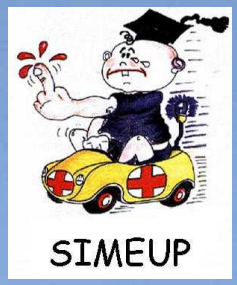
European Resuscitation Council

Italian Resuscitation Council IRC




Nanjing, China, March 2006

# Pediatric Basic Life Support

Simone Rugolotto, MD

*Department of Pediatrics, University of Verona, Italy*

*Alpine Pediatric Life Support Training Center*

http://www.provinz.bz.it/se/paednotmed/

# Europaregion
# Tirol-Südtirol/Alto Adige-Trentino

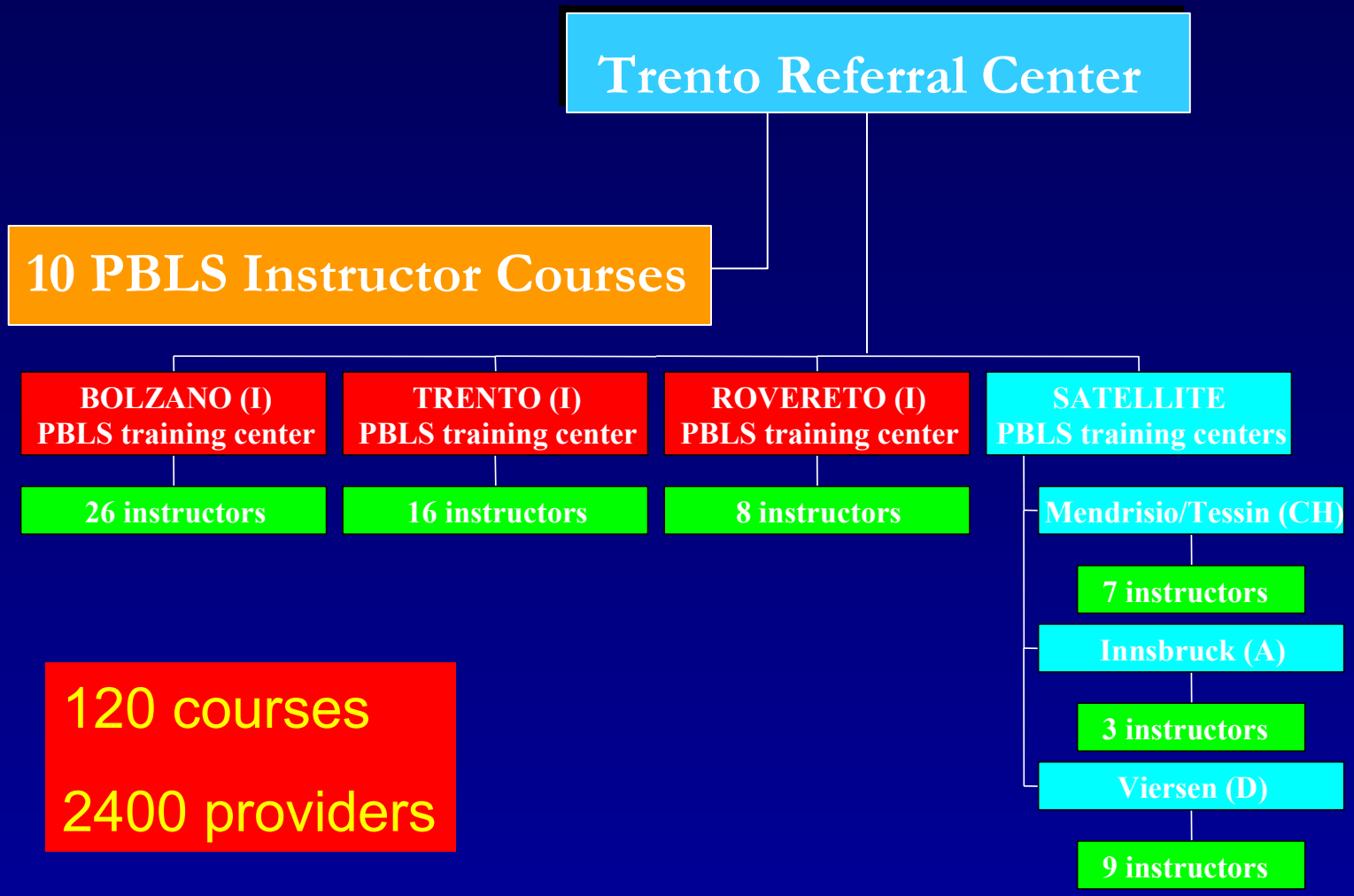

http://www.europaregion.info/

| | TIROL | SOUTH TIROL | TRENTINO | TOTAL |
|---|---|---|---|---|
| GEOGRAPHICAL DATA | | | | |
| area in sq. kms | 12.647 | 7.400 | 6.207 | 26.254 |
| population density per sq. km | 53 | 62 | 76 | 61 |
| number of communities | 279 | 116 | 223 | 618 |
| POPULATION | 665.391 | 459.687 | 469.887 | 1.594.965 |
| EDUCATION | | | | |
| nursery schools | 424 | 318 | 289 | 1.031 |
| primary and secondary (up to school- leaving age 15-16 years) schools | 581 | 429 | 348 | 1358 |
| secondary schools (age group 14/15-18) | 142 | 81 | 106 | 329 |
| Teachers in compulsory education (6-15)<br>Teachers in secondary education after 15 | 6775<br>3707 | 5.622<br>2.421 | 4.892<br>2.427 | 17.289<br>8.555 |
| HEALTH SERVICES | | | | |
| hospital beds | 4.761 | 2.711 | 3.030 | 10.502 |
| TRAFFIC | | | | |
| roads in kms | 2.482 | 2.336 | 2.353 | 7.171 |
| railway lines in kms | 484 | 230 | 196 | 904 |

# PBLS HISTORICAL BACKGROUND

- 1987 Experimental PBLS course (Florence)
- 1990 Pediatric Emergency Medicine Working Group of the Italian Society of Paediatrics
- 1994 Italian Resuscitation Council
- 1997 First PBLS-Training center (Genua)
  First PBLS Manual IRC
- 1998 PBLS Training Center in Trento
- 1999 First Italian PALS course in Trento
- 2000 First PBLS Courses and Manual in German
- 2001 Referral Training Center in Trento
- 2003 First European Paediatric Life Support Course

# Euregio PBLS centers, instructors and courses



# Departmental statistics: year 2005

- ✓ Transports: total of 189, 159 ambulance, 30 helicopter
- ✓ Admissions: 480 (86< 1500 g, 36 < 1000g, 100 < 33 wks, 176  33-37 wks)
- ✓ Deaths: 19
- ✓ Deliveries: 1850
- ✓ Personnell: 10 doctors, 33 nurses, 4 residents.
- ✓ Beds: 10 IC beds, 15 non IC beds.
- ✓ Day Hospital admissions: 1200.

# Departmental statistics: year 2005

- ✓ High frequency options: HFOV, BabyLog HFV.
- ✓ NO delivery. Human Milk Bank.
- ✓ Training and teaching courses: 7 NRP courses, 140 pupils, weekly “rad” meeting, daily “OG” meeting.
- ✓ International achievement: training programs in: AFRICA, Burundi University, in Neonatology; KOSSOVO WHO NRP and essential neonatal care.
- ✓ Hospital: 5000 employees (870 MD), 1900 beds

→ Italian referral center for early assisted toilet training.

