

ICE: Induced Cooling by EMS

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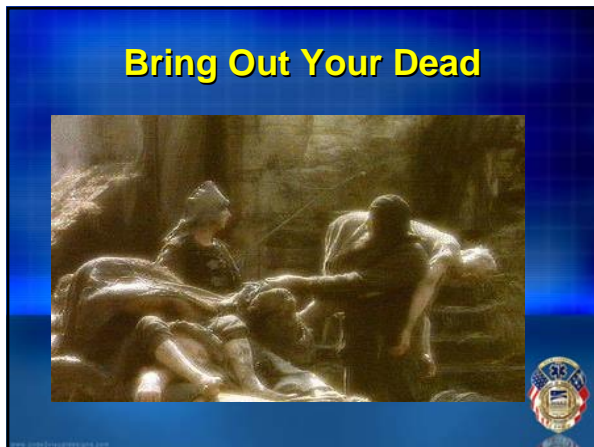
Disclosure

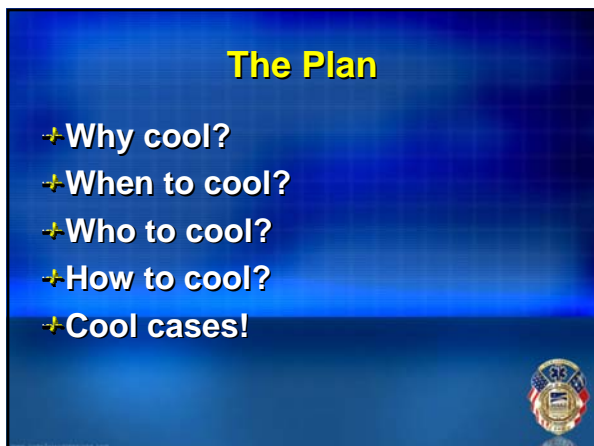
Financial relationships include
•Alsus Corp. - Speaker
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The Plan

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

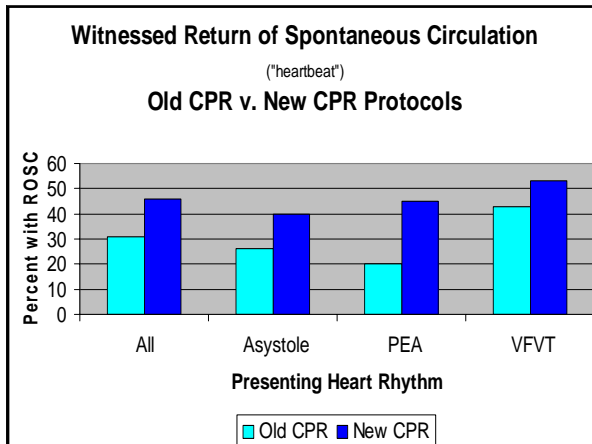


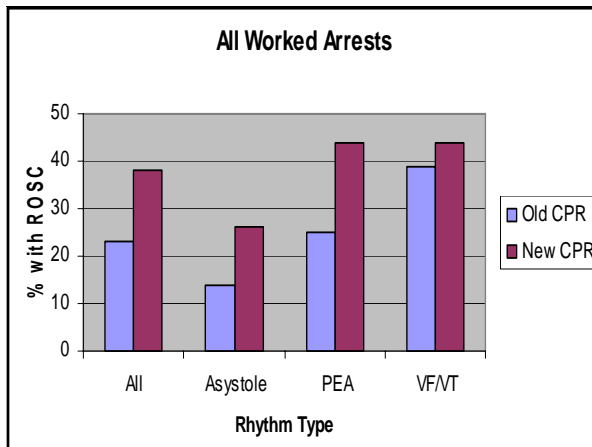


Why Hypothermia?

