrest in dogs: a prospective randomized study.

-Kuboyama K et al. Crit Care Med 1993.

Group	Deficit Score	Histologic Score
Normo	44	150
Immed	19	81
Delay	38	107

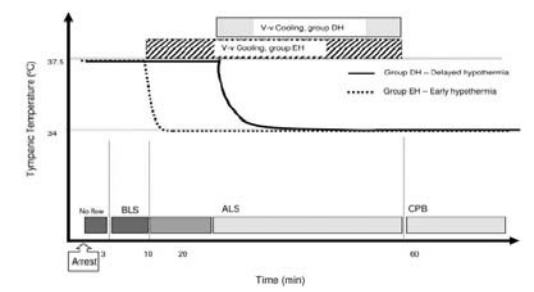
During CPR – Does It Matter?

- A single animal study and Dr. Safar's editorial suggest it matters
- Animal study demonstrated dramatic increase in neurologically intact survivors when hypothermia was induced at the initiation of resuscitation
  - Nozari A et al. Circulation 2006;113:2690-96

During CPR?

- This is possible, with the following concerns:
  - Adequate temperature monitoring
  - Effectiveness of defibrillation
  - Effectiveness of ACLS medications (if these actually matter)
  - Increased cost (minimal, but real)

During CPR – Does It Matter?



During CPR – Does It Matter?

Resuscitation Variables

Group	DH	EH	*P*
Countershocks, total	13 (1–58)	1 (1–8)	0.125
Countershocks, total energy, J	2755 (150–14 770)	185 (150–1510)	0.125
ROSC, min of CPB	51 (15–235)	16.5 (15–80)	0.395
Total bicarbonate, mEq	107 (55–175)	95 (40–230)	0.908
Total epinephrine, mg	2.45 (1.3–4.3)	0.75 (0.2–3)	0.01
Total NE, mg	13.86 (5.22–26.64)	17.80 (2.47–112.94)	0.674
Duration of NE infusion, h	5.3 (3.8–35.6)	20.5 (0.9–85.4)	0.093
Survival, h	21 (4–96)	96 (48–96)	0.002

NE indicates norepinephrine. Data are given as median (range).

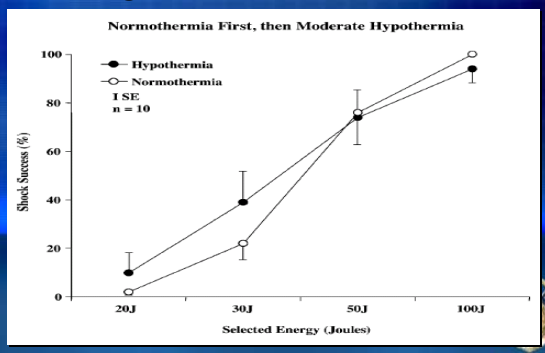
During CPR – Does It Matter?

	Delayed hypothermia	Early hypothermia
OPC 5 or death	0000000	0
OPC 4		0
OPC 3		0
OPC 2		0
OPC 1	0	0000

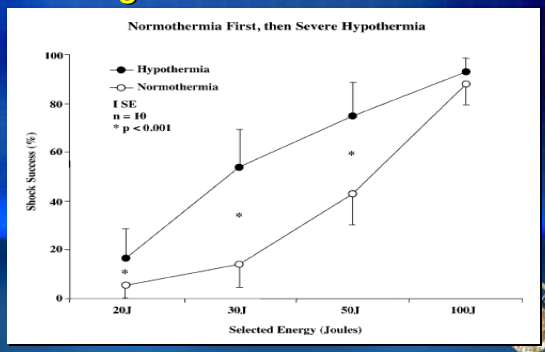
During CPR – Will Defib Work?

- Animal model evaluating shock success at normothermia, moderate hypothermia (33 degrees), and severe hypothermia (30 degrees)
- Logistic regression demonstrated risk of post-defibrillation asystole to be 18% in the normothermic group vs. 1% in the hypothermic group
  - Rhee J et al. Resuscitation 2005;65:79-85

During CPR – Will Defib Work?



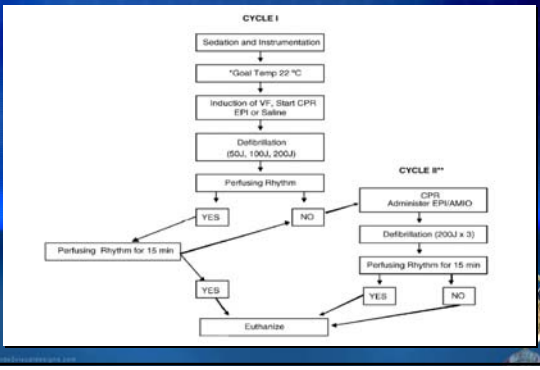
During CPR – Will Defib Work?



During CPR – Will Drugs Work?

- Animal study for severe hypothermia
- Purpose was to study treatment for accidental, severe hypothermia with ventricular fibrillation arrest
- Bottom line: The drugs worked
  - Wira C et al. Resuscitation 2006;69:509-16

During CPR – Will Drugs Work?



