The place of therapeutic hypothermia in the rescue chain

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2005 ERC Guidelines

The importance of good quality post resuscitation care

- Survival among those admitted varies from 0 – 50-60%!
- Of 22105 patients admitted to ICU in the UK: 30% discharged

ERC Guidelines 2005, Resuscitation 2005
Peter Safar:
“Death is a protracted pathophysiologic process, not a moment”

Chain of Survival

Heart  Brain
Challenge!

• To take THE WHOLE chain seriously
  - not only during resuscitation, but also in the post resuscitation phase – during reperfusion!

Success depends on:

• teamwork
• focus
• enthusiasm
• goal-directed strategy
  → good quality
  → good organisation/logistics
  → resources
What is the optimal treatment after ROSC?

• **Early decision** if active treatment. Consider anoxia time, time to ROSC, cause of arrest, general condition, ethical aspects
  - if awake, adequate – keep them awake!
  - if comatose, early optimization of haemodynamics and oxygenation and focus on optimal vital organ perfusion
    → goal-directed, standardised intensive care treatment with mechanical ventilation
• Treat the cause of arrest as early as possible
  - revascularisation if indicated (the majority have CHD)
• As early as possible, therapeutic hypothermia
  - fast induction, steady and stable maintenance
  - slow, controlled rewarming
• Awakening, prognostication after 36-72 hours, but complications may prolong this!
Why therapeutic hypothermia?

• several experimental studies have showed/are showing its neuroprotective effects

• three positive non-randomised studies (from Japan, Austria, Australia)

• three positive randomised studies of different size and quality
  - the survival rate in the normothermia group in the HACA trial was good: 45% survival, 39% with favorable outcome
  - anyhow, significant better in the hypothermia group

• no negative studies

• easy to perform, not dangerous - works excellent in several places all over the world!

→ we are treating patients with a reperfusion syndrome and need to save the brain!
Therapeutic hypothermia also good for the heart

• improves resuscibility in pigs  
  Boddicker et al, Circulation 2004  
  Nozari et al, Circulation 2006

• beta-blocker similar effects
  - reduces metabolism, also in the heart
  - reduces heart rate
  - reduces oxygen consumption/demand

→ beta-blocker use in the early post resuscitation period was associated with increased survival 6 months after OHCA  
  Skrifvars et al, Resuscitation 2004

→ beta-blocker use during CPR improved resuscibility/survival and postROSC left ventricular function  
  Cammarata et al, Crit Care Med 2004
The Postresuscitation Syndrome

1. The underlying cause of the arrest

2. Ischemia and reperfusion syndrome
   - primary (before and during CPR)
   - secondary ischemic damage (during reperfusion)

3. Systemic inflammatory response ("a sepsis-like syndrome")

4. Myocardial dysfunction
   Kern, Tang, Gazmuri, Laurent et al

5. Coagulopathy
   Bottiger et al, Circulation 1995      Adrie et al, JACC 2005

6. (Adrenal dysfunction)
   Pene et al, Intensive Care Med 1995

7. Complications (cerebral, pulmonal, systemic, renal or ....)
Therapeutic possibilities

- **Optimizing physiology/general intensive care treatment**
  - body temperature
  - blood pressure (brain!)
  - myocardial dysfunction
  - acid-base
  - blood glucose
  - oxygenation/ventilation
  - electrolytes, especially potassium
  - anticonvulsants
  - Therapeutic hypothermia
  - Vasopressors
  - Fluid management
  - Treat hyperglycemia
  - Normocapnia
  - Adequate oxygenation
  - Early detection/treatment

- **Revascularisation**
  - PCI/thrombolysis on indication
  - (coronary artery bypass grafting) on indication

- **Anti-arrhythmic therapy**
  - revascularisation
  - beta-blockers
  - amiodarone
  - Hypothermia has beta-blocker similar effects
  - Herlitz et al, Resuscitation 2006
Optimal treatment during reperfusion

Active and optimal intensive care treatment!

