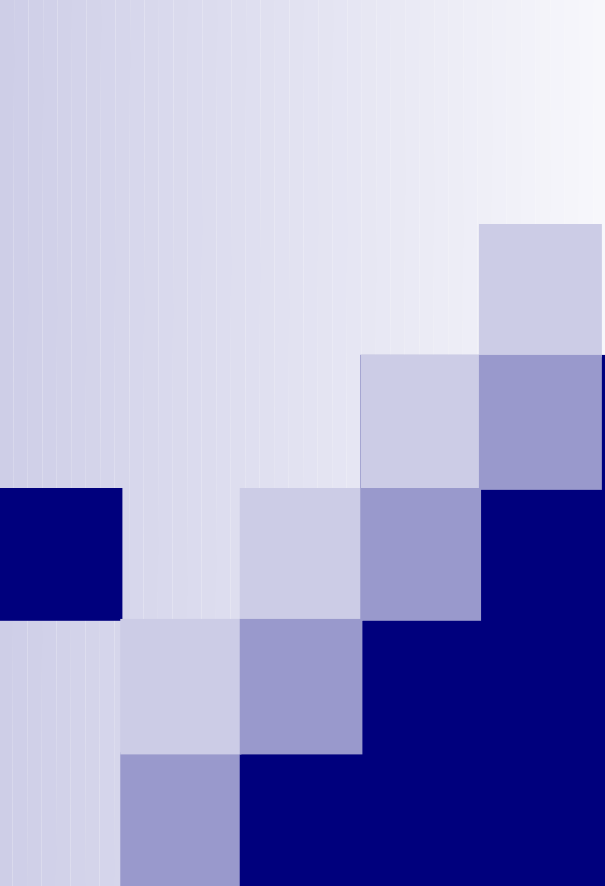




Resuscitation in Special Situations

what's new...

Asc. Prof. Dr. Serkan Şener
Acıbadem University, School of Medicine
Department of Emergency Medicine
Acıbadem Ankara Hospital

Objectives

- To understand the unique considerations involved in the common special resuscitation situations.
- To be able to modify resuscitation efforts for special situations.



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Erişkin Yaşam Zinciri



- Immediate **recognition** and activation of **emergency response system**
- Early **cardiopulmonary resuscitation** (CPR)
- Early **defibrillation**
- Effective **advanced life support** (ACLS)
- Integrated **post-cardiac arrest care**



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Pediatric Yaşam Zinciri



- **Prevention**
- Early **cardiopulmonary resuscitation** (CPR)
- Prompt access to the **emergency response system**
- Rapid pediatric **advanced life support** (PALS)
- Integrated **post-cardiac arrest care**



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Exceptions

- Patients who benefit from early airway management and CPR;
 - ☐ < 8 y
 - ☐ Trauma
 - ☐ Toxic ingestions
 - ☐ Drowning



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Special Situations

- Asthma
- Anaphylaxis
- Pregnancy
- Morbid Obesity
- Pulmonary Embolism (PE)
- Electrolyte Imbalance
- Ingestion of Toxic Substances
- Trauma
- Accidental Hypothermia
- Avalanche
- Drowning
- Electric Shock/Lightning strike
- Percutaneous Coronary Intervention
- Cardiac Tamponade
- Cardiac Surgery

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Special Situations

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Accidental Hypothermia

- Core temperature measurement
 - Standard thermometers (not below 35)
 - Tympanic
 - Rectal
 - Urine bladder