# Goal of PBLS

**To prevent brain damages caused by hypoxia**

**in children who are:**

**Unresponsive**

**Not breathing**

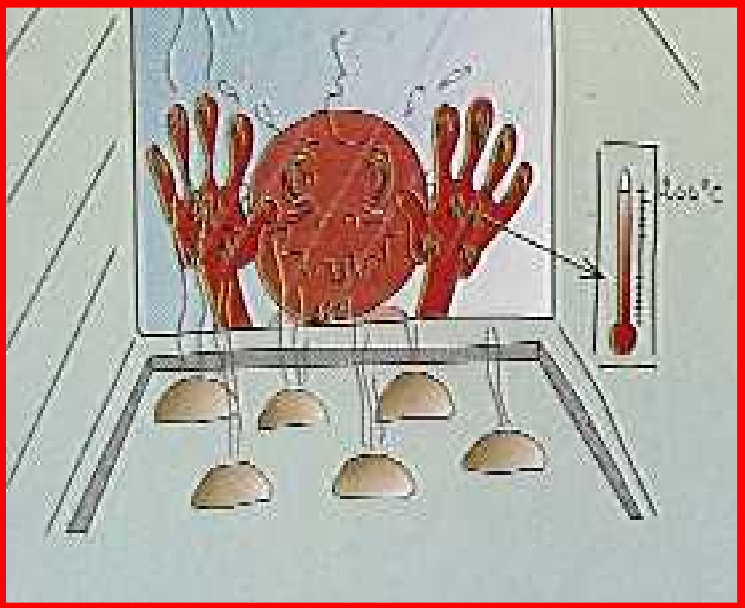
**Without pulse**

# PBLS issues

- Early understanding of respiratory and cardiac arrest
- Timely and effective warning
- CPR
- Foreign-body airway obstruction treatment
- Prevention of injuries


