CARDIO - PULMO - (CEREBRAL) RESUSCITATION

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European resuscitation council

• Európske guidelines týkajúce sa resuscitácie boli publikované Európskou radou pre resuscitáciu (ERC) v International Journal Resuscitation v novembri 2005.

• www.erc.edu, www.resus.org.uk
• www.erc.edu
• www.resus.org.uk

• Resuscitation (in October 2010)
• http://lf.upjs.sk/kaim/
Most common causes of cardiac arrest

- 1. place IHD... *Myocardial infarction*,
- Trauma
- Poisoning
- Drowning
- Hypotermia...
CARDIOPULMONARY RESUSCITATION (CPR)


- Basic life support
- Advanced life support
THE CHAIN OF SURVIVAL

Early access to emergency services

Early BLS to buy time

Early defibrillation to reverse VF

Early advanced care to stabilise

up to 4 min

up to 8 min
BASIC LIFE SUPPORT (BLS)

A - Airway
B - Breathing
C - Circulation (CAB)
Adult basic life support

1. **UNRESPONSIVE?**
   - Shout for help

2. **NOT BREATHING NORMALLY?**
   - Call 112*
   - 30 chest compressions
   - 2 rescue breaths
   - 30 compressions
Shake shoulders gently
Ask “Are you all right?”
If he responds
• Leave as you find him.
• Find out what is wrong.
• Reassess regularly.
<table>
<thead>
<tr>
<th>Action</th>
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<tbody>
<tr>
<td>Approach safely</td>
</tr>
<tr>
<td>Check response</td>
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<td>Shout for help</td>
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<tr>
<td>Open airway</td>
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SHOUT FOR HELP

Approach safely
Check response
Shout for help
Open airway
Check breathing
Call 112
30 chest compressions
2 rescue breaths
## OPEN AIRWAY

- Approach safely
- Check response
- Shout for help
- Open airway
- Check breathing
- Call 112
- 30 chest compressions
- 2 rescue breaths
AIRWAY OPENING BY
NECK EXTENSION
Cervical spine injury

- Jaw thrust for open airway (not for lay rescuer)
CHECK BREATHING

• Look, listen and feel for NORMAL breathing

• Do not confuse agonal breathing with NORMAL breathing
Recovery position

1

2

3

4
AGONAL BREATHING

• Occurs shortly after the heart stops in up to 40% of cardiac arrests

• Described as barely, heavy, noisy or gasping breathing

• Recognise as a sign of cardiac arrest!
Approach safely
Check response
Shout for help
Open airway
Check breathing
Call 112
30 chest compressions
2 rescue breaths
Basic life support

- Unresponsiveness
- Apnoea, gasping

Call 112
Start chest compressions
CHEST COMPRESSIONS

- Place the heel of one hand in the centre of the chest
- Place other hand on top
- Interlock fingers
- Compress the chest
  - Rate 100 min⁻¹
  - Depth 5-6 cm
  - Equal compression : relaxation ratio
- When possible change CPR operator every 2 min
EXTERNAL CHEST COMPRESSIONS

- One rescuer
- 30:2
- Heart rate: 100/min
- Depth: 5 cm
RESCUE BREATHS

- Pinch the nose
- Take a normal breath
- Place lips over mouth
- Blow until the chest rises
- Take about 1 second
- Allow chest to fall
- Repeat
Continous chest compression - only
Continous chest compression - only

• If layman is not able or is unwilling to perform mouth to mouth breathing
VENTILATION MANAGEMENT

- During CPR oxygenation is paramount
- CO$_2$ elimination is on the second place
  - 30 : 2, 500-600 ml, 6-7 ml/kg bw
  - FiO$_2$=0.21, F$_{ET}$O$_2$≤0.16
- hyperventilation – no!
CARDIOPULMONARY RESUSCITATION (CPR)

- Basic life support
- Advanced life support: C, A, B, Drugs, ECG, ...
In hospital CPR - Advanced life support

- One person starts 30 : 2
  others call resuscitation team
  + defibrillator, r. equipments (airway, breathing bag, adrenalin,..)

- only one person: leave the patient,
  call r. team (RRT)
  30 : 2
VENTILATION MANAGEMENT

ALS – In-hospital CPR – A, B

- Oral/nasal airway
- **Tracheal intubation**: \( f: 10/\text{min} \), \( \text{FiO}_2 = 1.0 \)
  (reservoir bag), \( V_T \) 6-7 ml/kg
- Laryngeal mask
- Oe-Trach Combitube

- Surgical airway
  - coniotomy
- Ventilation:
  - **Ventilator**
  - Transtracheal jet ventilation
<table>
<thead>
<tr>
<th></th>
<th>$O_2$</th>
<th>$\text{FiO}_2$</th>
<th>$V_T \times f$</th>
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<tr>
<td>adults</td>
<td>13</td>
<td>85-100</td>
<td>1000 x 15</td>
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<td>4</td>
<td>&gt;40</td>
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<tr>
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<td>5</td>
<td>85-100</td>
<td>300 x 20</td>
</tr>
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**BAG WITH OXYGEN SUPPLY**

