

# Advanced Life Support - Guidelines 2015 (ACLS)



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## Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)

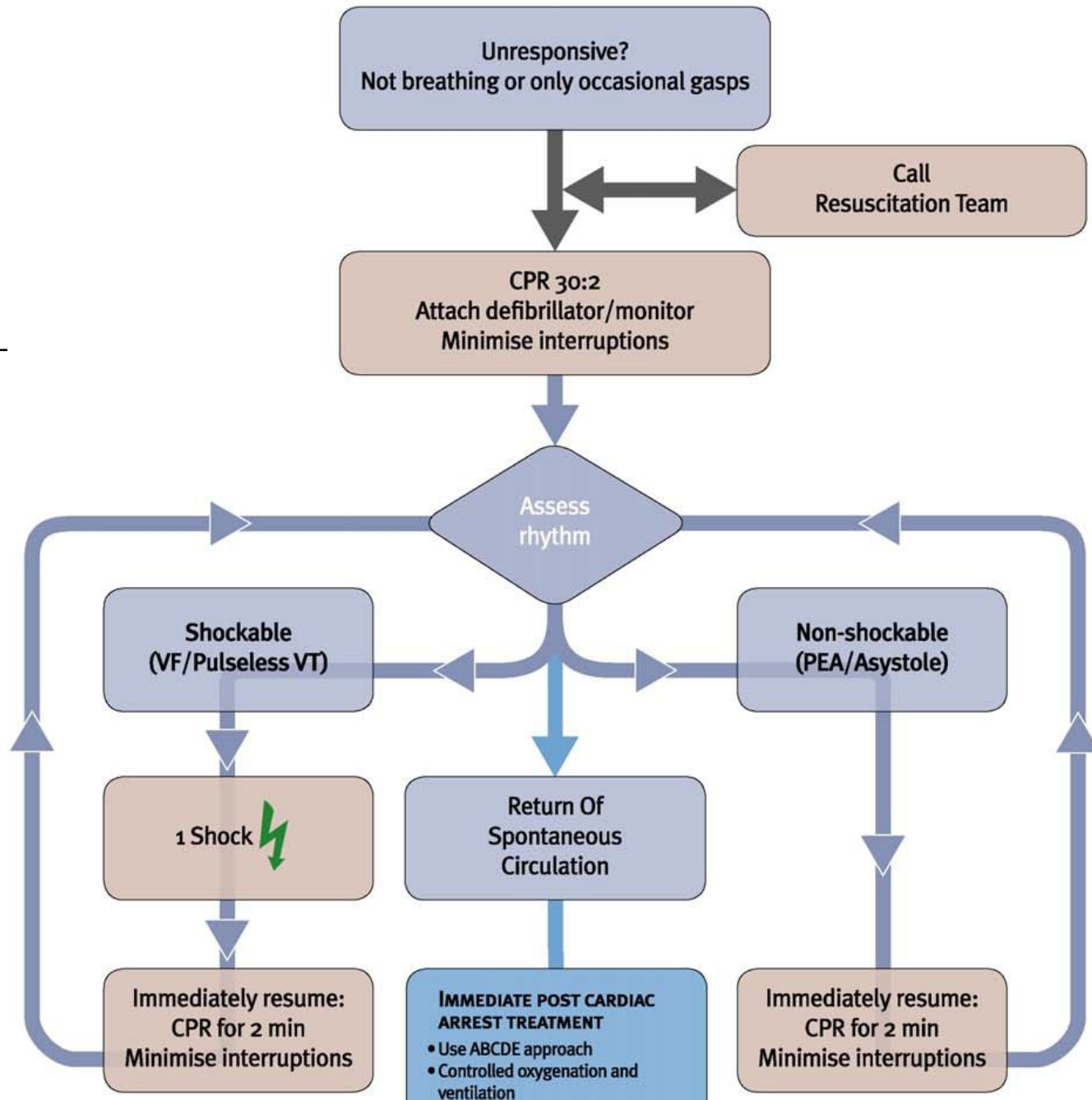


# Primary survey

- Danger
- Responce = Unresponsive
- Send for HELP
- A+B+C ... in 10 seconds
- ... start Chest compressions
- 
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# Advanced Life Support