- ✦ 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 ROSC¹
 - + 45% (38%) of v-fib arrests
 - + 37% (22%) of all cardiac arrests
- + Discharge¹
 - + 12% (10%)
- + Post Resuscitation Deaths³
 - + 10% die due to recurrent dysrhythmias
 - + 30% die due to cardiovascular collapse
 - + 40% die due to PRE



Post Resuscitation Encephalopathy

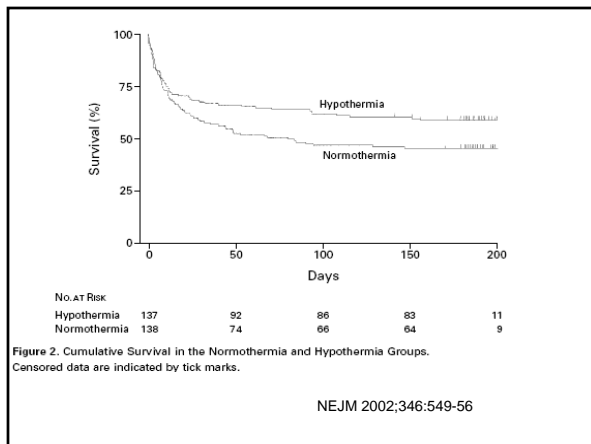
- + Initial insult from cardiac arrest
- + Period of luxuriant hyperperfusion³
- + Cell injury^{8,11}
 - + Oxygen free radical formation
 - + Inflammatory cascade
 - + Glutamate mediated cell death
- + Loss of autoregulation
 - + Sludging and hypoperfusion^{3,8,11}
 - + Perfusion/demand mismatch^{8,11}



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





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 American Heart Association
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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°C¹⁷

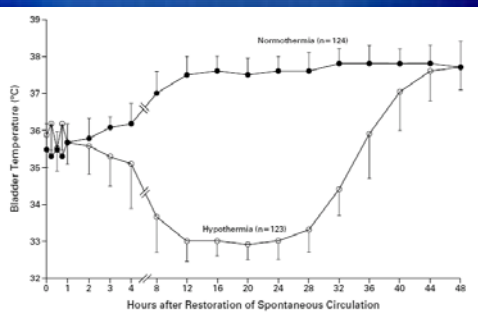


Hypothermia

- ✦ 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

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

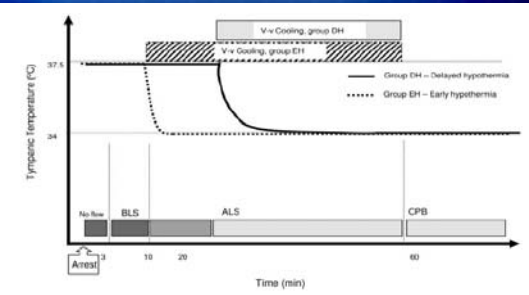


During CPR?

- + 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?

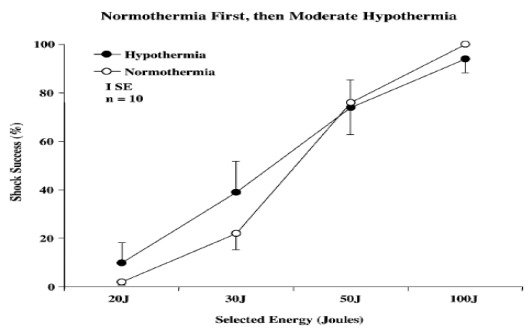
	Delayed hypothermia	Early hypothermia
OPC 5 or death	0000000	0
OPC 4		0
OPC 3		0
OPC 2		0
OPC 1	0	0000

During CPR – Will Defib Work?

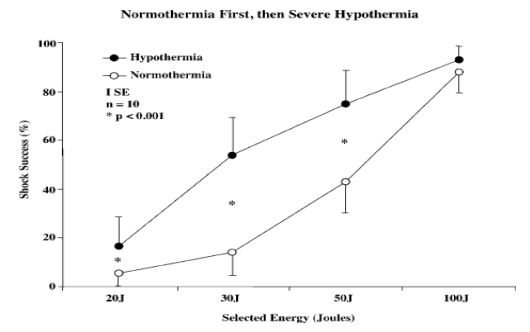
- ✦ Animal model evaluating shock success at normothermia, moderate hypothermia (33 degrees), and severe hypothermia (30 degrees)
 - ✦ Logistic regression demonstrated risk of post-defibrillation asystole to be 18% in the normothermic group vs. 1% in the hypothermic group
- ✦ Rhee J et al. Resuscitation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



During CPR – Will Defib Work?