PCI/thrombolysis (if indicated)
Initiate cooling
Optimalisation of hemodynamics

Induction
Time after ROSC [hours]

Rewarming
Maintenance

Induction

Optimal treatment during reperfusion
Standardised post resuscitation care at UUH, Oslo, (since 2003)

Goal: To reduce the vital organ injuries (brain, heart) through:

1. **Initial optimalisation** of haemodynamics and oxygenation

2. **Treat the cause** of arrest; reperfusion after STEMI (PCI)
   
   **Therapeutic hypothermia** (33 °C in comatose patients for 24 h)
   
   - start (anyhow) as early as possible
   
   - initially 1-3 l ice-cold NaCl (4 °C) i.v., together with icebags
   
   - cooling device for maintenance
   
   - controlled rewarming (0.5 °C /h)

3. **A standardised treatment protocol** for 1-2 days

4. **Avoid long respiratory treatment** (> 2-3 days)
   
   - if no cardial, pulmonary or other complications are present

Sunde et al, Resuscitation, in press
## Standardised treatment protocol

### 1. Treatment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Goal</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reperfusion</td>
<td>Reperfusion</td>
<td><strong>Strategy</strong> PCs in STEMI</td>
</tr>
<tr>
<td>- Blood pressure</td>
<td>MAP &gt; 65-70 mmHg</td>
<td><strong>Volume, pressors, inotropic agents</strong></td>
</tr>
<tr>
<td>- Central venous pressure</td>
<td>8 – 12 mmHg</td>
<td><strong>Volume, vasodilatation (Glyc.nitr.)</strong></td>
</tr>
<tr>
<td>- ECG, rate/ischemia</td>
<td>60 – 100/min</td>
<td><strong>Volume, sedation, Glyc.nitr, Beta-bl.</strong></td>
</tr>
<tr>
<td>- Temperature</td>
<td>33 °C</td>
<td><strong>Cold NaCl i.v., icebags, cooling device or cold, wet blankets</strong></td>
</tr>
<tr>
<td>- Respirator</td>
<td>SO₂ &gt; 95</td>
<td><strong>Respirator control, PEEP</strong></td>
</tr>
<tr>
<td>- Blood glucose</td>
<td>5 – 8 mmol/l</td>
<td><strong>Actrapid/NaCl 1 IE/ml</strong> (NB! avoid hyperventilation)**</td>
</tr>
<tr>
<td>- Electrolyts</td>
<td>Normal values</td>
<td><strong>Evtl. substitution</strong></td>
</tr>
<tr>
<td>- Hb</td>
<td>&gt; 9-10 g/dl</td>
<td><strong>Volume, Furosemid</strong></td>
</tr>
<tr>
<td>- Diuresis</td>
<td>&gt; 1 ml/kg/h</td>
<td><strong>Evtl. Tribronate 125-250 ml</strong></td>
</tr>
<tr>
<td>- Buffers</td>
<td>pCO₂ 5 – 6 kPa</td>
<td><strong>Sedation, BZD, Phenytoin or Thiopenthol, EEG early</strong></td>
</tr>
<tr>
<td>- Seizures</td>
<td>pH &gt;7.1, BE&gt; -10</td>
<td>(early contact with a neurologist)**</td>
</tr>
</tbody>
</table>

### 2. Sedation:

- Fentanyl and Propofol
  (+ evtl. muscle relaxation, Cisatracurium, pancuronium)
3. Monitoring:  A-line
   - O₂-saturation
   - Telemetri, ECG
   - CVL → central venous pressure
   - Temperature (bladder, oesophagus)
   - Arterial bloodgases (pH, BE, pCO₂, pO₂)
   - Blood sugar and electrolyts
   - Echo cor, X-ray thorax
   - EEG and SEP (on indication)

4. Pressor/inotropi:
   - First choice - Dopamine 2-10 µg/kg/min
   - If tachykardi, check volume status, evtl.
     change to Norepinephrine (0.02–0.3 µg/kg/min)
   - If pump failure/cardiogenic shock:
     - IABP
     - Dobutamine + Epinephrine
     - Evtl. Simdax

5. Awakening:  Cooled patients slowly rewarmed after 24 h (0.5 °C/h).
   - When tp>35.5 °C sedation can be stopped and the patient can wake up/extubation
Results: from 1.9.03 – 01.11.05

All patients treated after OHCA at Ulleval University Hospital

99 patients admitted to ED with cardiac etiology

9 excluded, died in ED

90 patients admitted to ICU

55 (61%) patients survived
45 CPC 1
8 CPC 2
2 CPC 3

• 59% of all patients survived with favourable outcome
Patients from Oslo EMS

Control period (1996-98)
68 patients admitted to ED

10 excluded
died beforeICU admission

58 patients admitted to ICU

18 (31%) patients survived
9 CPC 1 26% with favourable outcome
6 CPC 2
2 CPC 3
1 CPC 4