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Accidental Hypothermia

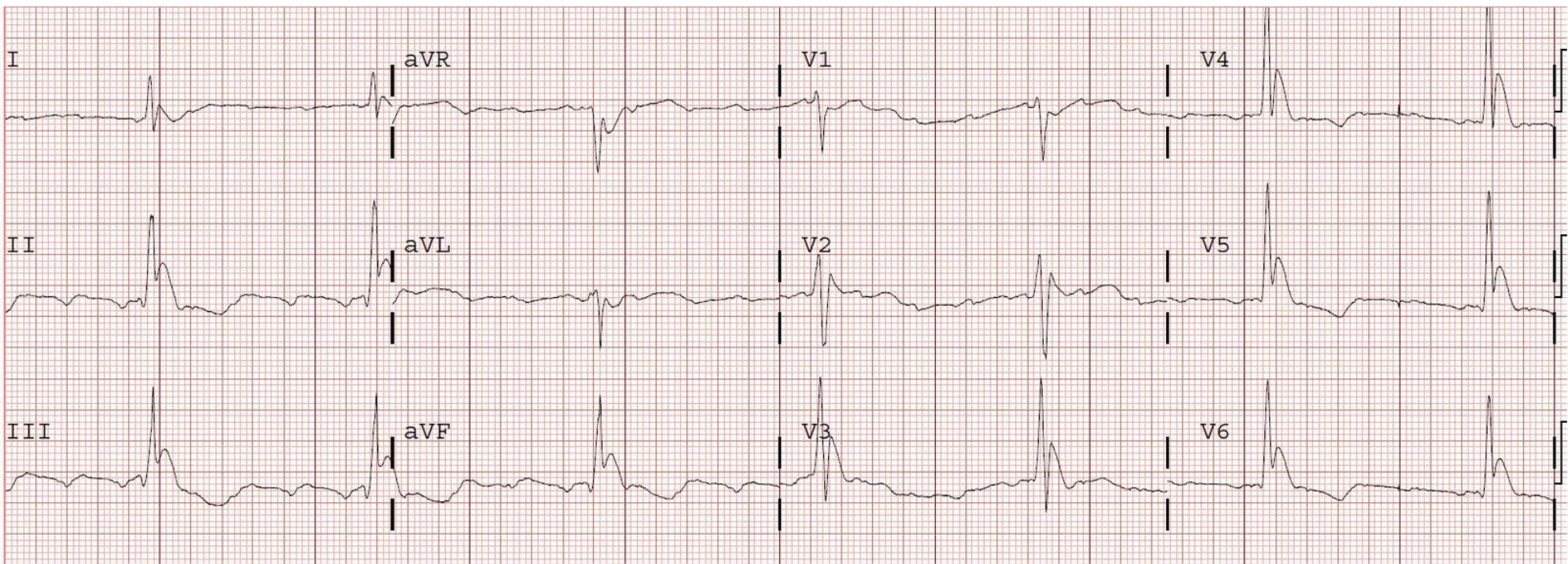
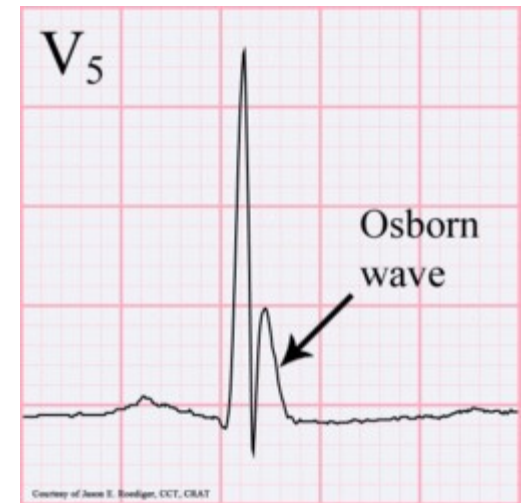
■ Classification

- ☐ Mild 35-32 °C
- ☐ Moderate 32-30 °C
- ☐ Severe < 30 °C



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ECG in hypothermia (Osborn = J wave)



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CPR Modifications in Hypothermia

- Begin CPR without delay
- More force is needed to compress the chest wall sufficiently ($\uparrow$ muscle rigidity)
- The efficacy of most medications is temperature dependent ($> 30^{\circ}\text{C}$)
- Avoid pharmacologic manipulation of pulse and blood pressure ($> 30^{\circ}\text{C}$)
- Do not quit CPR until the patient rewarmed

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Defibrillation

- The temperature at which defibrillation should first be attempted in the severely hypothermic patient and the number of defibrillation attempts that should be made have not been established.
- After first 3 shocks, postpone next shocks until $> 30^{\circ}\text{C}$
- Defibrillation attempts are usually unsuccessful until the core temperature is well **above 30°C**

Incagnoli P, Bourgeois B, Teboul A, Laborie JM. Resuscitation from accidental hypothermia of 22 degrees C with circulatory arrest: importance of prehospital management *Ann Fr Anesth Reanim.* 2006;25:535-538.