During CPR – Will Defib Work?

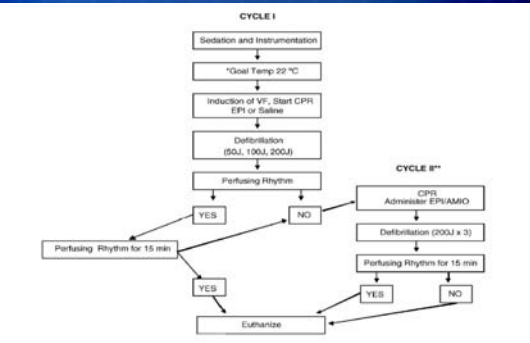


During CPR – Will Drugs Work?

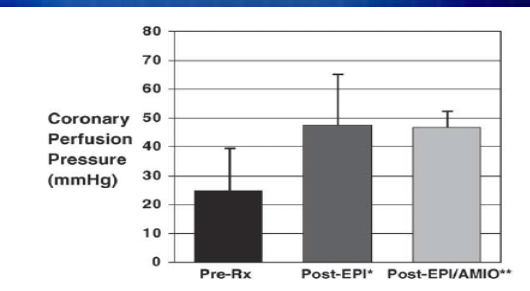
- ✦ Animal study for severe hypothermia
- ✦ Purpose was to study treatment for accidental, severe hypothermia with ventricular fibrillation arrest
- ✦ Bottom line: The drugs worked
 - ✦ Wira C et al. Resuscitation 2006;69:509-16



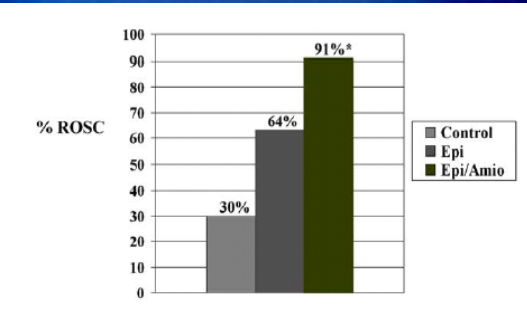
During CPR – Will Drugs Work?



During CPR – Will Drugs Work?



During CPR – Will Drugs Work?



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



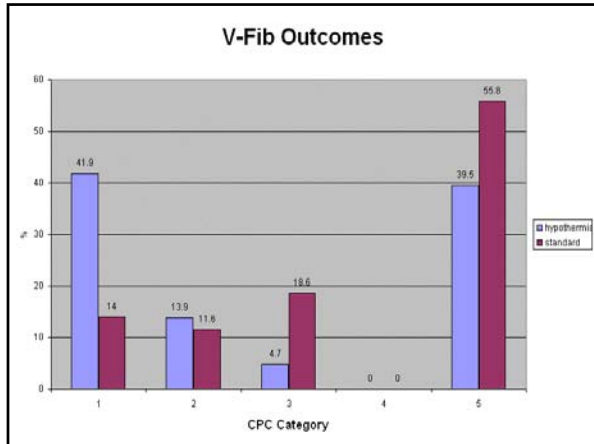
Feature Articles

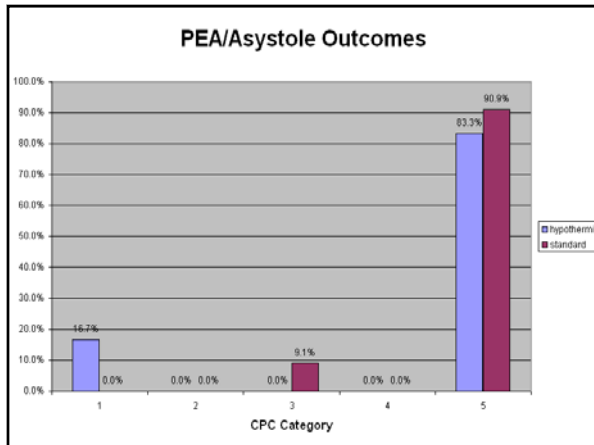
From evidence to clinical practice: Effective implementation of therapeutic hypothermia to improve patient outcome after cardiac arrest¹⁰