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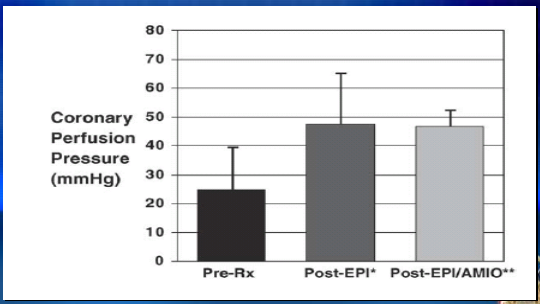

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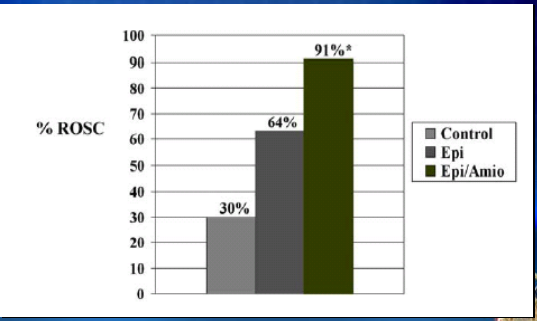


Summary of "When"

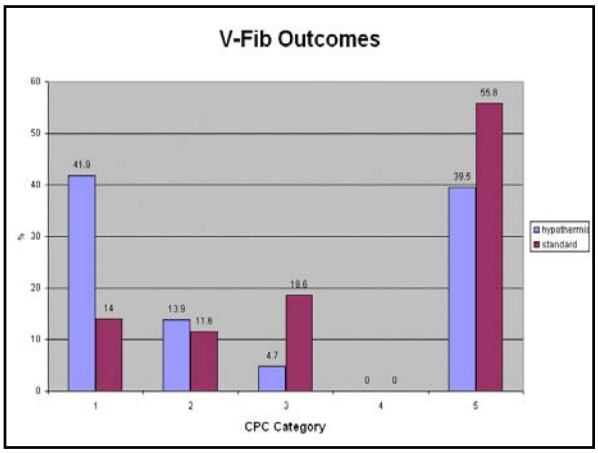
- Evidence suggests earlier is better
- Preliminary animal data suggests we should consider induction during the resuscitation
- Certainly, induction immediately after ROSC appears indicated:
  - Absolutely for VF/VT
  - Probably for other rhythms as well

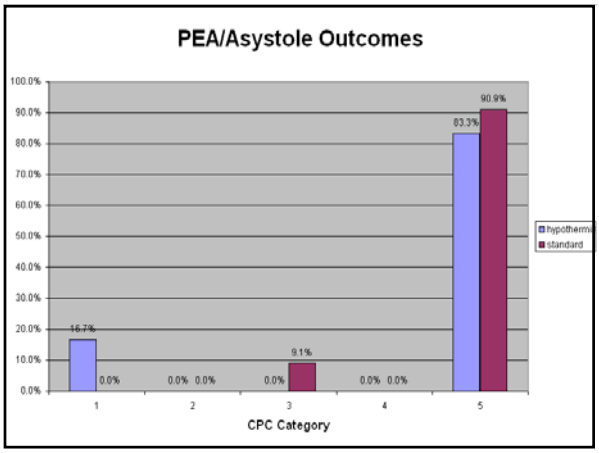
Feature Articles

From evidence to clinical practice: Effective implementation of therapeutic hypothermia to improve patient outcome after cardiac arrest

Mauro Oddo, MD; Marie-Denise Schaller, MD; François Feihl, MD; Vincent Ribordy, MD; Lucas Liaudet, MD

- 109 out of hospital cardiac arrest from all rhythms
- Retrospective study using historical controls
- 55 induced hypothermia and 54 controls
- Cool to 33deg C with external device for 24 hrs
- Patients treated with versed, fentanyl and vecuronium
- MAP were maintained 90-100mmHg

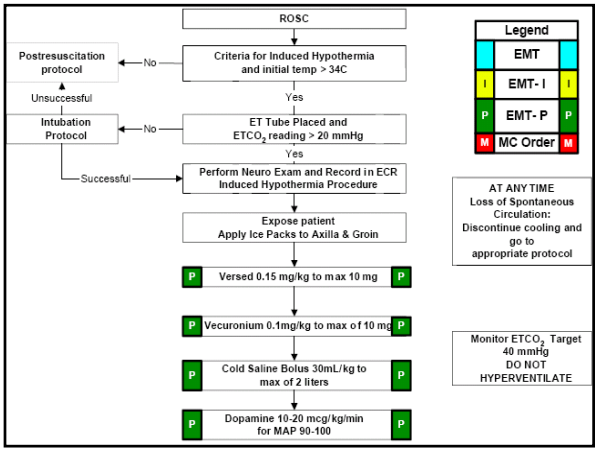

V-Fib Outcomes
60
50
40
30
20
10
0
41.9
14
13.9
11.6
4.7
18.6
0
0
39.5
55.8
1
2
3
4
5
CPC Category
hypothermia
standard