Inlet $O_2$
10 - 13 l/min
Advanced life support
Self-inflating bag-mask + airway

Figure 4.8 The two-person technique for bag-mask ventilation. © 2005 European Resuscitation Council.
LIFE-THREATENING CARDIAC RHYTHM DISTURBANCES

Ventricular fibrillation

Ventricular tachycardia

Asystole

Electro-mechanical dissociation (EMD)
Pulseless ventricular activity (PVA)
Adult ALS Algorithm

Unresponsive?
- Open Airway
  - Look for signs of life
  - Call Resuscitation Team

CPR 30:2
- Until defibrillator/monitor attached

Assess Rhythm

Shockable (VF/Pulseless VT)
- 1 Shock
  - 150-360 J biphasic or 360 J monophasic

Immediately resume: CPR 30:2 for 2 min

During CPR:
- Correct reversible causes*
- Check electrode position and contact
- Attempt / verify:
  - IV access
  - airway and oxygen
- Give uninterrupted compressions when airway secure
- Give adrenaline every 3-5 mins
- Consider: amiodarone, atropine, magnesium

Non-shockable (PEA/Asystole)
- Immediately resume: CPR 30:2 for 2 min

* Reversible Causes
- Hypoxia
- Hypovolaemia
- Hypo/hyperkalaemia/Metabolic
- Hypothermia
- Tension Pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis (coronary or pulmonary)
DEFIBRILLATION

- Paddle positions (sternum, apex)
- Self-adhesive pads (sparks!!)

- Biphasic defibrilators:
  1. 150-200J
  2. 150-360J,....

- CPR for 2 min (5 x 30:2) after shock
DEFIBRILLATION

• Check the rhythm (organised QRS complexes: regular + narrow)

• After the third shock give: adrenalin 1 mg every 3-5 min. iv amiodarone 300 mg iv

• Time between CC and shock delivery < 5 s

• Signs of life return: normal breathing, movement, coughing
McCormick Chicago

Arlanda Stockholm

Munchen
Adult ALS Algorithm

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LIFE-THREATENING CARDIAC RHYTHM DISTURBANCES

Cardiac arrest (asystole)  
Fine VF will not be shocked successfully

Pulseless electrical activity (PEA, EMD) -  
myocardial contractions are too weak to produce pulse
POTENTIALLY REVERSIBLE CAUSES (5 H’s & 5 T’s):

- Hypoxia
- Hypovolemia
- Hypothermia
- Hyper/hypoK⁺ and metabolic disorders
- H⁺ ions (acidosis)
- Tension pneumothorax
- Tamponade
- Toxic/therap. disturbances
- Thrombosis coronary
- Thrombosis pulmonary
POTENTIALLY REVERSIBLE CAUSES – rescue activities (5 H’s & 5 T’s):

- **Hypoxia** – ventilation with 100% oxygen
- **Hypovolemia** (haemorrhage-trauma, GIT bleeding, rupture of an aortic aneurysm - fluid (saline or Hartman´s solution + urgent surgery)
- **Hypothermia** (in drowning incident)
- **Hyper/hypoK⁺ and metabolic disorders**
- **H⁺ ions** (acidosis)
POTENTIALLY REVERSIBLE CAUSES – rescue activities cont
(5 H’s & 5 T’s):

- **T**ension pneumothorax - needle thoracocentesis and chest drainage
- **T**amponade – needle pericardiocentesis
- **T**oxic substances – appropriate antidotes
- **T**hrombosis coronary - thrombolysis
- **T**hrombosis pulmonary – trombolytic drugs
DRUGS USED CPR

1. Adrenaline
   1 mg á 3'- 5 ' 

2. Bicarbonate
   50 ml 8,4% or 100 ml 4,2%
   - pH < 7.1, BE < -10
   - hyperkalaemia
   - tricyclic antidepressant overdose

3. Amiodarone 300 mg ...150 mg (inf. 900 mg/24h)
   lidocaine 1 mg/kg

& equipment
- (defibrilator)
- oxygen
- Ambu bag
- face mask
- F1/1
- infusion set
- plastic IV cannula
DRUG DELIVERY ROUTES

• **Intravenous** (central, peripheral + 20 ml sol. F 1/1 + arm elevation 10 s)
• **Intraosseal**
• **Tracheal** (2-3 x more dose + 10 ml F1/1) (adrenaline, lidocaine, atropine)

• NEVER IM nor SC !!!
EZ-IO AD Proximal Tibial Access

Intraosseous Infusion System
Automatic intraosseal injector
Post – resuscitation care

Therapeutic hypothermia

• Comatose adults after out-of-hospital VF cardiac arrest must be cooled to 32-34 °C for 12-24 h.
• Improved neurological outcomes
PROTOCOL FOR CPR INTERPRETATION
„Utstein in-hospital“

TIME

~ disaster call
~ start CPR
~ emerg. team arrival
~ onset of circulation
~ living out

+ provided activities...
RESULTS EVALUATION

• Criterion of temporary result of CPR is ROSC

• Criterion of long term result of CPR is return of neurological a psychical competencies
Thank you!