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





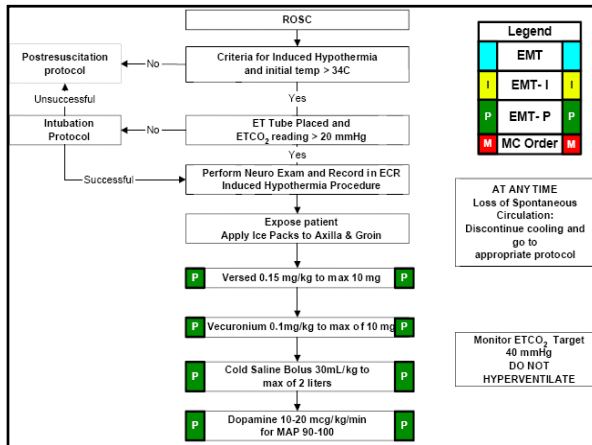


Our Program: ICE

- I**nduced
- C**ooling by
- E**MS

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







**1 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 ETCO₂ >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 ETCO₂=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.

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

7. BP, MAP, HR, O2 saturation, and cardiac rhythm hourly.

8. Record core temperature q 15 minutes

9. Alternative methods for monitoring core temp may be rectal probe

10. 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.

11. Record total amount of cold saline infused prior to transporting to ICU _____ mL.

12. Record initial foley output _____ mL.

13. Labs:

<input type="checkbox"/> UA	<input type="checkbox"/> Phos	<input type="checkbox"/> ABG (temp corrected)	<input type="checkbox"/> CK's q 3 hrs x 3
<input type="checkbox"/> PT	<input type="checkbox"/> Magnesium	<input type="checkbox"/> UCG	<input type="checkbox"/> Other:
<input type="checkbox"/> PTT	<input type="checkbox"/> Lactate	<input type="checkbox"/> Cardiac Panel	

Patient Identification: _____ Origin: R10/06

**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 < 30 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 (Noreuron) _____ 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 ET/CO2 monitoring
 ABG
(Goal PaCO2 35-45)

20. STAT Diagnostics:
 PCNSE 12 lead ECG Other: _____

Physician signature: _____ Transcribed by: _____ Checked by (Nurse): _____
Request #: _____ 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 ($>37^{\circ}\text{C}$) is associated with poor outcome. However, hyperthermia alone could not discriminate accurately between patients with poor and those with favorable outcomes.

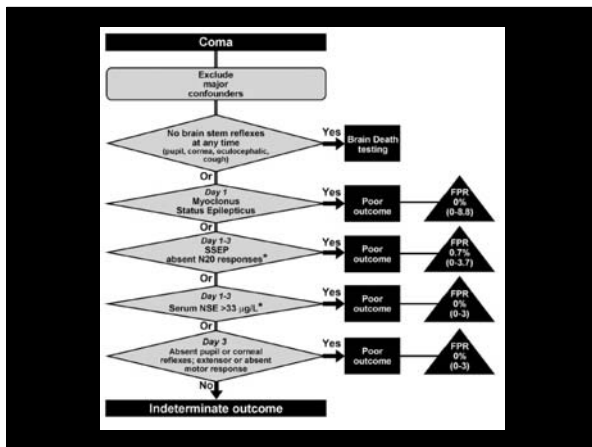
Recommendations. Prognosis cannot be based on elevated body temperature alone (recommendation level C).