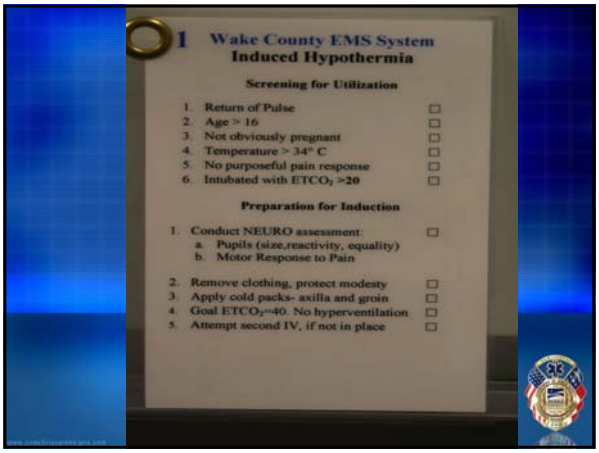

PEA/Asystole Outcomes
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
16.7%
0.0%
0.0%
0.0%
0.0%
9.1%
0.0%
0.0%
0.0%
83.3%
90.9%
1
2
3
4
5
CPC Category
hypothermia
standard


Our Program: ICE
Induced
Cooling by
EMS

Pearls:

- **Criteria for Induced Hypothermia:**
- ROSC after cardiac arrest not related to trauma or hemorrhage.
- Age greater than 16
- Female without obviously gravid uterus
- Initial temperature > 34C
- Patient is intubated and remains comatose (no purposeful response to pain)
- If patient meets other criteria for induced hypothermia and is not intubated, then intubate according to protocol before inducing cooling. If unable to intubate DO **NOT** initiate induced hypothermia.
- When exposing patient for purpose of cooling undergarments may remain in place. Be mindful of your environment and take steps to preserve the patients modesty.
- Do not delay transport for the purpose of cooling.
- Reassess airway frequently and with every patient move.
- Patients develop metabolic alkalosis with cooling. Do not hyperventilate.
- If there is loss of ROSC after cooling is initiated or any other complication as the result of this protocol please complete





Wake County EMS System
Induced Hypothermia

Screening for Utilization

1. Return of Pulse ☐
2. Age > 16 ☐
3. Not obviously pregnant ☐
4. Temperature > 34° C ☐
5. No purposeful pain response ☐
6. Intubated with $ETCO_2$ >20 ☐

Preparation for Induction

1. Conduct NEURO assessment: ☐
   a. Pupils (size,reactivity, equality)
   b. Motor Response to Pain
2. Remove clothing, protect modesty ☐
3. Apply cold packs- axilla and groin ☐
4. Goal $ETCO_2$=40. No hyperventilation ☐
5. Attempt second IV, if not in place ☐

Getting Started

- Process mapping
- Stake holder buy-in
- Establish expectations
- Turn the process over

Process Mapping

- Interoperability of phases of care
  - Dispatch to discharge
- Limited participating hospitals
  - High volume PCI facilities
- Redundancy
  - Same process at any entry point

Adult Emergency Department
Induced Hypothermia and/or Rewarming
Status Post Cardiac Arrest Orders

140010

Inclusion Criteria

- Non Traumatic Cardiac Arrest with Return of Spontaneous Circulation (ROSC)
- Core Temperature greater than 93.2°F (34°C) at presentation
- Time to initiation of hypothermia is less than 6 hours
- Comatose after ROSC: GCS less than 8, and no purposeful movements to pain

Exclusion Criteria

- Uncontrolled GI bleeding
- Patient requiring Mannitol therapy
- Advanced Directives or DNR status
- Cardiovascular instability as evidenced by: Uncontrollable dysrhythmias
- Refractory hypotension (unable to achieve target MAP with pressors – at least 75mmHg)
- Sepsis as suspected cause of cardiac arrest
- Suspected intracranial hemorrhage
- Major intracranial, intrathoracic or intrabdominal surgery within 14 days
- Gravid pregnancy

DATE /TIME	Weight _____kg	Time of ROSC _____

1. ☑ STAT point of care HCG. Inform MD of the results
2. ☑ Place temperature-sensing foley to monitor temp.
3. ☑ Set up for icy catheter insertion
4. ☑ **TIME COOLING STARTED: _____(in ED)**
   (GOAL is to get core temp to 32°-34°C within 6 hrs of onset of arrest)
   ☑ If core temperature is greater than 93.2°F (34°C) at initiation of protocol, bolus with **refrigerated 0.9% NS** until patient's core temperature is 93.2 °F (34° C). Bolus at 100mL/min with a maximum of 2 liters total. This is to include EMS volume. **(Omit if already given by EMS)**

Initiate Cool Guard protocol (preferred method)

5. If unable to use intravascular catheter above, initiate surface cooling by placing two cooling blankets (one anterior, and one posterior). Observe boney skin areas q 2hrs for any signs of breakdown. Place ice packs around neck, in axillary areas, and in groin.

IF patient has recurring arrhythmias, discontinue active cooling, and inform ED MD.