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Rewarming

- Recommended rewarming rates are between 0.5 to 2 °C/hr
- Passive External Rewarming
- Active Rewarming:
 - Active External Rewarming
 - Active Core Rewarming



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Passive Rewarming

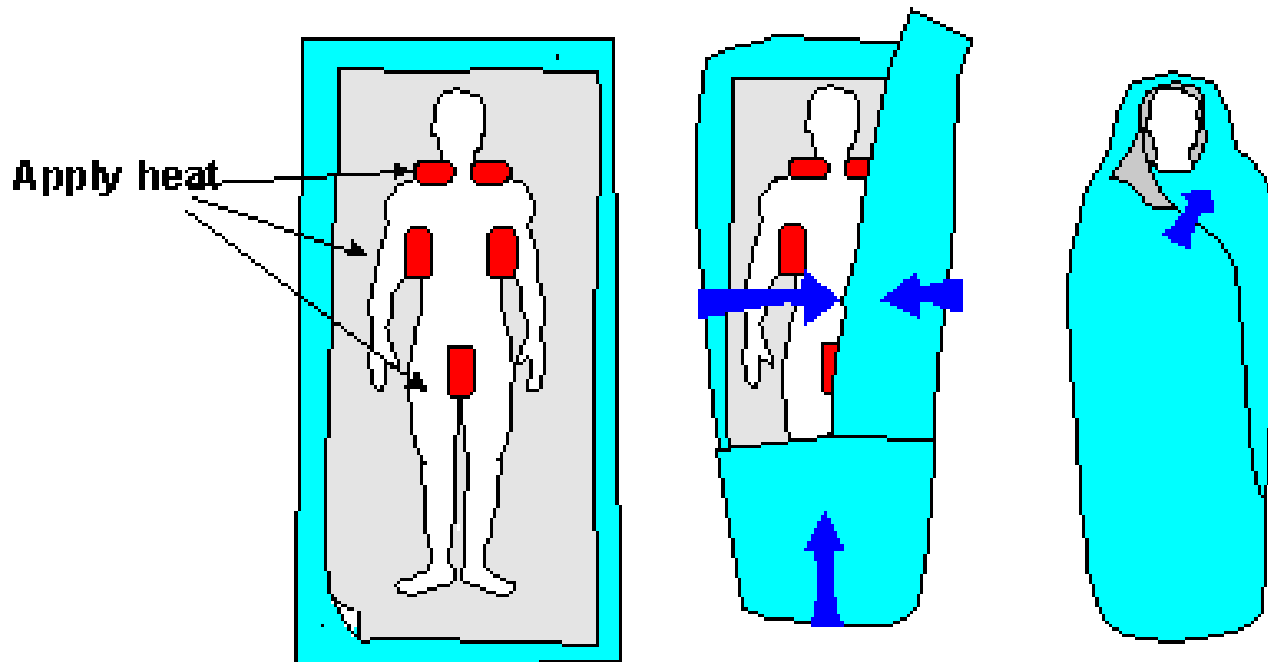
- Moderate (30°C to 32°C)
- Hypothermia with a perfusing rhythm
 - ☐ Wear off the cold and wet clothes
 - ☐ Cover with blankets
 - ☐ Increase the room temperature



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Passive Rewarming

Hypothermia Wrap



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Indications For Active Rewarming

- Moderate to severe hypothermia ($< 32^{\circ}\text{C}$)
- Cardiovascular instability (cardiac arrest)
- Inadequate rate or failure to rewarm
- Endocrinologic insufficiency
- Traumatic or toxicologic peripheral vasodilation
- Secondary hypothermia impairing thermoregulation