2010

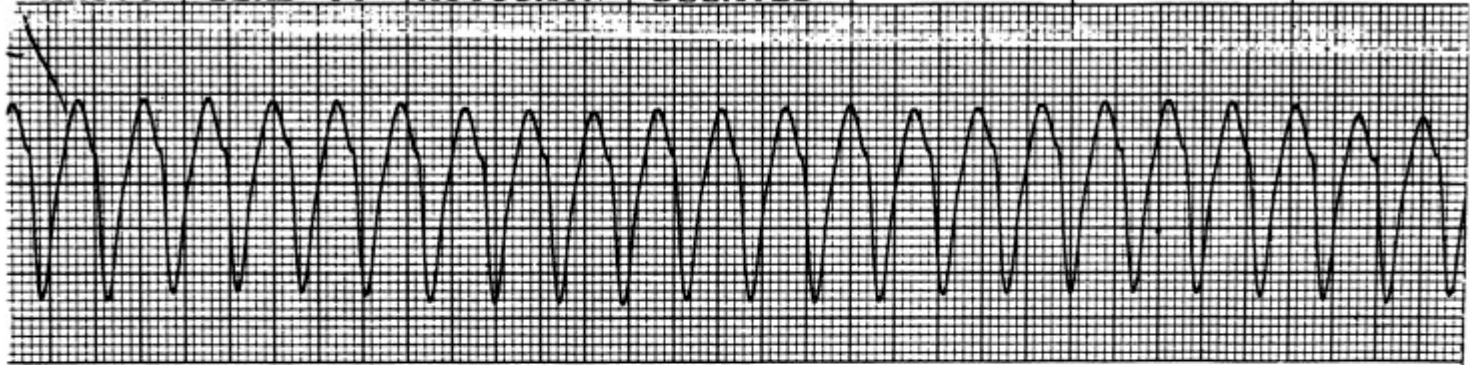




# VF/VT

**A**

HR 208 | LEAD II | AUTOGAIN | DELAYED



**B**

HR --- | LEAD II | AUTOGAIN | DELAYED



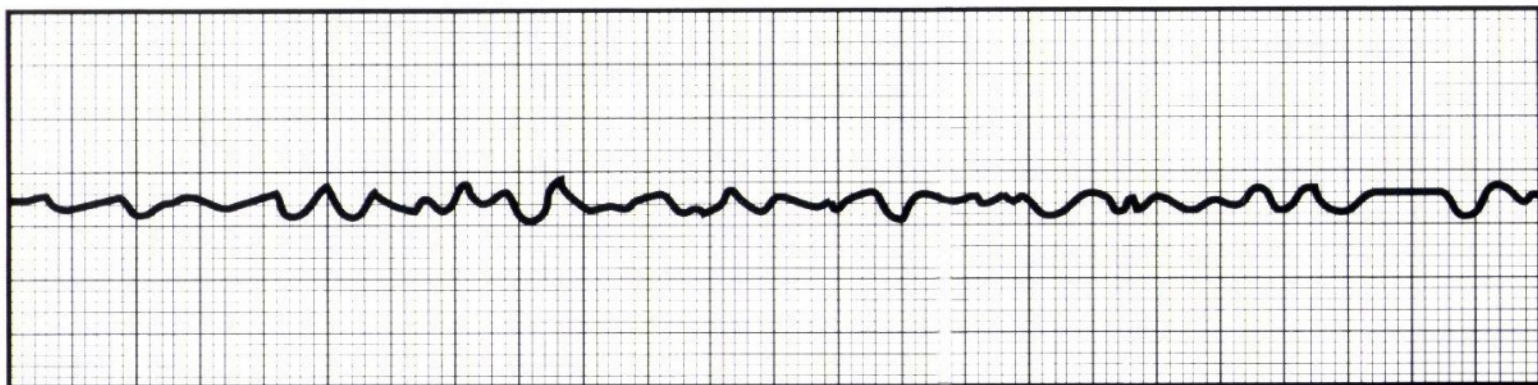


# VENTRICULAR Fibrillation

**Hrubovlnná komorová fibrilace**



**Jemnovlnná komorová fibrilace**



# Ventricular fibrillation

- electrical instability of heart muscle (ischemia, hypothermia)

sings:

- pulselessness

Th: defibrillation,  
adrenalin, vasopressin  
amiodarone

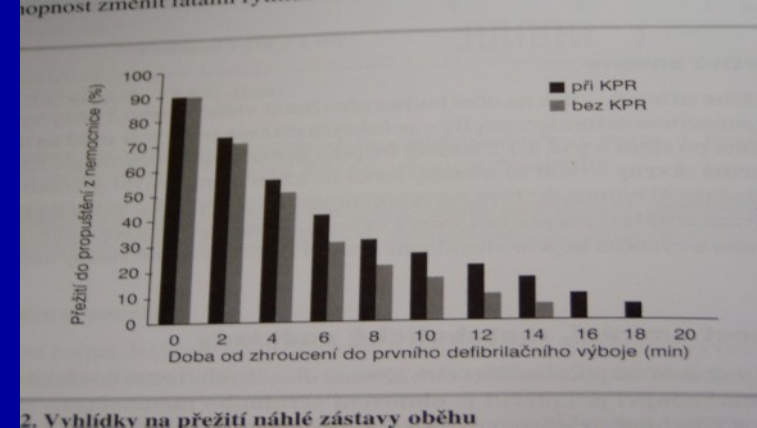
# Please Shock-Shock-Shock, EVerybody Shock, And Let's Make Patients Better

- (Please = precordial thump)
- Shock 200J bifasic / 360J mono
- EVerybody = Epinephrine / Vasopressin
  
- And = Amiodarone
- Let's = Lidocaine
- Make = Magnesium
- Patients = Procainamide
- Better = Bicarbonate



# Defibrillation

- Defibrillation sends a high energy DC electric shock through the heart, stopping it momentarily. The sinoatrial node should then take over and a coordinated rhythm restart. However, ventricular fibrillation often recurs so multiple shocks are used routinely.