E = MC²


5



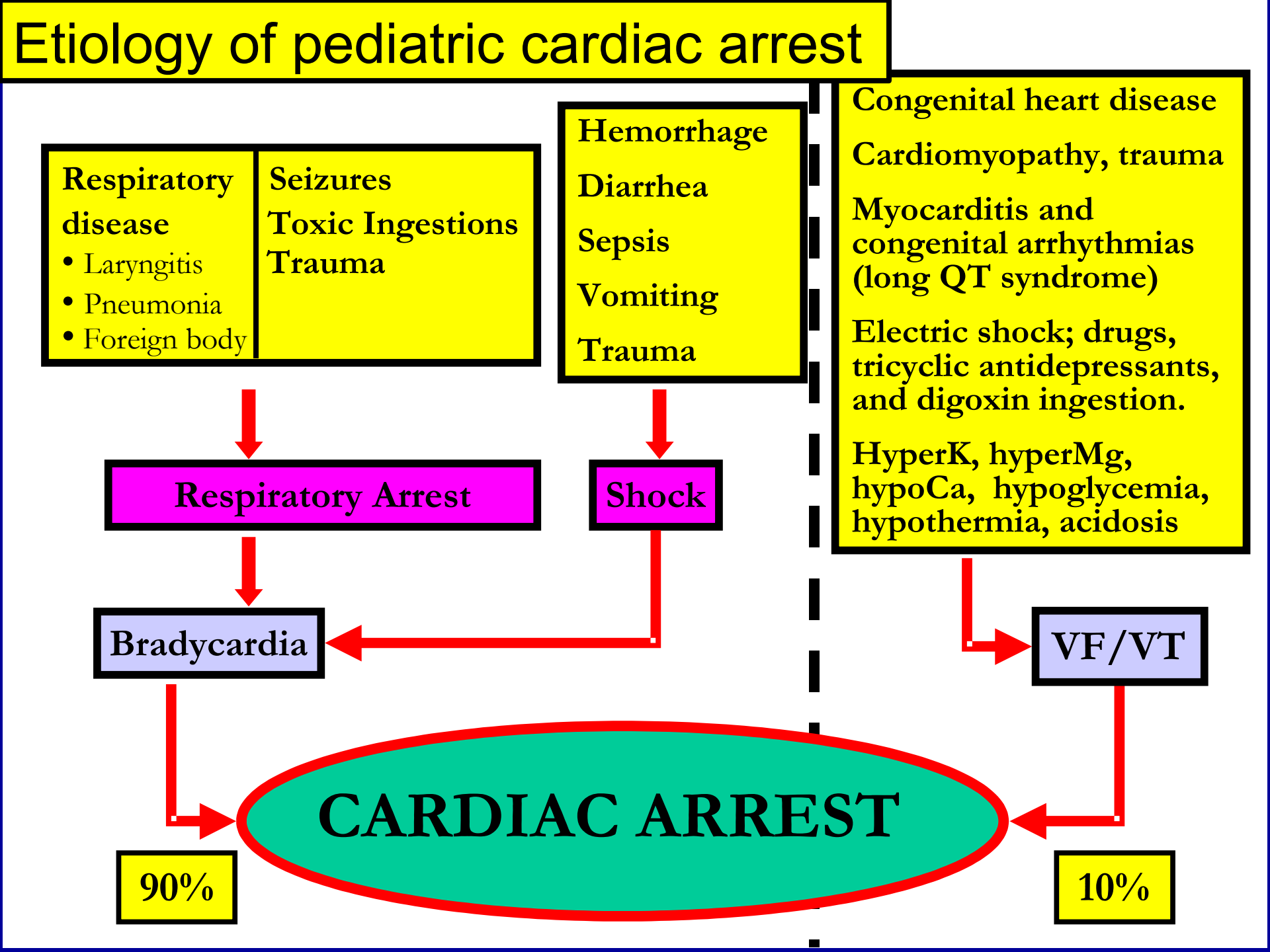
# Cardiac arrest

In children,

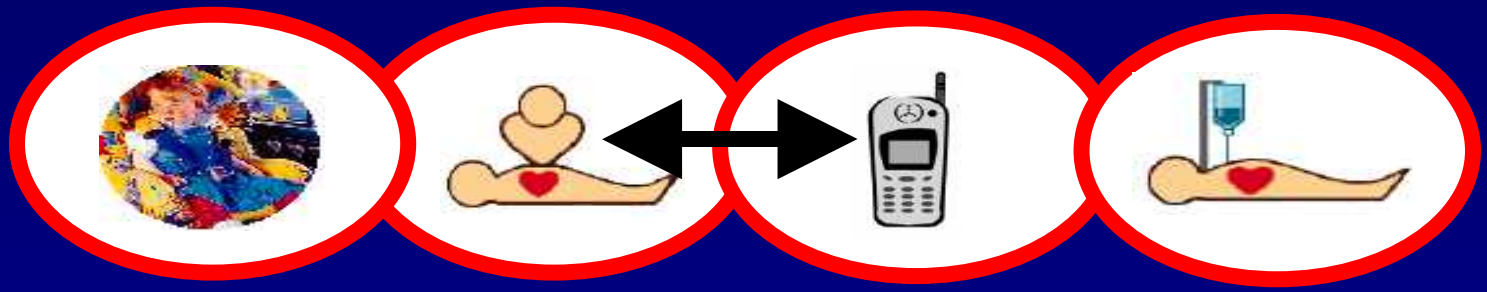
primitive cardiac arrest

is a rare event

# Etiology of pediatric cardiac arrest



# Pediatric Chain of Survival



Prevention

Early CPR

Early warning

Early PALS

# A.B.C.

**A** - airway

**B** - breathing

**C** - circulation

Techniques differ according to the age of the child

# Pediatric patients

**Infant:** less than 1 year
( up to 10 Kg - about 75 cm)

**Child:** between 1 yr and puberty
( up to 40 kg)

**Over puberty:** Adult BLS

**Assess** safety

**Assess** the status of consciousness (verbal and pain stimuli no shaking)

**If the patient is unconscious**

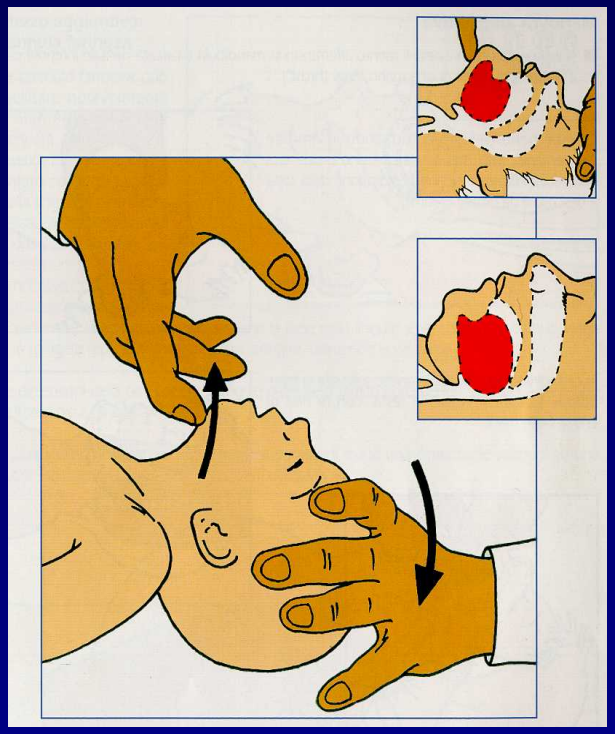
# A - AIRWAYS

**ACTION**

- Shout for help