15 (26%) patients with one-year survival

Intervention period (2003-2005)
69 patients admitted to ED

8 excludeddied beforeICU admission

61 patients admitted to ICU

34 (56%) patients survived
31 CPC 1 56% with favourable outcome
3 CPC 2

34 (56%) patients with one-year survival

Sunde et al, Resuscitation, in press

p=0.001

p=0.001
<table>
<thead>
<tr>
<th>Prognostic factors</th>
<th>Control period (n=58)</th>
<th>Intervention period (n=61)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>46 (79)</td>
<td>50 (82)</td>
<td>1.2 (0.5, 2.9)</td>
<td>0.89</td>
</tr>
<tr>
<td>Age</td>
<td>68 ± 12</td>
<td>63 ± 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &lt; 70</td>
<td>28 (48)</td>
<td>43 (71)</td>
<td>2.6 (1.2, 5.4)</td>
<td>0.022</td>
</tr>
<tr>
<td>Witnessed</td>
<td>55 (95)</td>
<td>60 (98)</td>
<td>3.3 (0.33, 32.4)</td>
<td>0.36</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>43 (74)</td>
<td>43 (71)</td>
<td>0.8 (0.4, 1.9)</td>
<td>0.81</td>
</tr>
<tr>
<td>Initial VF</td>
<td>49 (84)</td>
<td>55 (90)</td>
<td>1.7 (0.6, 5.1)</td>
<td>0.51</td>
</tr>
<tr>
<td>Amb. response time(min)</td>
<td>6 (4-9)</td>
<td>6 (4-8)</td>
<td></td>
<td>0.70</td>
</tr>
<tr>
<td>Time to ROSC(min)</td>
<td>18 (13-22)</td>
<td>18 (10-27)</td>
<td></td>
<td>0.98</td>
</tr>
<tr>
<td>Comatose on admission</td>
<td>52 (90)</td>
<td>52 (85)</td>
<td>1.2 (0.5, 2.8)</td>
<td>0.65</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>33 (57)</td>
<td>36 (59)</td>
<td>1.1 (0.5, 2.3)</td>
<td>0.82</td>
</tr>
</tbody>
</table>
### The inhospital treatment

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Control period (n=58)</th>
<th>Intervention period (n=61)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reperfusion treatment</td>
<td>2 (3)</td>
<td>30 (49)</td>
<td>27.10 (6.06, 121.09)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Therapeutic hypothermia</td>
<td>0</td>
<td>40 (66)</td>
<td>2.39 (1.13, 5.08)</td>
<td>0.022</td>
</tr>
<tr>
<td>Inotropic agents</td>
<td>29 (50)</td>
<td>43 (80)</td>
<td>10.72 (3.45, 33.33)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Intra aortic ballon pump</td>
<td>0</td>
<td>8 (15)</td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Glyceryl nitrate</td>
<td>31 (53)</td>
<td>0</td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Fluid balance 1st day (ml)</td>
<td>2300 ± 1211</td>
<td>3455 ± 1594</td>
<td>&lt; 0.001 *</td>
<td></td>
</tr>
<tr>
<td>Insulin</td>
<td>4 (7)</td>
<td>27 (44)</td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Respirator time (days)</td>
<td>2 (1-5)</td>
<td>2 (1-5)</td>
<td></td>
<td>0.70*</td>
</tr>
<tr>
<td>Stay at ICU (days)</td>
<td>4 (3-6)</td>
<td>5 (2-8)</td>
<td></td>
<td>0.49*</td>
</tr>
</tbody>
</table>

Sunde et al, Resuscitation, in press
## Physiological variables during the first 24 h