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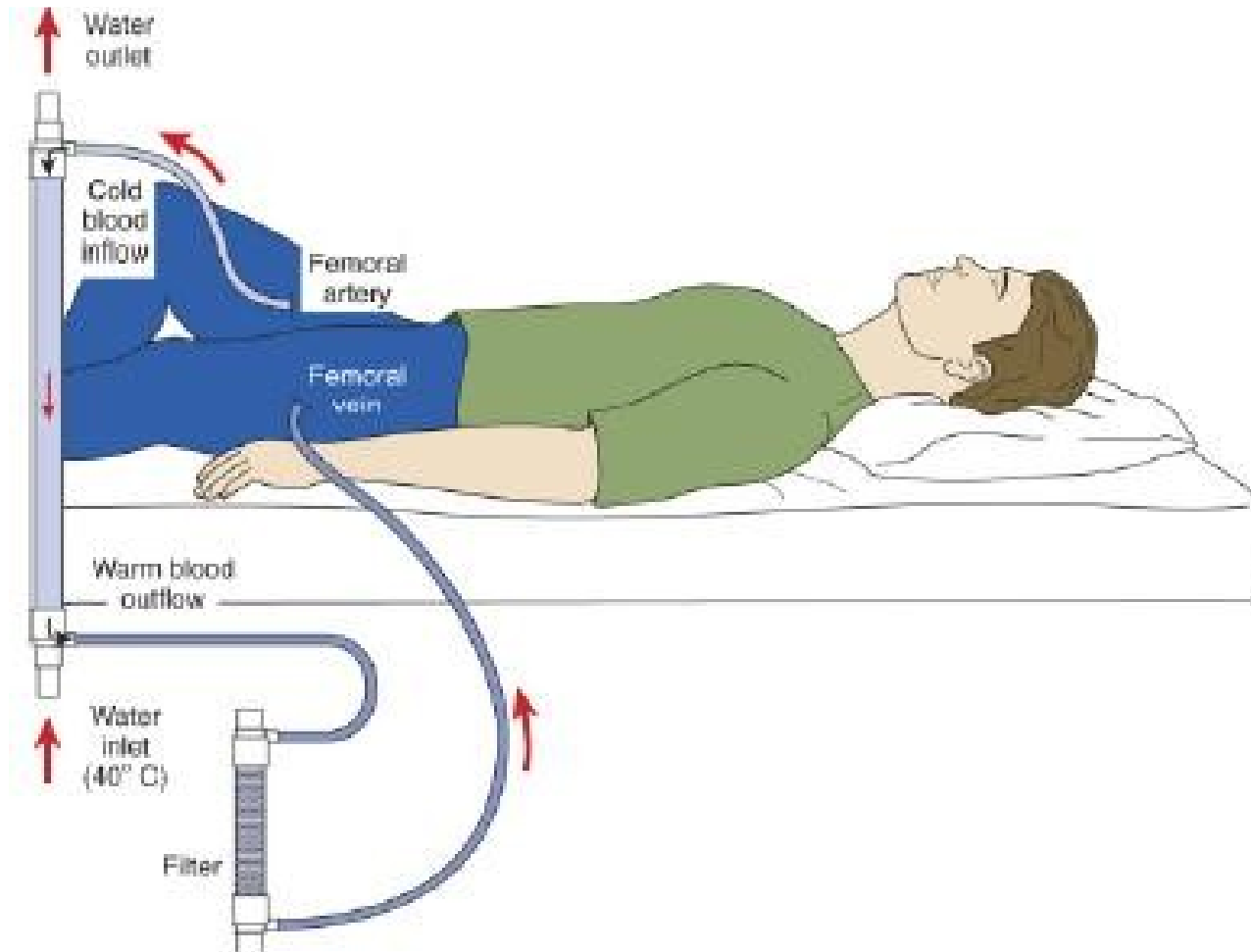
Active Rewarming Techniques

- Alternative effective core rewarming techniques:
 - Warm-water lavage of the pleural, peritoneal, gastric and urine bladder cavity (43 °C)
 - Extracorporeal blood warming with partial bypass(ECMO)
- Adjunctive core rewarming techniques also include warmed
 - IV or intraosseous (IO) fluid (43 °C)
 - Humidified oxygen



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Extracorporeal blood warming with bypass (ECMO)



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The Arctic Sun Temperature Management System (Medivance)



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ThermoWrap CureWrap



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(*Pediatr Emer Care* 2011;27: 215–217)

Successful Resuscitation From Cardiopulmonary Arrest Due to Profound Hypothermia Using Noninvasive Techniques

Jay D. Fisher, MD, Carla Schaefer, MD,† and John J. Reeves, MD**

of successful resuscitation in a 2-year-old boy found in cardiac arrest due to profound hypothermia. Invasive techniques such as cavity lavage, extracorporeal membrane oxygenation (ECMO), and cardiopulmonary bypass were not used.

Rewarming measures were immediately initiated. He was given 10 mL/kg of warmed saline (40°C) through the IO. The patient's head and body were covered in warm blankets, and warmed humidified air (42°C) was given through his endotracheal tube. A Bair Hugger (Arizant Healthcare, Eden Prairie, Minn) conductive warmer was placed around the patient, and a rewarming blanket set to 41.6°C was placed underneath the patient.

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After ROSC

- According to standard postarrest guidelines patients should continue to be warmed to a goal temperature of approximately 32 to 34°C to induce hypothermia is appropriate.