Position of electrodes:

Energy:

Joule (Watt  $\times$  sec.)

heard - ONLY 4%/

monophasic shock

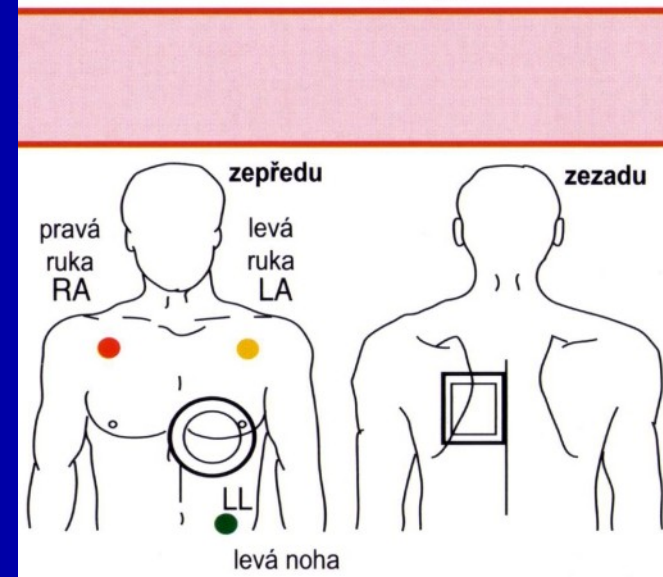
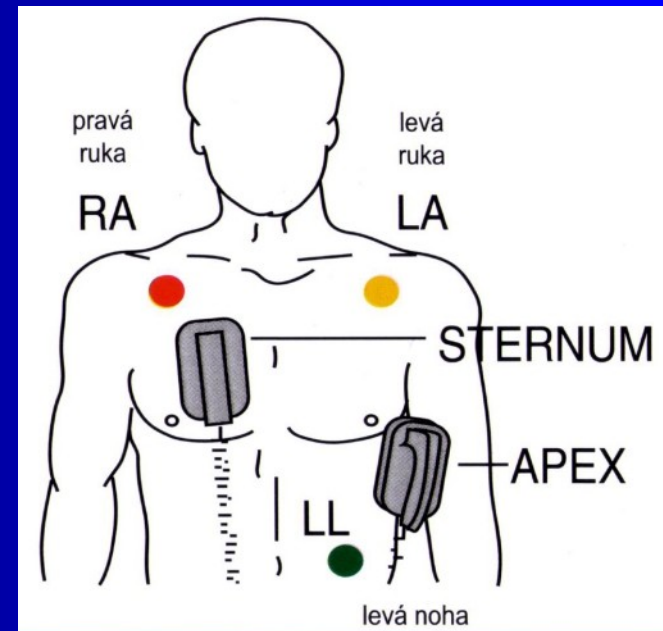
360 J