  - ✓Call fast (do not leave the child, also trauma, drowning, intoxication)
  - ✓Call first (cardiac patient, witnessed collapse, adult) and early defibrillation
- Position the child
- Open the airways

A

# Open the airways



**Tilt the head and lift the jaw**

**In infants, neutral position of the head**

**In case of trauma: jaw thrust**

A

# B - Breathing

**Assessment**

**Look**
**Listen**
**Feel**

**10 seconds**

B

# B - Breathing

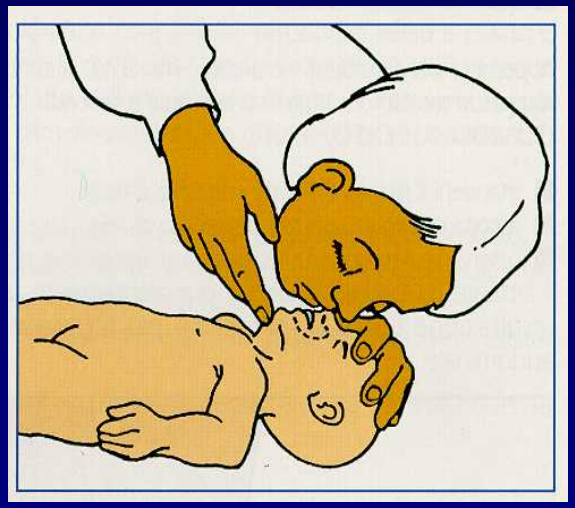
**ACTION**

**Breath present** → **Keep open airways; turn the child on his side into the recovery position (in children only and without trauma)**

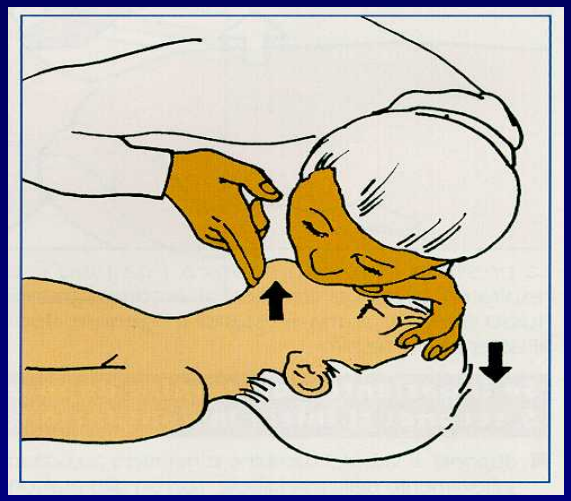
**Breath absent** → **5 rescue breaths, slow and progressive, with a duration of 1-1,5 seconds, making sure the expansion of chest**

B

# Rescue breaths



Mouth-to mouth and nose (infant)