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

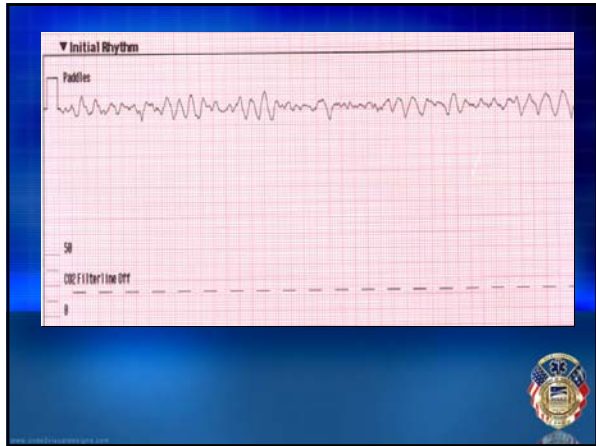
- + Patient bit the blade of the laryngoscope
- + Modified prehospital protocol with ice packs only
- + Intubated in the ED via RSI
- + Cath lab with 100% LAD
- + 24 hours of IH
- + Discharged neurologically intact

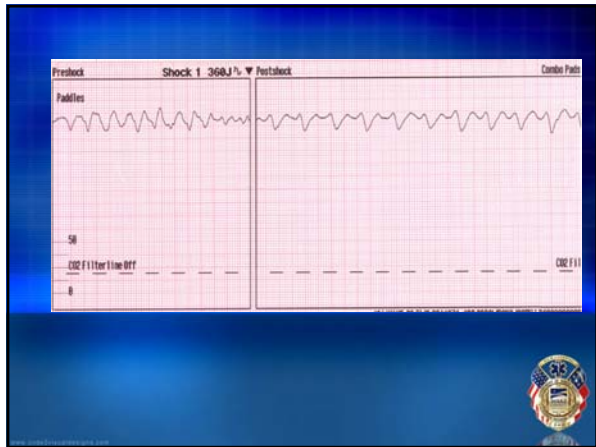


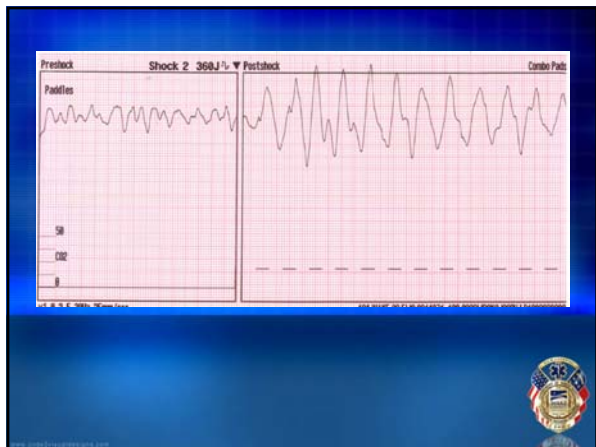
Case #2

- + 63 year old male
- + Witnessed arrest in his home
- + Wife performed compression-only CPR via EMD
- + Fire and EMS arrived simultaneously