biphasic shock

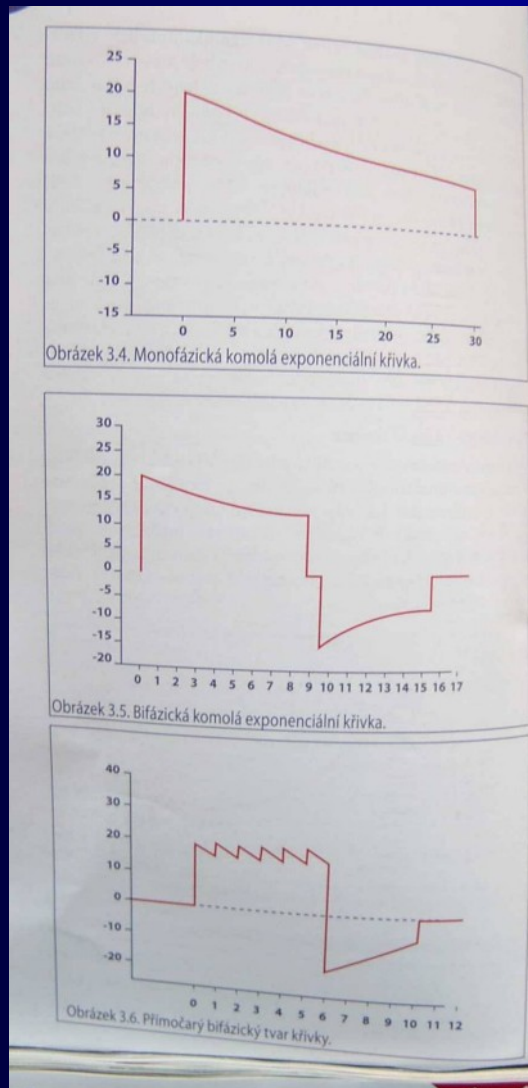
200 – 300 - 360J

internal shock

25 - 35 J



# Biphasic versus monophasic



- Monophasic defibrillation delivers a charge in only one direction.
- Biphasic defibrillation delivers a charge in one direction for half of the shock and in the electrically opposite direction for the second half.

## Defibrillation

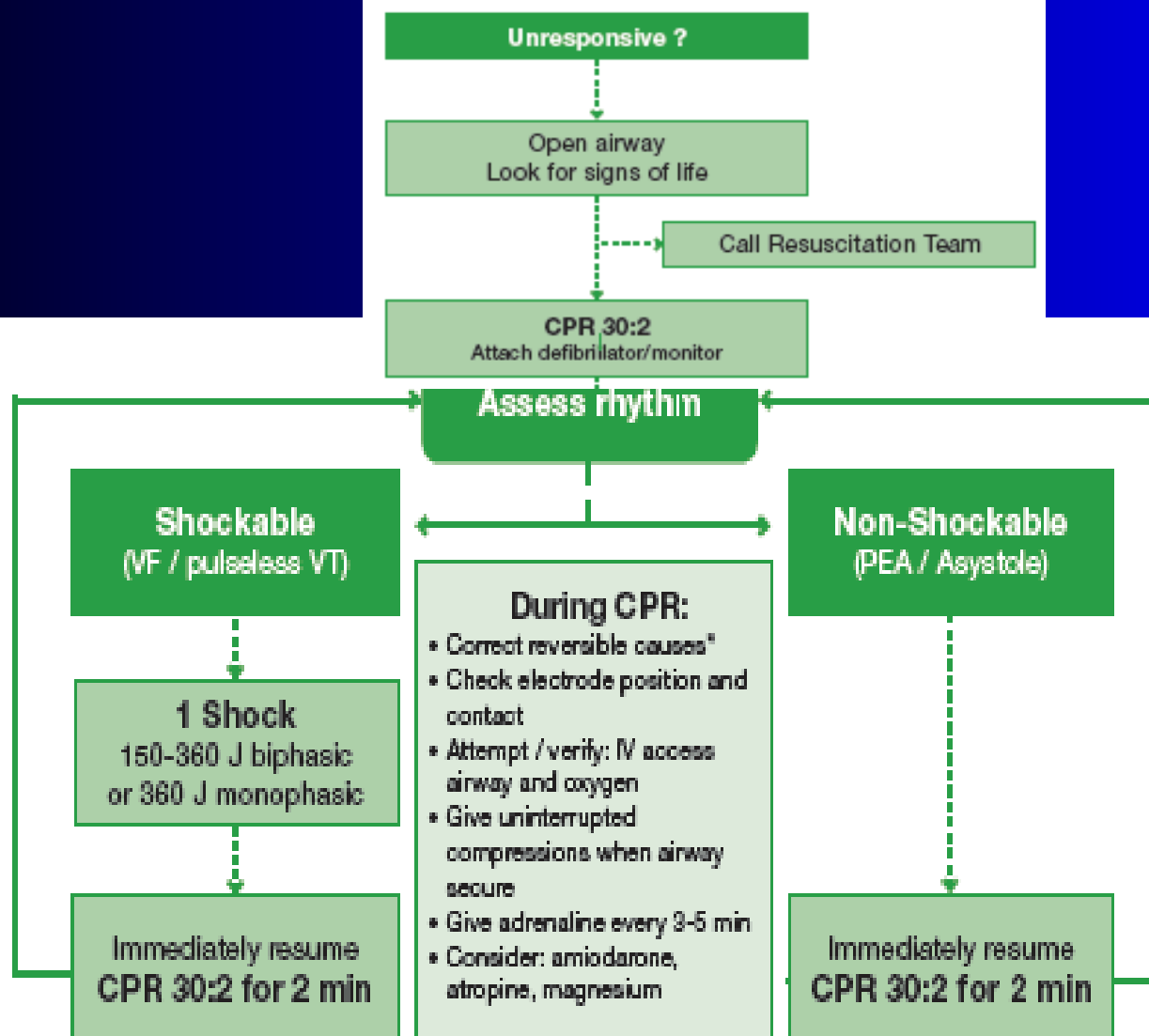
**Voltage** 1,5 – 3 kV

**Current** 30 – 40 A

**Time** 15 ms

**Impedance of Th** 70 – 80 ohms

- Skin burns
- "stand clear" order



**\*Reversible causes**

Hypoxia  
Hypovolaemia  
Hypo/hyperkalaemia/metabolic  
Hypothermia

Tension pneumothorax  
Tamponade, cardiac  
Toxins  
Thrombosis (coronary or pulmonary)