6. ☑ BP, MAP, HR, O2 saturation, and cardiac rhythm hourly.
7. ☑ Record core temperature q 15 minutes
8. ☑ Alternative methods for monitoring core temp may be rectal probe
9. ☐ 0.9% **NS** at _____mL/hr. Once icy catheter is inserted discontinue cold saline and replace with room temperature 0.45% **NS** at 100mL/hr.
10. Record total amount of cold saline infused prior to transporting to ICU _____mL
11. ☑ Record initial foley output _____mL
12. Labs:

☐ UA	☐ Phos	☐ ABG (temp corrected)	☐ CK's q 3 hrs x 3
☐ PT	☐ Magneusium	☐ UCG	☐ Other:
☐ PTT	☐ Lactate	☐ Cardiac Panel	

Patient Identification:

Origin: R10/06

WakeMed

Adult Emergency Department
Induced Hypothermia and/or Rewarming
Status Post Cardiac Arrest Orders

140010

13. ☑ Set up CVP monitor. When functional, attach to icy catheter triple lumen.
    CVP goal of 6-10 mmHg
14. ☑ **Nitroglycerin IV** start at 5 mcg/min, increase by 5 mcg/min increments q 3-5 min until a BP response is noted. Goal is to keep MAP* less than 120 or ☐ _____
15. ☑ Norepinephrine (**Levophed**) IV start at 0.5 mcg/min and titrate as needed to keep **MAP** greater than 75.
    ☐ Other pressor agent: _____
16. ☐ **Fentanyl** _____mcg/hr (2 mcg/kg/hr initially) continuous infusion
    (Consider if patient is hemodynamically unstable or has renal insufficiency, or if Creatinine Clearance < 50 mL/min.)
    OR:
    ☐ **Morphine** _____ mg/hr (0.1 mg/kg/hr) continuous infusion
    (Consider if patient is hemodynamically stable.)
17. ☐ Lorazepam (**Ativan**): _____ mg/hr (0.01 mg/kg/hr initially) continuous infusion to maintain sedation.
    OR:
    ☐ Propofol (**Diprivan**): _____ mcg/min (5 mcg/kg/min initially) continuous infusion, titrate Q 5 minutes to maintain sedation.
18. ☐ Vecuronium (**Norcuron**): _____ mcg/min (0.8-1.2 mcg/kg/min) continuous infusion.
    Pharmacy to mix 1:1 in NS (**Avoid in significant renal or hepatic impairment.**)
    ☑ Insert NGT to low intermittent wall suction
    ☑ Intake and output hourly
    ☑ If femoral line, reverse Trendelenberg to raise HOB as much as possible without kinking line
19. Vent Settings
    ☑ No warm humidified air
    ☑ Continuous ETCO2 monitoring
    ☑ ABG
    (Goal $PaCO_2$ 35-45)
20. STAT Diagnostics:
    ☐ PCXR ☐ 12 lead ECG ☐ Other: _____

Physician signature:	Transcribed by:	Checked by (Nurse):
_____	_____	_____
Beeper #: ___	Date: ____ Time: ____	Date: ____ Time: ____

Stakeholder buy-in

- Identify all stakeholders
- Present rationale
- Identify key players

Stakeholders

- ED
  - Nursing
  - Physicians
- Cardiology
  - Cath lab nursing
  - CCU nursing
  - Cardiologists
- ICUs
  - Nursing
  - Intensivists
- Neurology
- Pharmacy
- Hospital Admin

Expectations

- Provide sample protocols
- Work product goals
- Deadlines
- Inevitable completion

Turn the process over

- Key to buy in
- Sense of ownership
- Daily advocates

Elements of Prehospital Hypothermia

- ROSC
  - Uninterrupted compressions, timely defibrillation, controlled ventilations, efficient dispatch
- Method of cooling
  - $$ vs. ease of use
- Hospital coordination
  - Selective destination
  - Continuation of cooling

Hospital Destination

- High volume cardiac catheterization center
- Post-arrest care may include PCI and transfer while in the 24 hour window is cumbersome

What Have We Done So Far?

- February 2006 – EMS physicians and command staff leadership reviewed literature
- March 2006-August 2006 – Developed community-wide plan for post-resuscitation care
- August 2006-October 4, 2006 – Education regarding the plan
- Implemented plan – October 5, 2006

Old Habits

- One facility wanted to use the HACA criteria strictly
  - Was resuscitation started between 5 and 15 minutes after collapse?
  - Did the entire code last > 60 minutes?
- Many hesitate to initiate therapy when:
  - Initial rhythm was not VF/VT
  - Patient is going to the cardiac cath lab

Problems – Old Habits

- Reluctance when not v-fib or when going to the cath lab.
- Disparate experience with IH.
- Induction decision based on down time, duration of CPR and neuro exam.

Old Habits

- The immediate post-resuscitation neurologic exam
- One of the reasons we use paralysis – to get people not to do this!
- The immediate post-resuscitation neurologic exam is useless as a prognostic tool

Data from Neurological Literature

A more recent meta-analysis of predictive studies suggested only 4 variables had a high specificity: absent pupillary light reactions on day 3, absent motor response to pain on day 3, bilaterally absent median SSEPs within week 1, and burst suppression or isoelectric EEGs within week 1.

Maramattom BV et al. The Neurologist 2005;11:234-43

Data From the Neurological Literature

- 2006 Evidence-Based Review of the literature
- A must-read for clinicians caring for victims of cardiac arrest
- None of us are proposing that we fill ICUs with hopeless cases
- It is imperative, however, that we define hopeless in an evidence-based way
  - Wijdicks EFM et al. Neurology 2006;67:203-10

Do Circumstances of Arrest Adequately Predict Outcome?

Conclusions. Anoxia time, duration of CPR, and cause of cardiac arrest are related to poor outcome after CPR, but none of these variables can discriminate accurately between patients with poor and those with favorable outcomes.

Recommendations. Prognosis cannot be based on the circumstances of CPR (recommendation level B).

Is Elevated Body Temperature Predictive of Poor Outcome?