<table>
<thead>
<tr>
<th></th>
<th>Control period (n=58)</th>
<th>Intervention period (n=61)</th>
<th>Mean difference (95 CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood sugar (mmol/l)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>14.3 ± 4.5</td>
<td>14.3 ± 4.9</td>
<td>0.05 (-1.98, 2.08)</td>
<td>0.96</td>
</tr>
<tr>
<td>after 12 h</td>
<td>9.7 ± 3.3</td>
<td>8.0 ± 3.5</td>
<td>-1.69 (-3.25, -0.14)</td>
<td>0.033</td>
</tr>
<tr>
<td>after 24 h</td>
<td>7.5 ± 2.7</td>
<td>6.4 ± 1.6</td>
<td>-1.16 (-2.19, -0.15)</td>
<td>0.028</td>
</tr>
<tr>
<td><strong>pCO₂ (kPa)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>5.3 ± 2.4</td>
<td>5.4 ± 1.5</td>
<td>0.09 (-0.78, 0.95)</td>
<td>0.84</td>
</tr>
<tr>
<td>after 12 h</td>
<td>5.6 ± 1.4</td>
<td>5.2 ± 0.7</td>
<td>-0.34 (-0.83, 0.14)</td>
<td>0.17</td>
</tr>
<tr>
<td>after 24 h</td>
<td>5.3 ± 0.9</td>
<td>5.3 ± 0.6</td>
<td>0.05 (-0.30, 0.40)</td>
<td>0.77</td>
</tr>
<tr>
<td><strong>BE (mmol/l)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>-10.3 (-15.2, -5.5)</td>
<td>-8.5 (-12.3, -5.8)</td>
<td></td>
<td>0.20*</td>
</tr>
<tr>
<td>after 12 h</td>
<td>-5.5 (-7.1, -3.0)</td>
<td>-3.2 (-6.7, -2.1)</td>
<td></td>
<td>0.077*</td>
</tr>
<tr>
<td>after 24 h</td>
<td>-2.5 (-4.5, -0.4)</td>
<td>-3.2 (-6.4, -1.2)</td>
<td></td>
<td>0.10*</td>
</tr>
<tr>
<td><strong>Temperature (°C)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>35.9 ± 1.0</td>
<td>35.4 ± 1.3</td>
<td>-0.48 (-1.02, 0.07)</td>
<td>0.087</td>
</tr>
<tr>
<td>after 12 h</td>
<td>37.5 ± 1.1</td>
<td>33.9 ± 1.7</td>
<td>-3.64 (-4.21, -3.07)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>after 24 h</td>
<td>38.4 ± 1.3</td>
<td>34.0 ± 1.9</td>
<td>-4.41 (-4.99, -3.81)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>MAP (mmHg)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>90 ± 22</td>
<td>89 ± 23</td>
<td>-0.92 (-9.37, 7.53)</td>
<td>0.83</td>
</tr>
<tr>
<td>after 12 h</td>
<td>76 ± 10</td>
<td>73 ± 11</td>
<td>-3.54 (-7.80, 0.72)</td>
<td>0.10</td>
</tr>
<tr>
<td>after 24 h</td>
<td>77 ± 13</td>
<td>74 ± 10</td>
<td>-2.96 (-7.74, 1.81)</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Pulse rate (min⁻¹)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admission</td>
<td>101 ± 23</td>
<td>88 ± 22</td>
<td>-12.56 (-21.26, -3.85)</td>
<td>0.005</td>
</tr>
<tr>
<td>after 12 h</td>
<td>85 ± 14</td>
<td>67 ± 13</td>
<td>-18.91 (-24.45, -13.38)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>after 24 h</td>
<td>87 ± 16</td>
<td>68 ± 15</td>
<td>-19.08 (-25.33, -12.83)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
# Multivariat analysis - independent factors of survival

<table>
<thead>
<tr>
<th>Prognostic factors</th>
<th>Adjusted odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention period</td>
<td>4.47</td>
<td>1.60 – 12.52</td>
</tr>
<tr>
<td>Age&gt;70</td>
<td>0.48</td>
<td>0.17 – 1.37</td>
</tr>
<tr>
<td>Time to ROSC (min)</td>
<td>0.91</td>
<td>0.85 – 0.96</td>
</tr>
<tr>
<td>Ambulance response time</td>
<td>0.91</td>
<td>0.78 – 1.07</td>
</tr>
<tr>
<td>Initial VF</td>
<td>1.84</td>
<td>0.33 – 10.41</td>
</tr>
</tbody>
</table>

Sunde et al, Resuscitation, in press
## Complications

<table>
<thead>
<tr>
<th></th>
<th>Control period (n=58)</th>
<th>Intervention period (n=61)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General complications</td>
<td>37 (64)</td>
<td>44 (72)</td>
<td>1.47 (0.68 – 3.19)</td>
<td>0.44</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>33 (57)</td>
<td>29 (48)</td>
<td>1.28 (0.69 – 2.40)</td>
<td>0.43</td>
</tr>
<tr>
<td>Sepsis</td>
<td>1 (1)</td>
<td>2 (3)</td>
<td>2.33 (0.21 – 26.21)</td>
<td>0.60</td>
</tr>
<tr>
<td>Severe arrhythmias</td>
<td>9 (16)</td>
<td>15 (25)</td>
<td>1.90 (0.80 – 4.53)</td>
<td>0.14</td>
</tr>
<tr>
<td>Bleeding</td>
<td>n.a</td>
<td>5 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizures</td>
<td>16 (28)</td>
<td>11 (18)</td>
<td>0.63 (0.28 – 1.39)</td>
<td>0.34</td>
</tr>
<tr>
<td>Status epilepticus</td>
<td>3 (5)</td>
<td>5 (8)</td>
<td>1.98 (0.46 – 8.56)</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Sunde et al, Resuscitation, in press
Specific cardiac treatment:

- 47 (77%) underwent angiography
- 30 (49%) received PCI treatment
- the occluded artery:
  - 16 LAD
  - 10 RCA
  - 11 CX
  - 16 patients with a three vessel disease
- 3 underwent acute ACB operation (all three survived)
- all patients for angiography received ASA and heparin, 54% received clopidogrel and 15% abciximab (microcirculation!)
  ➫ 45 patients (74%) had coronary heart disease

Sunde et al, Resuscitation, in press
• in 40 of 52 (77%) comatose patients

• patients were cooled regardless of initial rhythm

• time from CA to target tp (33°C) : 5.5 h ± 2.2 h
  - with cold fluids (25 patients, 63%): 4.6 h ± 1.3 h
  - without cold fluids : 7.3 h ± 3.0 h  p = 0.001

• muscle relaxants to 27 patients (68% of all cooled pat.)

Sunde et al, Resuscitation, in press
Therapeutic hypothermia: more clinical data

Table 4. Outcome, at hospital discharge, of comatose patients with out-of-hospital cardiac arrest (initial rhythm: ventricular fibrillation)

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>CPC 1 Total Recovery</th>
<th>CPC 2 Moderate Disability</th>
<th>CPC 3 Severe Disability</th>
<th>CPC 4 Vegetative State</th>
<th>CPC 5 Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapeutic hypothermia</td>
<td>18/43 (41.9)</td>
<td>6/43 (13.9)</td>
<td>2/43 (4.7)</td>
<td>0/43 (0)</td>
<td>17/43 (39.5)</td>
</tr>
<tr>
<td>Standard resuscitation</td>
<td>6/43 (14.0)</td>
<td>5/43 (11.6)</td>
<td>8/43 (18.6)</td>
<td>0/43 (0)</td>
<td>24/43 (55.8)</td>
</tr>
</tbody>
</table>

→ favourable outcome (CPC 1 and 2), all initial rhythms included
- 26/55 (47%) vs 11/54 (20%), p=0.005 (chi-square)

• similar results from
  - Oslo, Bergen, Stavanger (Norway)
  - Lund, Helsingborg, Uppsala (Sweden)
  - Copenhagen (Denmark)

Oddo et al, Crit Care Med 2006
Therapeutic hypothermia: clinical data

Oddo et al, Crit Care Med 2006
Prehospital cooling

- start after ROSC and still comatose 5-10 min
- start during CPR

Boddicker et al, Circulation 2004

→ requires a good, easy and feasible cooling method
Therapeutic hypothermia also good for the heart

- improves resuscibility in pigs
- beta-blocker similar effects
  - reduces metabolism, also in the heart
  - reduces heart rate
  - reduces oxygen consumption/demand

→ beta-blocker use in the early post resuscitation period was associated with increased survival 6 months after OHCA

Skrifvars et al, Resuscitation 2004

→ beta-blocker use during CPR improved resuscibility/survival and postROSC left ventricular function

Cammarata et al, Crit Care Med 2004
Conclusion

• no clinical absolute predictive clinical signs the first 2 days after the arrest! Edgren et al, Lancet 1993 Madl et al, Crit Care Med 2000

• decide as early as possible, “yes” or “no” to active treatment
  - ethics, morbidity, anoxia time, status in ED, general condition

  ➔ If active treatment, do everything, be aggressive,
  - optimise haemodynamics and oxygenation
  - treat the cause (revascularisation if indicated)
  - mechanical ventilation
  - therapeutic hypothermia
  - standardised general post resuscitation intensive care for the first days, then awake – reevaluate!

  ➔ cerebral monitoring: SEP – prognostication
    EEG – seizure detection/treatment
    NSE/S-100
    other …… ??
Implementation

- Informative publications in the important medical papers in Norway and presentations at meetings in and outside our hospital from 2003
- Based on available science and general intensive care we designed a standardised treatment protocol in 2003
- This was distributed in the Deps. of Anesthesiology and Cardiology, and at the Intensive Care Units (both doctors and nurses) during the spring 2003.
- Good contact with key doctors/nurses. Nurses active involved in equipment decisions
- The first patient cooled in April 2003
- The treatment and logistic protocol finally approved by all responsible chairs 01.03.04
- From the 01.09.03 we registered prospectively all OHCA hospitalised at Ulleval
- Goal: focus on these patients, only two specialised ICUs involved
Destiny after ROSC

• please, do care!

• if not already done, go home and reorganise!

• .... but it has to be carefully planned...
• because you may run into problems during implementation ......!
  - infrastructure
  - logistics
  - cooperation
  - sceptical and negative colleges
  - other local interference !?

GOOD LUCK and STAY COOL!