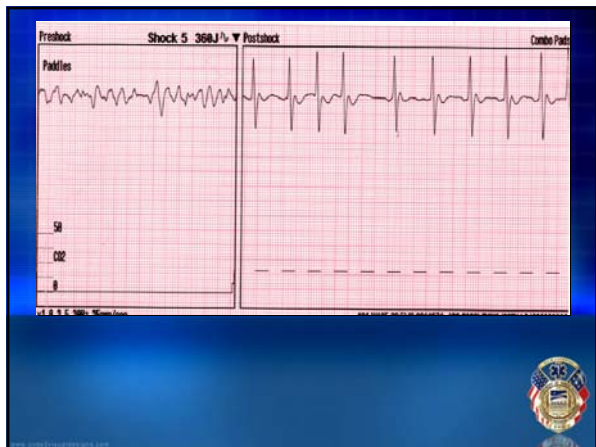


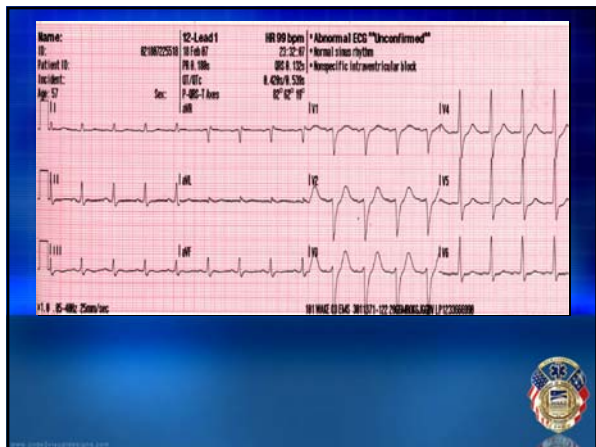
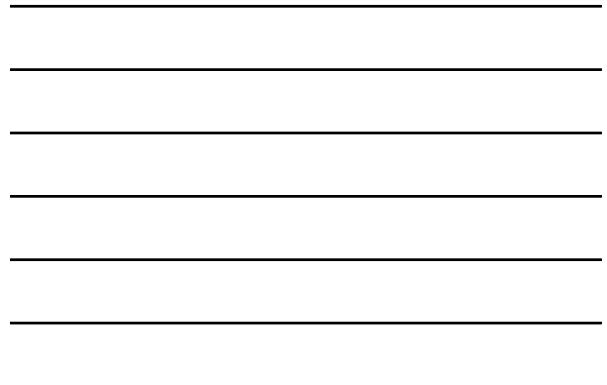
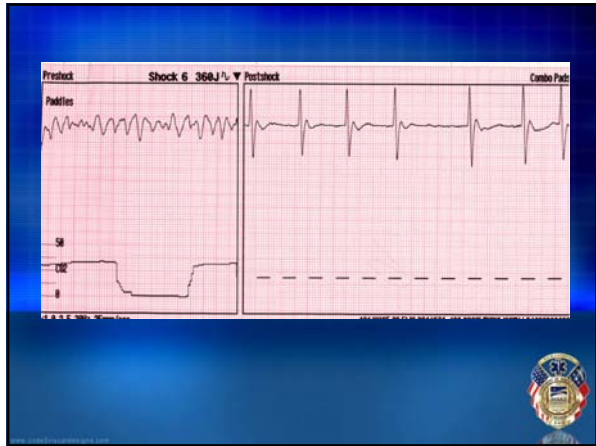












Patient #2

- ✦ 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



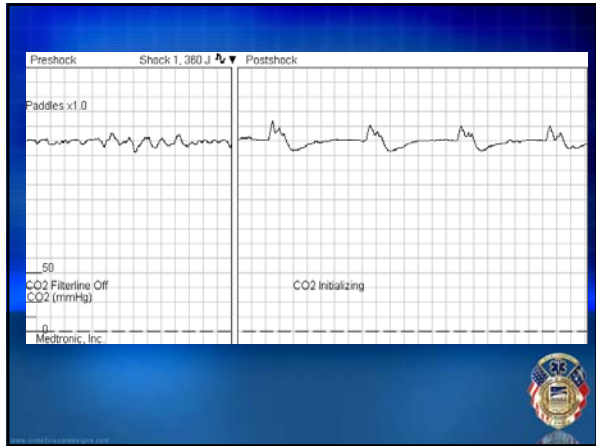


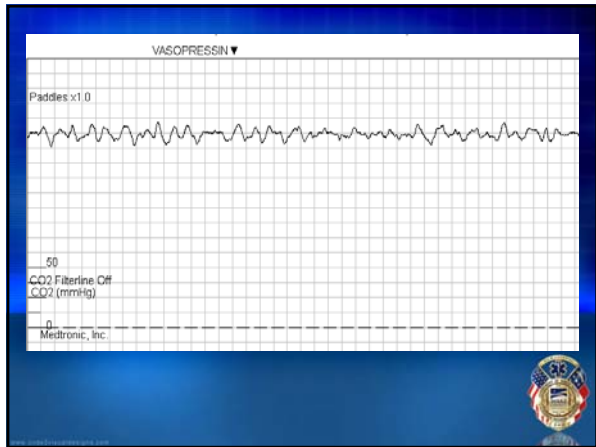
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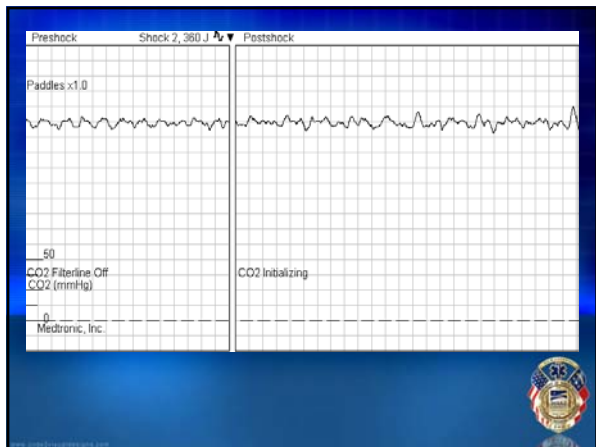
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Patient #4