# Asystole

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- isoelectric line



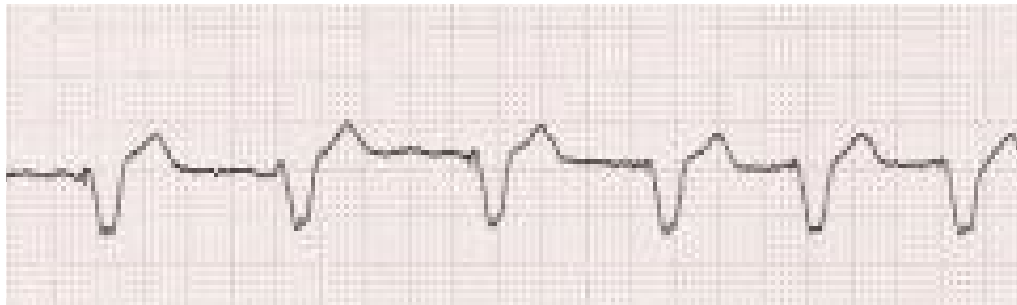


# Pulseless Electrical Activity

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(bezpulzová elektrická aktivita =  
elektromechanická disociace)

- complex, line, complex



# Asystole

## The worst situation

- **Diagnosis on ECG monitor – flat line**
- **Airway management - hypoxia**
- **Adrenalin 1 mg i.v. á 3 min.**  
**children 10 µg/kg**

Asystole ..... Check me in another lead,  
then let's have a cup of TEA."

- ((T = Transcutaneous Pacing)) ex 2005
- E = Epinephrine
- ((A = Atropine)) ex 2010

# Pulseless Electrical Activity

reasons:

- **Hypovolemia**
- **Hypoxia**
- **H<sup>+</sup> acidosis**
- **Hyper/hypocalcemia**
- **Hypothermia**

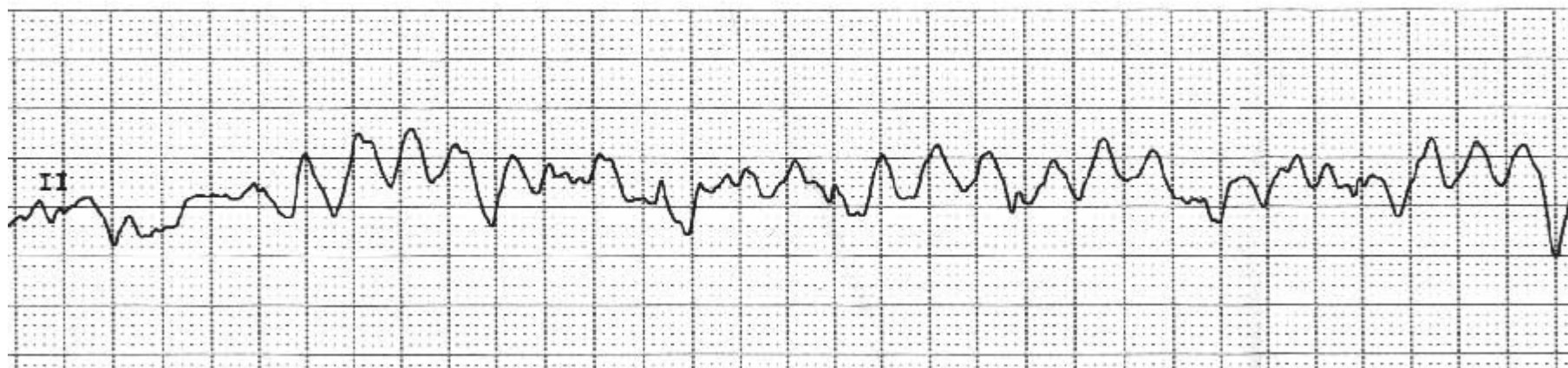
# PEA - reasons:

- „**Tablets**“ (overdose)
- **Cardiac Tamponade**
- **Tension pneumothorax**
- **Trombosis of C.a.**
- **Trombosis of a.pulm.** (embolie)

# Pulseless electrical activity are guided by the letters P-E-A

- Problem (H, T)
- Epinephrine
- (atropin) ex2010





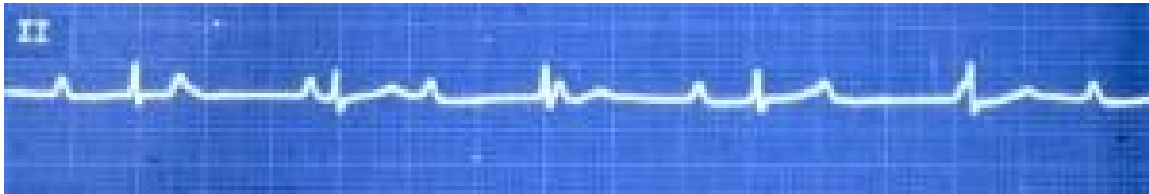
# Co je to?