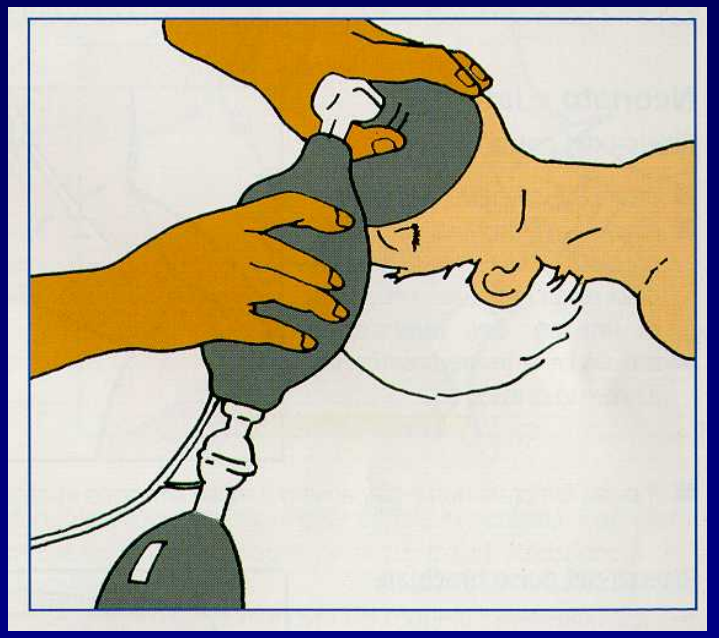


Mouth-to-mouth (child)