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CPR in Pregnancy

■ Treatable causes of pregnancy:

Search for and Treat Possible Contributing Factors (BEAU-CHOPS)

Bleeding/DIC

Embolism: coronary/pulmonary/amniotic fluid embolism

Anesthetic complications

Uterine atony

Cardiac disease (MI/ischemia/aortic dissection/cardiomyopathy)

Hypertension/preeclampsia/eclampsia

Other: differential diagnosis of standard ACLS guidelines

Placenta abruptio/previa

Sepsis

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Class I interventions

- Give 100% oxygen.
- Establish intravenous (IV) access above the diaphragm.
- Assess for hypotension; maternal hypotension that warrants therapy has been defined as a systolic blood pressure 100 mmHg or 80% of baseline.
- In the patient who is not in arrest, both crystalloid and colloid solutions have been shown to increase preload.

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CPR in pregnancy

- CPR interventions aim to rescue always FIRST the mother.
- Standard ACLS algorithms require no modification.
- ACLS / ATLS medications does not change.
- No need to adjust resuscitative drug doses

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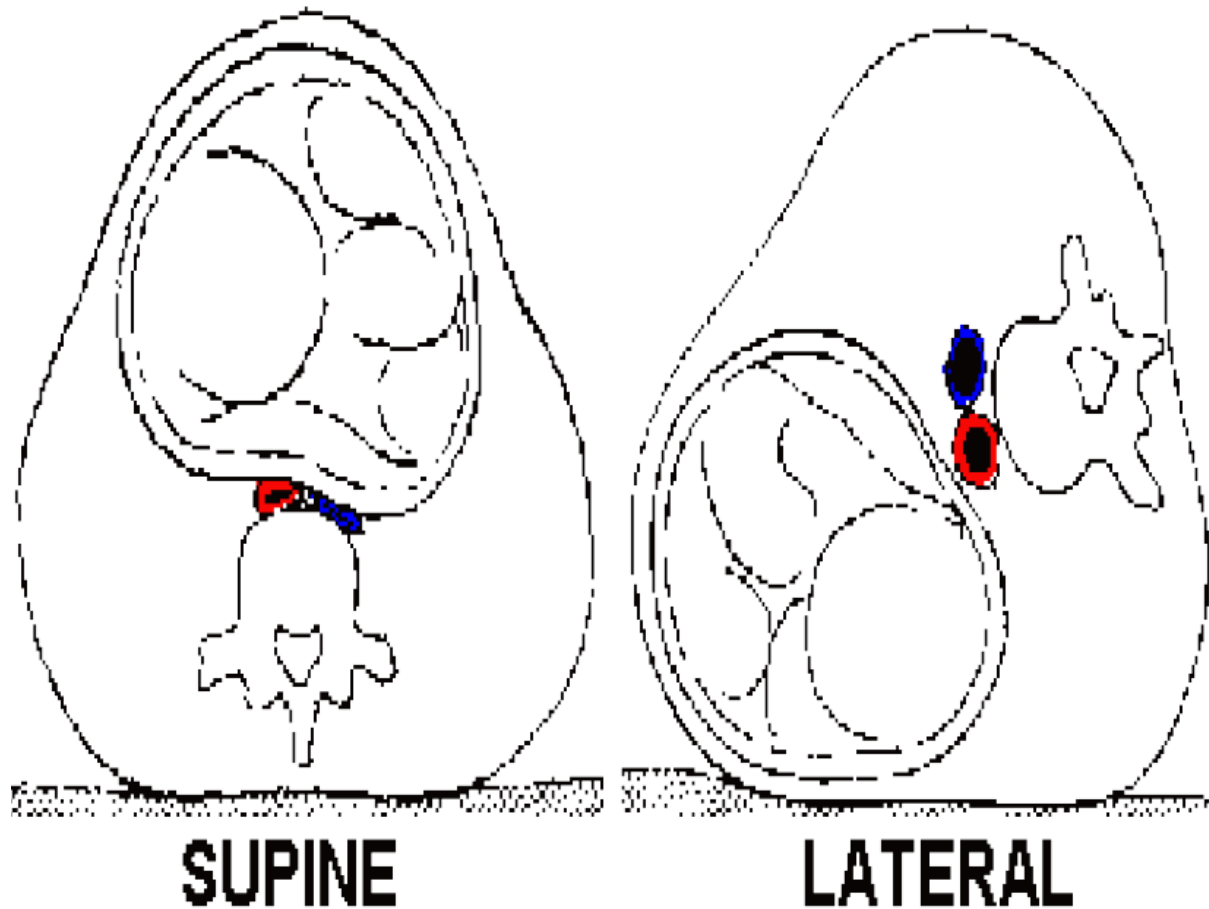
To prevent cardiac arrest

- Place the patient in the full left-lateral position to relieve possible compression of the inferior vena cava.
- Maternal aortocaval compression can occur for singleton pregnancies at 20 weeks of gestational age