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# Co je to?

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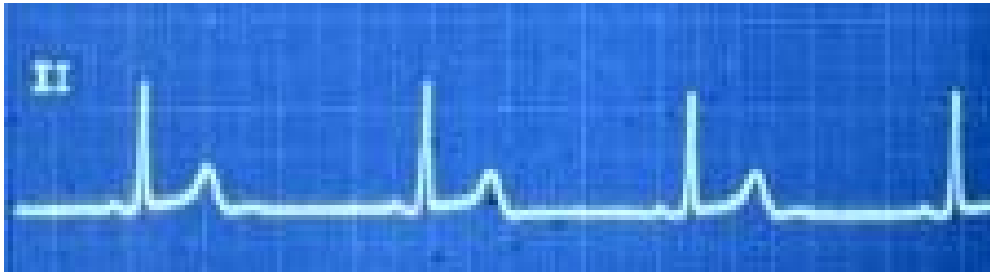
# Co je to?

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# Co je to?

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# Co je to?

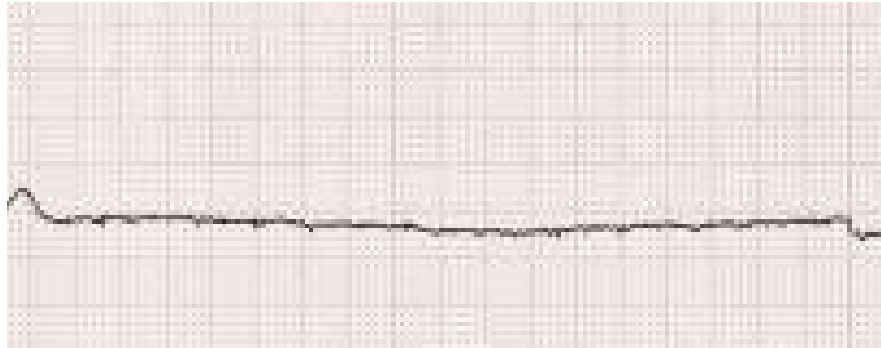
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# Co je to?

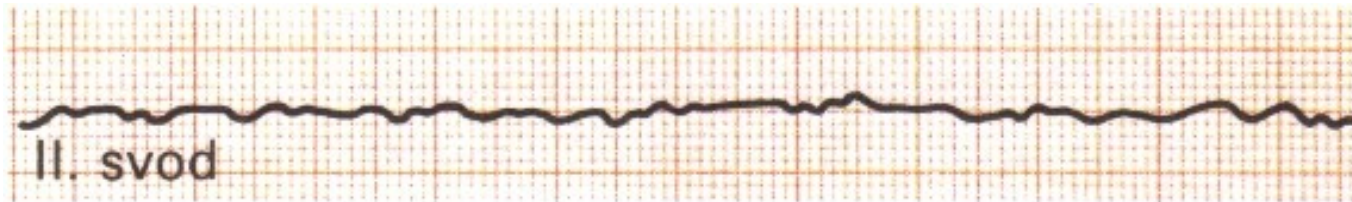
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# Asystole ??

## low amplitude VF ??

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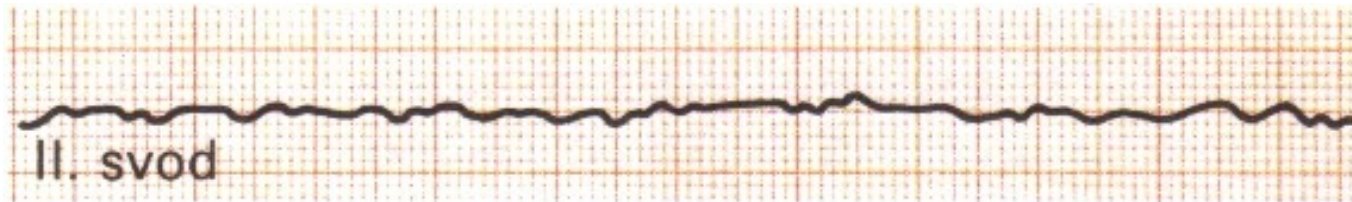