B

# Rescue breaths with bag and mask

Mask

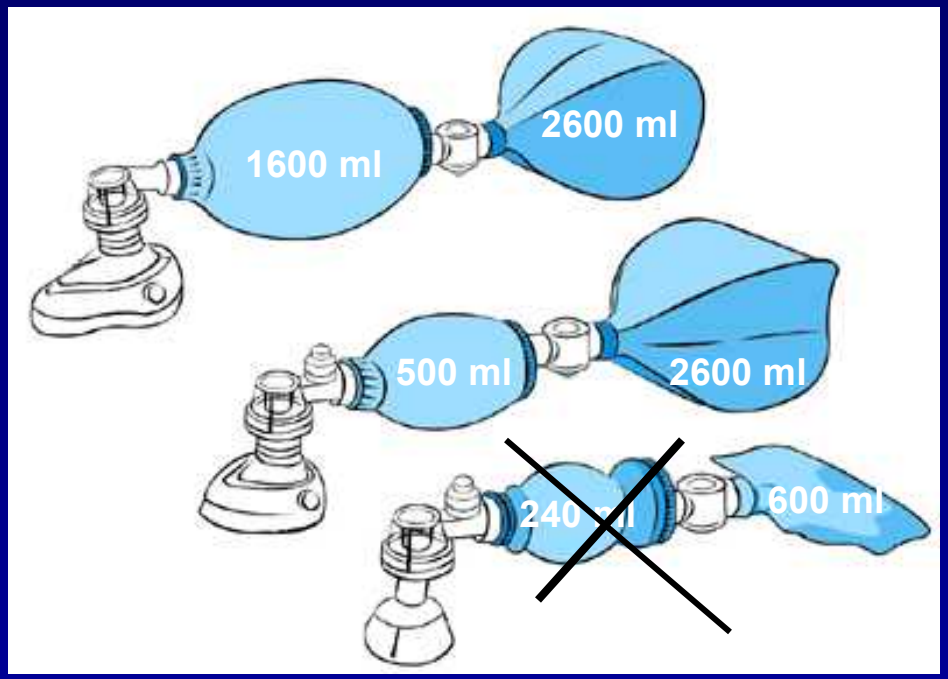


Bag and mask

B

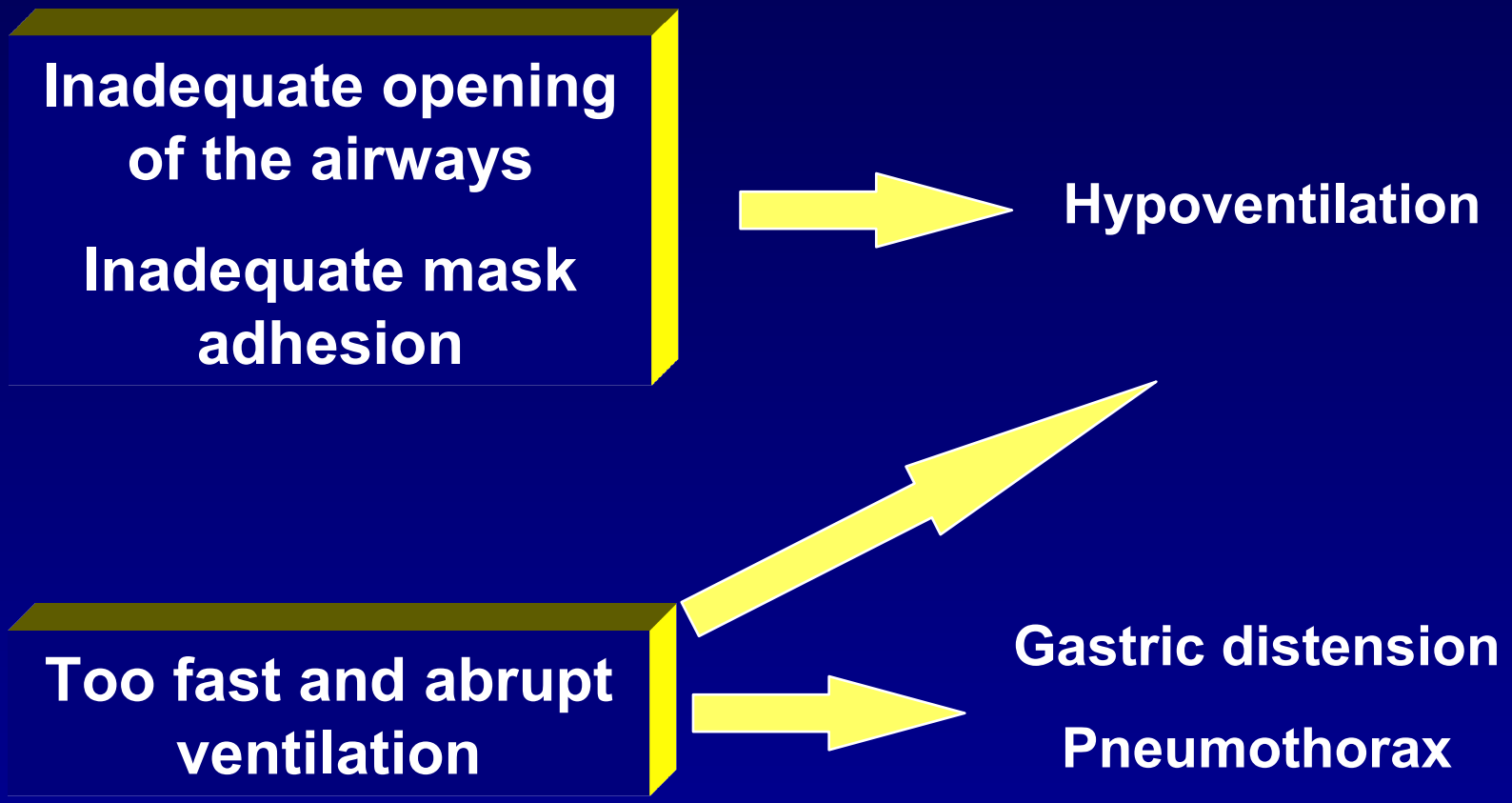
# FiO2 with bag and mask

- Bag 21%
- Bag + $O_2$ (10-12 l/min.) 40 - 60%
- Bag + $O_2$ (10-12 l/min.) + reservoir 80 - 90%