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Uterine obstruction of venous return can produce hypotension and may precipitate arrest



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Left lateral tilt position

- Difficult to apply chest compression



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ALTERNATIVE TECHNIQUE

Uterine displacement in supine position



Two hand technique



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One hand technique



EPAT
Emergency Physicians Association of Turkey

ACLS Modifications

■ A- Airway

- Aspiration risk → Early intubation & cricoid pressure
- Laryngeal swelling → Small bore tube (0,5-1 mm ↓)
- Hypoxia risk → Preoxygenation

■ B- Breathing

- ↑ Oxygen demand → hypoxia risk
- ↓ Functional residual capacity → faster desaturation
- Elevated diaphragm → ↓ ventilation volume

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Pregnant Prearrest On Magnesium Treatment

- Patients receiving magnesium treatment (eclampsia) before cardiac arrest should be applied IV / IO
 - 10 ml 10% calcium chloride
 - 30 ml 10% calcium gluconate



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Perimortem Cesarean

- Maternal hypotension can result in reduced placental perfusion.
- Preparation for emergent cesarean delivery should be made while resuscitating.
- Code team (emergency physician, gynecologist, neonatologist, anesthesiologist and intensivist) should be paged.

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Perimortem Cesarean

- The rescue team is not required to wait 5 minutes before initiating emergency hysterotomy,
 - obvious nonsurvivable injury,
 - Maternal prognosis is grave and resuscitative efforts appear futile
 - Especially if the fetus is viable.
- If emergency cesarean section cannot be performed by the 5-minute mark, it may be advisable to prepare to evacuate the uterus while the resuscitation continues.



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Drowning

- The process of experiencing **respiratory impairment** from submersion / immersion in liquid.
 - Immersion = to be covered in water
 - Submersion = the whole body under water



Idris AH, Berg RA, Bierens J, et al. Recommended guidelines for uniform reporting of data from drowning: The "Utstein Style". Resuscitation 2003; 59:45-57.



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Drowning Process

Airway under surface with
voluntary breath holding



Laryngospasm



Hypercarbia, hypoxia,
metabolic acidosis



Decrease in level of
consciousness, relaxation
larynx



Aspiration of liquid

The most
important
predictor
of survival



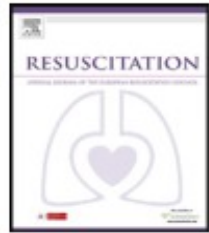
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Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation



Editorial

Drowning: more hope for patients, less hope for guidelines

- If water temperature is **warmer than 6 °C**, survival / resuscitation is extremely unlikely if submerged **longer than 30 min**
- If water temperature is **6 °C or below**, survival / resuscitation is extremely unlikely if submerged **longer than 90 min**

Claesson A. Characteristics of lifesaving from drowning as reported by the Swedish Fire and Rescue Services. *Resuscitation* 2012;83:1072–7.

Wanscher. Outcome of accidental hypothermia with or without circulatory arrest. Experience from the Danish Præstø Fjord boat accident. *Resuscitation* 2012;83:1078–84.

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Salt vs Fresh Water

- Extensive data from animal studies and human case series have shown that, irrespective of the tonicity of the inhaled fluid, the predominant pathophysiological process is hypoxaemia, driven by surfactant wash-out and dysfunction, alveolar collapse, atelectasis and intrapulmonary shunting.
- Small differences in electrolyte disturbance are rarely of any clinical relevance and do not usually require treatment.

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Drowning Outcomes

- Victim can be rescued in any step of the drowning process and the results are:
 - ☐ Death
 - ☐ Morbidity
 - ☐ Not morbidity



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Treatment

- Prehospital Modifications

- BLS

- CPR (initiate ventilation in water if possible)
 - ABC not CAB
 - No benefit of Heimlich maneuver
 - Prevent hypothermia
 - Cervical collar not needed if no trauma (cervical injury incidence only 0.5%)



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Treatment

- Hospital Modifications

- Pulmonary support

- ABG, electrolyte
 - Intubate alert victims if pulmonary function impaired (signs of acute lung injury $\text{PaO}_2/\text{FiO}_2 < 300 \text{ mmHg}$)
 - Use of surfactant, ECMO, NO_2 needs more evidence
 - CPAP or PEEP $\geq 10 \text{ cmH}_2\text{O}$ for best SaO_2 with lowest FiO_2

- Prophylactic antibiotics??

- No steroids

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