Conclusions. Elevated body temperature (>37 °C) is associated with poor outcome. However, hyperthermia alone could not discriminate accurately between patients with poor and those with favorable outcomes.

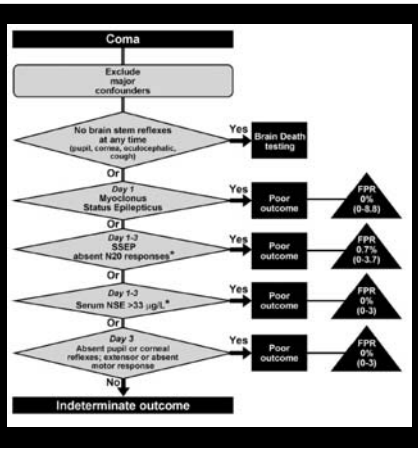
Recommendations. Prognosis cannot be based on elevated body temperature alone (recommendation level C).

Are Physical Exam Findings Predictive of Outcome?

Conclusions. The following clinical findings accurately predict poor outcome (FPR of 0 with narrow CIs); myoclonus status epilepticus within the first 24 hours in patients with primary circulatory arrest, absence of pupillary responses within days 1 to 3 after CPR, absent corneal reflexes within days 1 to 3 after CPR, and absent or extensor motor responses after 3 days.

Are Physical Exam Findings Predictive of Outcome?

Recommendations. The prognosis is invariably poor in comatose patients with absent pupillary or corneal reflexes, or absent or extensor motor responses 3 days after cardiac arrest (recommendation level A). Patients with myoclonus status epilepticus within the first day after a primary circulatory arrest have a poor prognosis (recommendation level B).



Summary of Predictors

- Situation of CPR and circumstances of resuscitation are not sufficiently predictive of outcome
- The initial post-resuscitation exam is not predictive of outcome.

Where Does This Leave Us?

- Post-resuscitation patients should receive hypothermia if initial rhythm was VF/VT
- Strong consideration should be given to providing the therapy to other post-resus patients
- Coordination between EMS, EM, ICU, and Cardiology is essential

Where Does This Leave Us?

- Post-resuscitation/cardiac specialty hospitals with expertise in these therapies should receive patients directly from the field or in prompt transfer
- We may be starting all codes cold in the near future

What Have We Found?

- Since October 2006, we have induced over 100 patients
- We have experienced no complications and 2 mild protocol violations
- "Doc, resuscitation is hard – this is easy"

So where are the numbers?

- We have completed survival analysis
- Currently looking at neuro outcomes
- We have submitted abstracts for SAEM in May 2008

Pittsburgh Data at NAEMSP

- OHCA – Results to date
  - 31 OHCA patients
  - 26/27 eligible cooled
- Survival 47%
- Good neuro outcome 38%

Thanks to Jon Rittenberger and Frank Guyette

Case #1: Mile High Club

- Male on-board commercial flight
- Developed chest pain
- Was provided ASA and SL NTG from the on-board medical kit

Case #1: Mile High Club

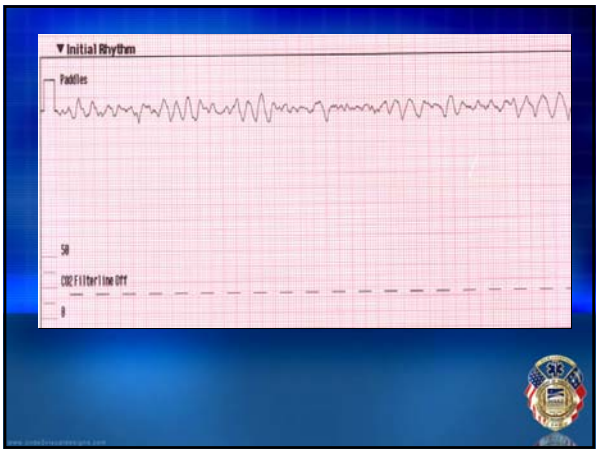
- Shortly after the medication:
  - Patient become unresponsive
  - Suffered cardiac arrest with non-shockable rhythm -- CPR
  - Plane was diverted to Raleigh-Durham International
- Patient was found with weak carotid pulse and no spontaneous respirations

Case #1 – Mile High Club

- Patient bit the blade of the laryngoscope
- Modified prehospital protocol with ice packs only
- Intubated in the ED via RSI
- Cath lab with 100% LAD
- 24 hours of IH
- Discharged neurologically intact