B

# Most frequent causes of inefficient ventilation or complications



# C - CIRCULATION

## ASSESSMENT

Lay person : check for normal breathing (not gasps)

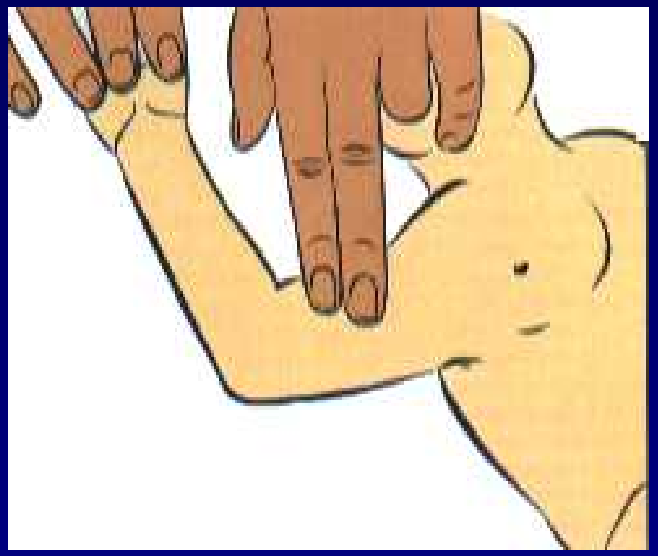
Duty to respond : check for signs of life (and pulse)