# Asystole ??

## low amplitude VF ??

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- if in doubt - asystoly



## B – breathing

## ACLS

positive pressure ventilation

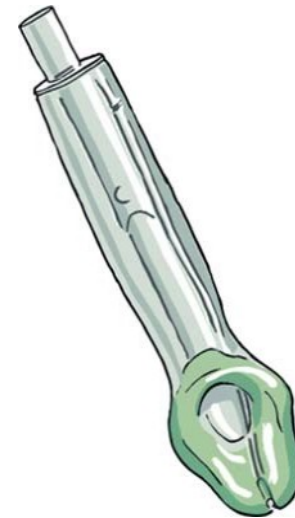
- bag („ambu“), holding mask by 1 or 2 hands
- (ventilator – Volume Control Ventilation)
- 6 ml/kg; 10/min, fiO<sub>2</sub> 100%
- ACLS 2 breaths
- ratio – 2 : 30 - ventilated by mask
- “no ratio” = 10 : 100 – advanced airway

# Advanced Airway

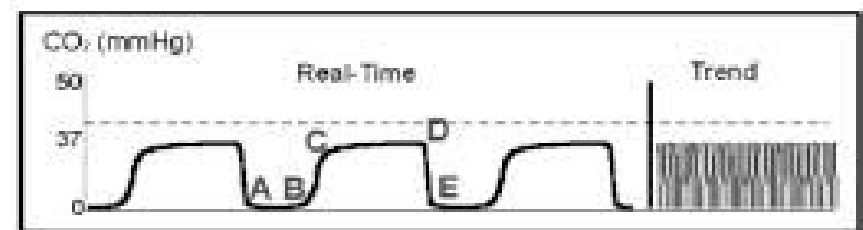
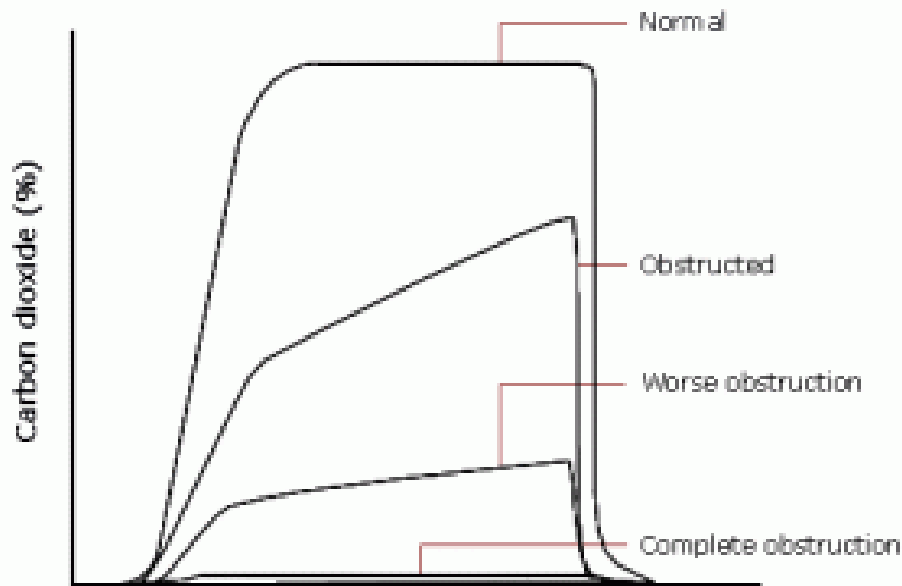
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100% O<sub>2</sub>, flow 10lpm

Subglottic devices:



# Capnography



- A – B Baseline
- B – C Expiratory Upstroke
- C – D Expiratory Plateau
- D     ETCO<sub>2</sub> value
- D – E Inspiration Begins

# Capnography

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## Sudden loss of waveform

- ET tube disconnected, dislodged, kinked or obstructed
- Loss of circulatory function



## Decreasing EtCO<sub>2</sub>

- ET tube cuff leak
- ET tube in hypopharynx
- Partial obstruction



## CPR Assessment

- Attempt to maintain minimum of 10mmHg



## Sudden increase in EtCO<sub>2</sub>

- Return of spontaneous circulation (ROSC)