Case #2

- 63 year old male
- Witnessed arrest in his home
- Wife performed compression-only CPR via EMD
- Fire and EMS arrived simultaneously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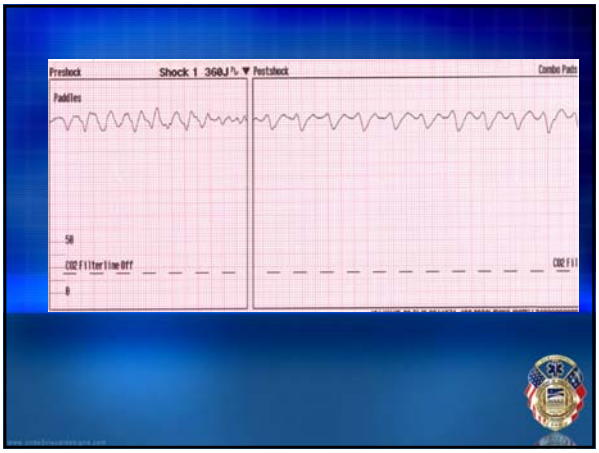
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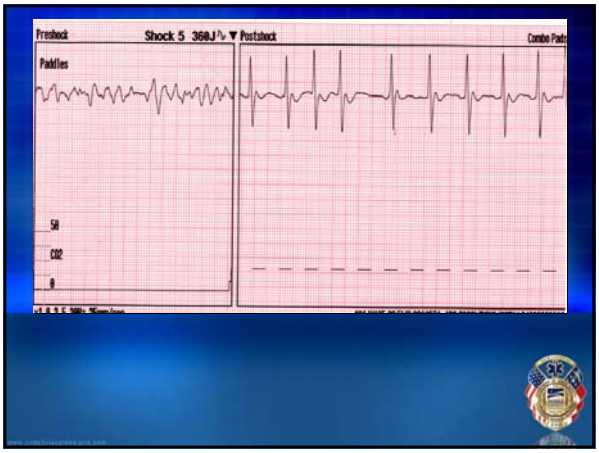
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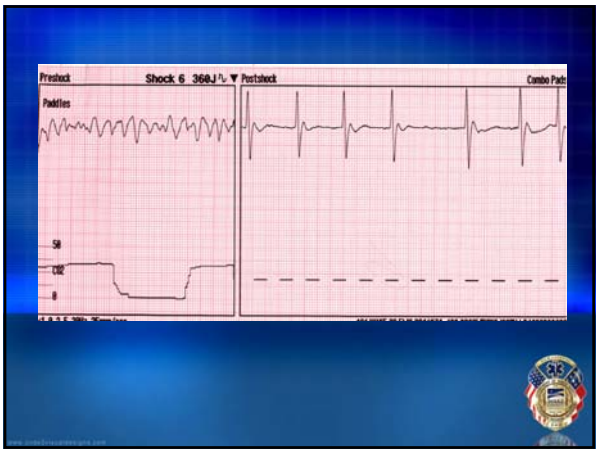
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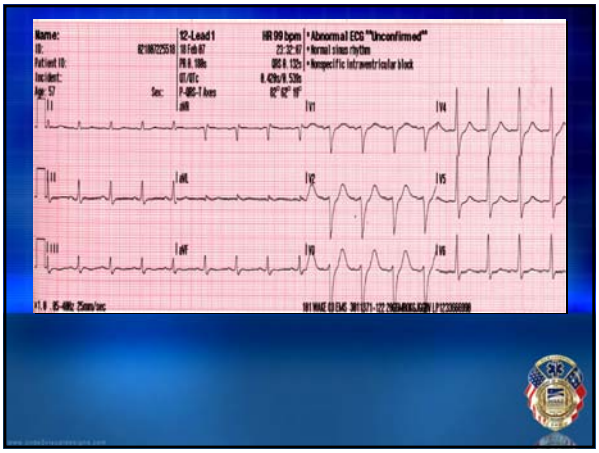
Name:
12-Lead 1
HR 99 bpm
• Abnormal ECG "Unconfirmed"
• Normal sinus rhythm
• Nonspecific intraventricular block

Patient #2

- Patient was induced on-scene after noting no purposeful response to pain
- Patient was without sustained ROSC with EMS for 15 minutes
- Temp on arrival was ~35
- Patient completed 24 hours of treatment – no neuro response

Patient #2

- Patient extubated ~48 hours into hospital course
- Very confused and minimally responsive
- Some combativeness

Patient #2

- On hospital day #5, patient with elevated troponins and had non-ST elevation MI
- Went to cath lab for successful PCI
- On hospital day #6, patient with return of neuro function save for recent memory
- D/C home neuro intact

Patient # 3 (6/2007)

- 20s year old male
- Warm water drowning with potential substance abuse
- Asystolic with EMS for over 15 minutes (~25 minutes without pulse in total)
- After ROSC, patient received ICE while on-scene

At the Emergency Dept

- The reasons why we shouldn't:
  - "He might have a head injury with ICH"
  - "He might have a spinal cord injury"
  - "He is a trauma patient and we're not sure trauma will do this"
- Patient's hypothermia therapy was put "on hold" until CT scan results could be obtained

In the ICU

- Patient was admitted to trauma services
- Eric Reyer, RN went to the ICU and asked trauma about hypothermia
- Permission was granted to consult the medical intensivist to resume hypothermia

And then . . .

- 36 hours later, patient completed rewarming
- And he did not wake up – at all
- Family was consulted and horrible prognosis was predicted

The Rest of the Story

- On hospital day #11, the patient without warning called his mother by name
- Over the next 24 hours, he regained all cognitive function except for a persistent pause in his speech
- He remains with physical weakness and is undergoing outpatient OT/PT

Summary

- ICE is easy
- It appears to improve outcomes for us
- There are essentially no negatives
- www.wakeems.com/ICE2008

Citations

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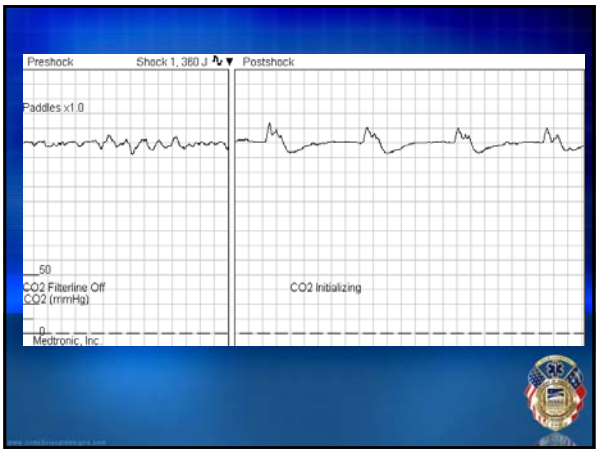
21. Holzer M. Hypothermia for neuroprotection after cardiac arrest: Systematic review and individual patient data meta-analysis. Crit Care Med 2005; 33:414-18.