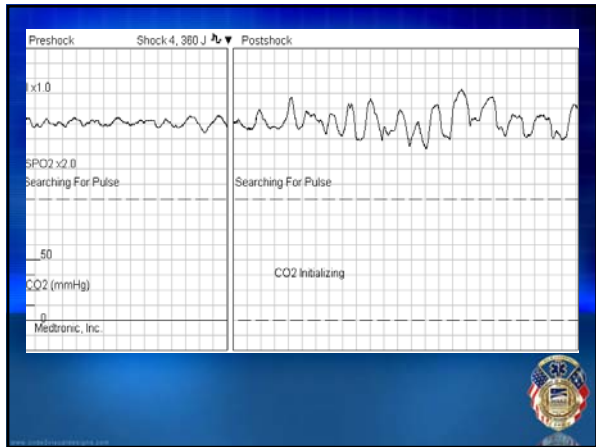
✦ EKGs to follow

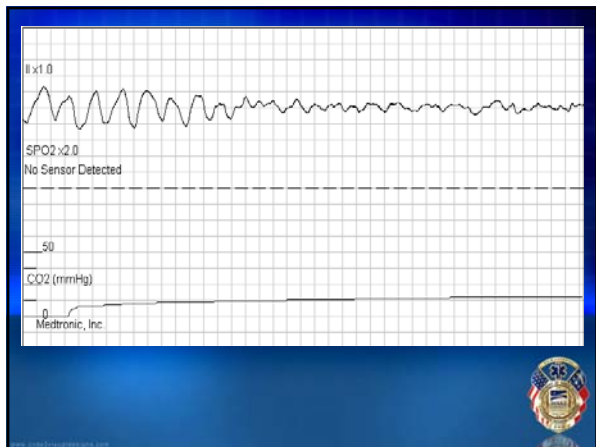


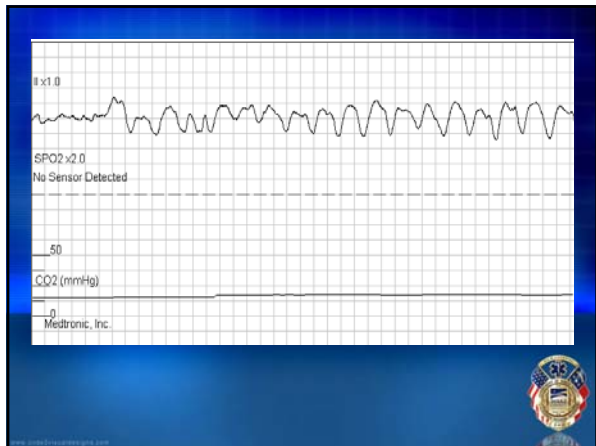


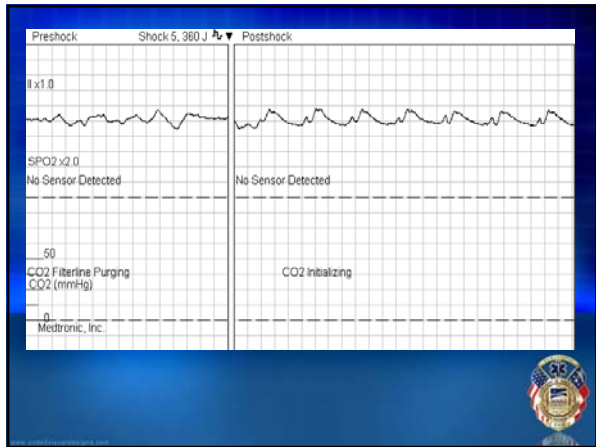


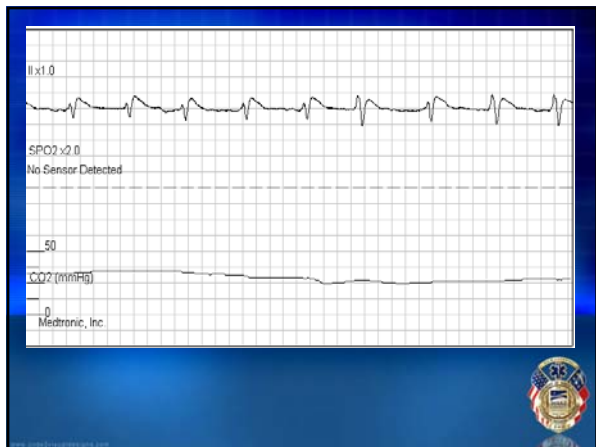