## Bronchospasm ("Shark-fin" appearance)

- Asthma
- COPD



## Hypoventilation



## Hyperventilation

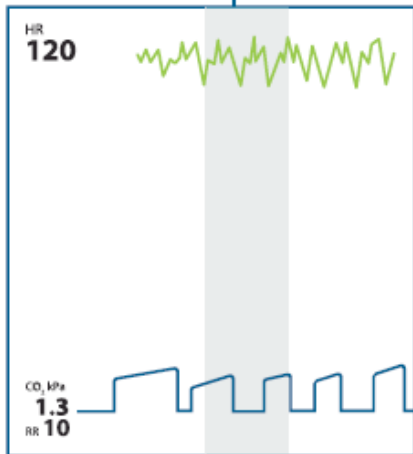
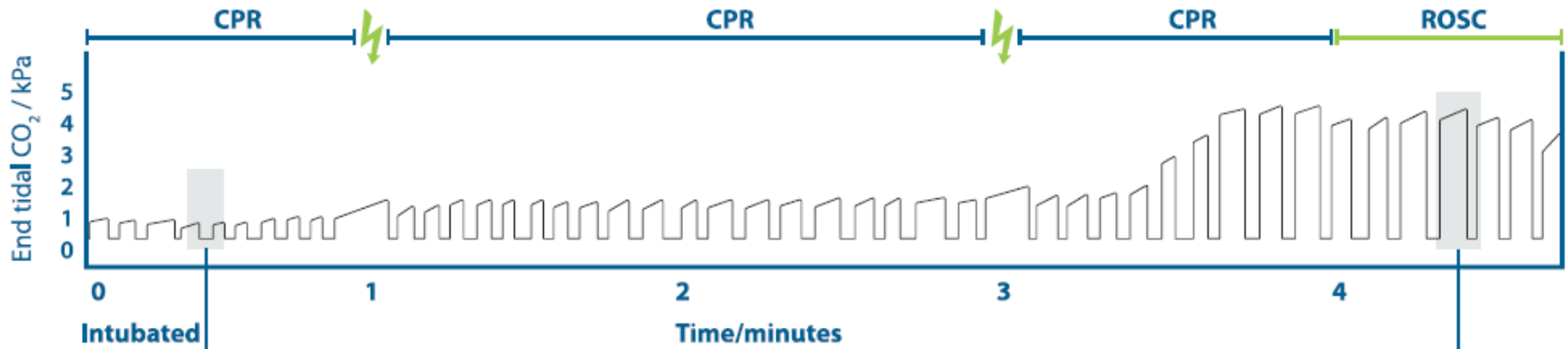


## Decreased EtCO<sub>2</sub>

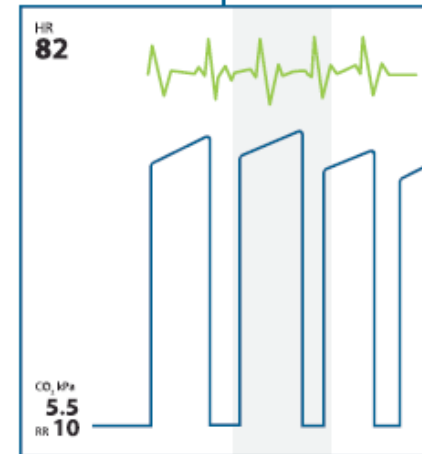
- Apnea
- Sedation



# Capnography



EtCO<sub>2</sub> < 1.33 kPa (10 mmHg) after 20 min of CPR is associated with a poor outcome





# Oxygen

- as high  $F_{iO_2}$  as possible – during compressions
- Hypoxia and acidosis contra efficiency of electric and pharmacology therapy

Hyperoxemia after recovery of circulation is harmful  
SpO<sub>2</sub> .. 94%

## Ratio 2005..2015

compressions : breaths

- adult nonintubated 30 : 2
- adult intubated 100:10
- child 30:2
  - 2medical = team 15:2
- newborn 3:1

## Drugs - administration

Intravenously – periferal cath. - v. jugul. externa  
- v. femoralis  
- central v. cath. - v. subclavia  
- v. jugul. interna

### Intraosseal access - children

- Add 20ml i.v of fluids to move the drug.
- Effect in 1 min

# drugs of VF

- after 3<sup>rd</sup> defibrillation:
- Adrenalin 1 mg i.v. á 3 min.  
children 10 µg/kg
- Antiarrhythmics:  
Amiodaron 5 mg/kg  
300 mg i.v.

# Epinephrine = Adrenalin

Alfa effect = **raise diastolic pressure**

- raise brain, heart perfusion pressure

Beta effect - raise contractility

- change of type of fibrillation

D: **1 mg i.v. a 3 min**

# Fluids

- Bolus of 20ml after each dose = movement of drug
- Acute bleeding – rubt. AAA, EUG;

## Types:

- Crystalloids – Ringer, Hartman, physiol. sol.
- Colloids – Gelatina, HAES = stark
- Glc – do NOT use – wrong neurology result

# Monitoring during ACLS

- Clinical signs:  
breathing efforts, movements and eye opening
- ECG:  
Pulse checks when there is an ECG rhythm compatible with an output can be used to identify ROSC, but may not detect pulses in those with low cardiac output states and a low blood pressure
- Capnometry
-

## When stop CPR:

- restored vital functions
- asystole for “20” minutes
- new information – when not to start



## After recovery of circulation

- ABCDE + Stabilisation of vital functions
- Diagnosis and treatment of the reason of arrest
- Hypothermia 32 – 36°C for 12 – 24 h  
(better neurological outcome)
- Potassium
- Intubation, Mandatory Ventilation, NasoGastric tube
- sedation, Convulsion