Patient #4

- EKGs to follow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Postshock
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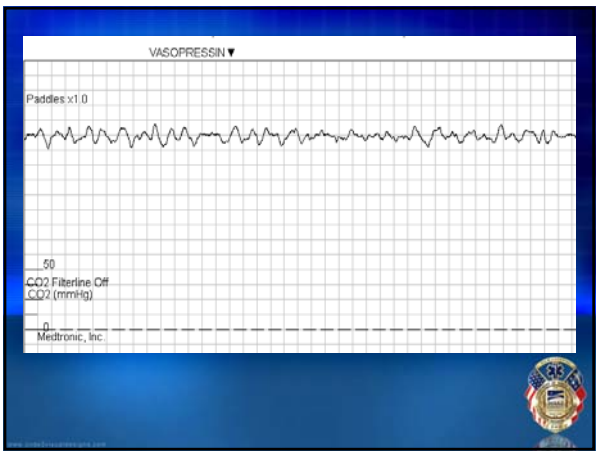
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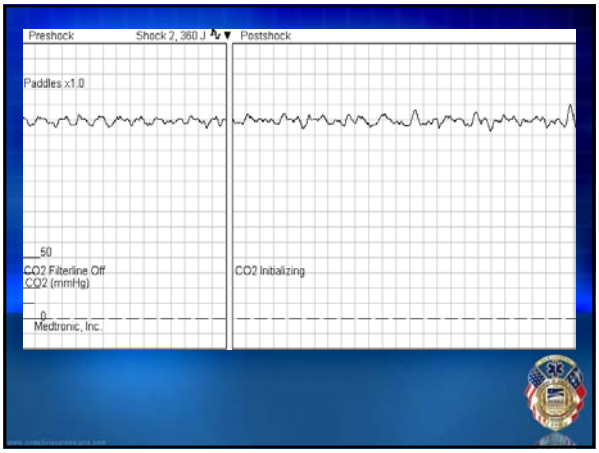
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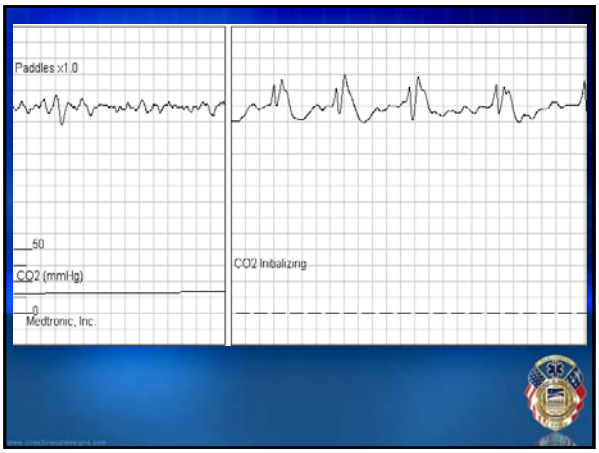
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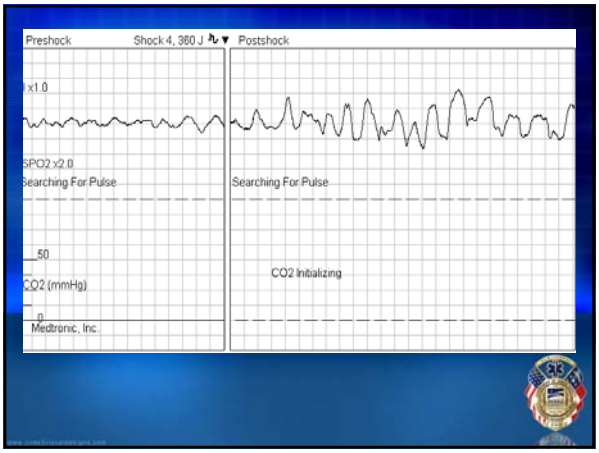
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Shock 4, 360 J
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Searching For Pulse
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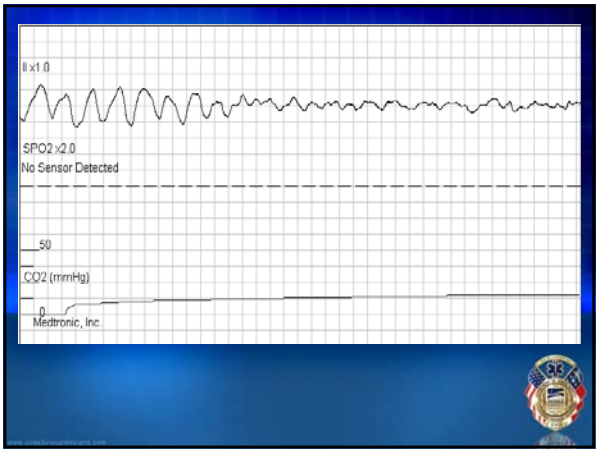