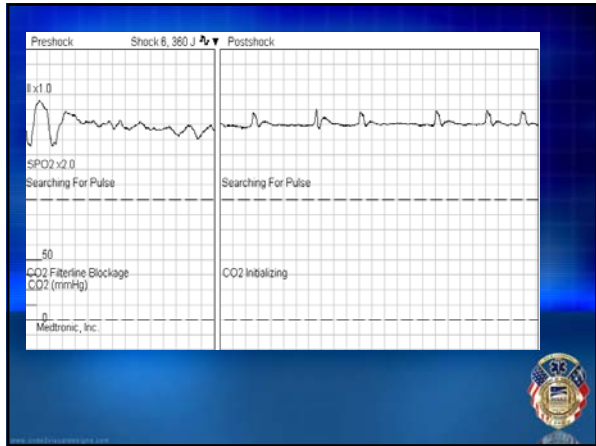


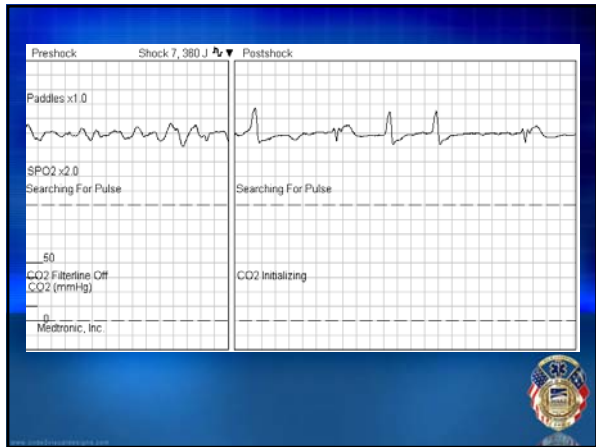


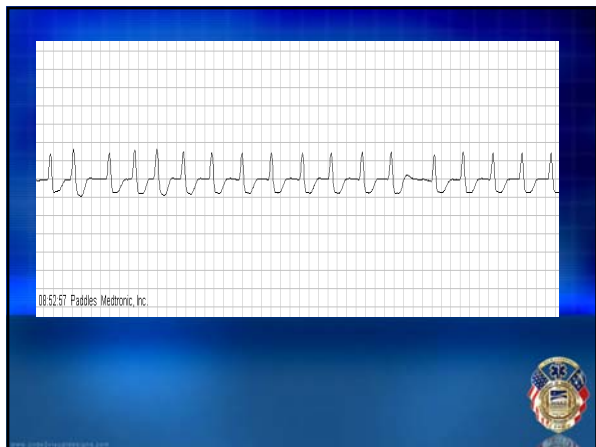












Patient #3

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