CO2 Initializing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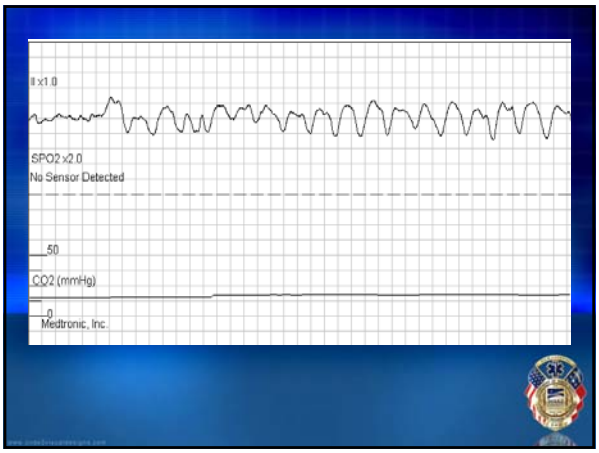
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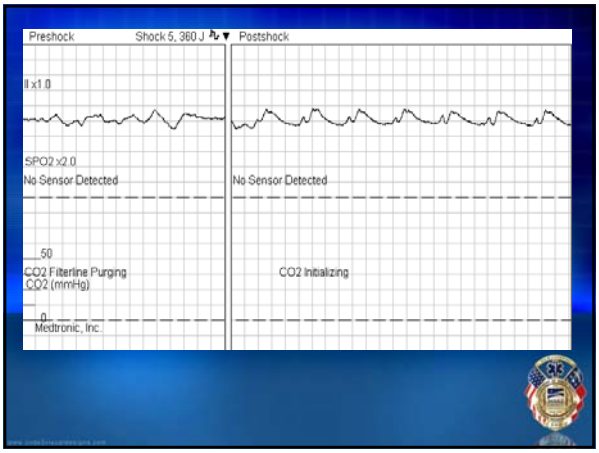
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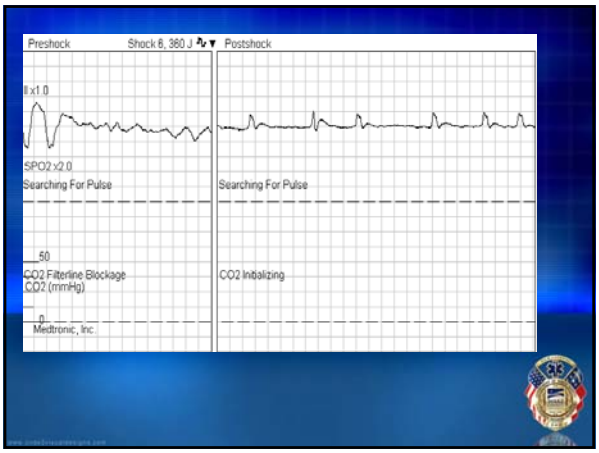
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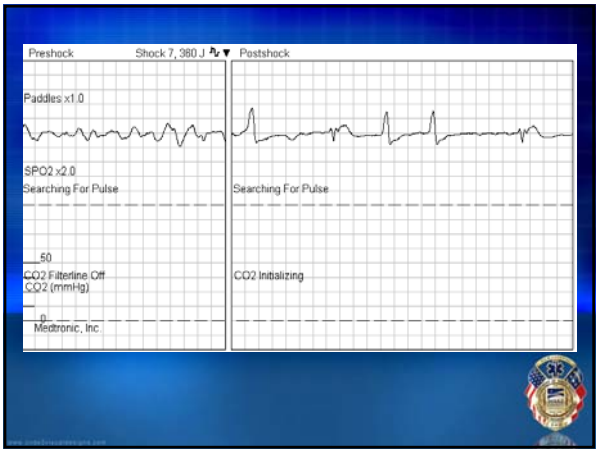
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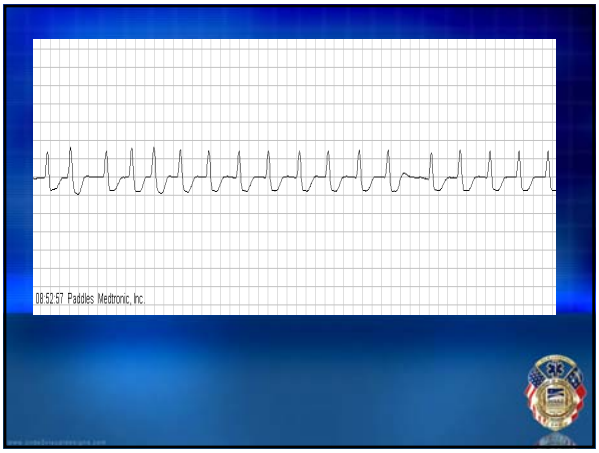
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Patient #3

- No drugs, no intubation during resuscitation
- Intubated after ROSC (no RSI)
- No movement to painful stimuli
- Induced on-scene
- Clean cath – held at 33 degress for 24+ hours
- Complete neurological recovery