Time: 10 seconds

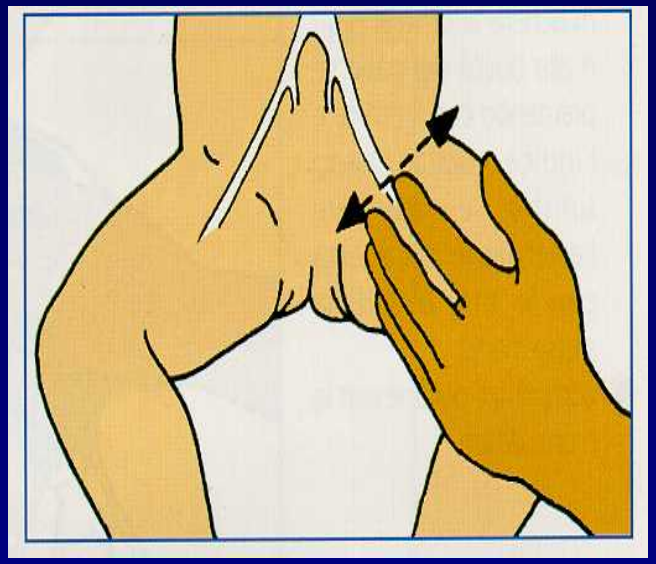
**Pulse location is different in infants and in children**

C

# Check pulse in the infant



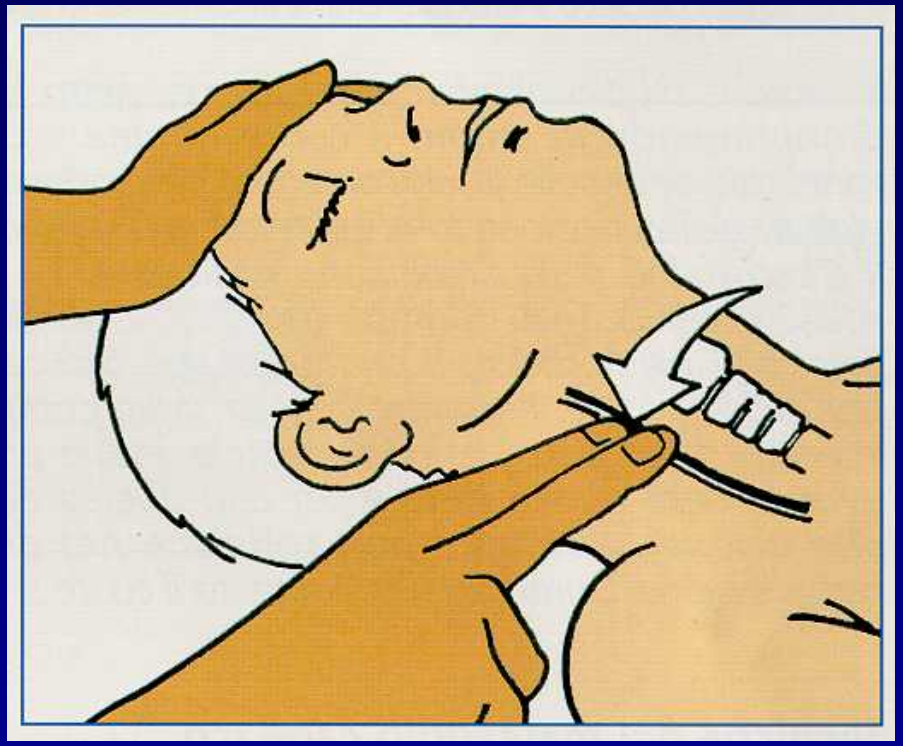
Brachial pulse



Femoral pulse

C

# Check pulse in the child



Carotid pulse

C

# C - CIRCULATION

**ACTION**

**Pulse present** → **20 breaths per minute**

**Pulse absent**

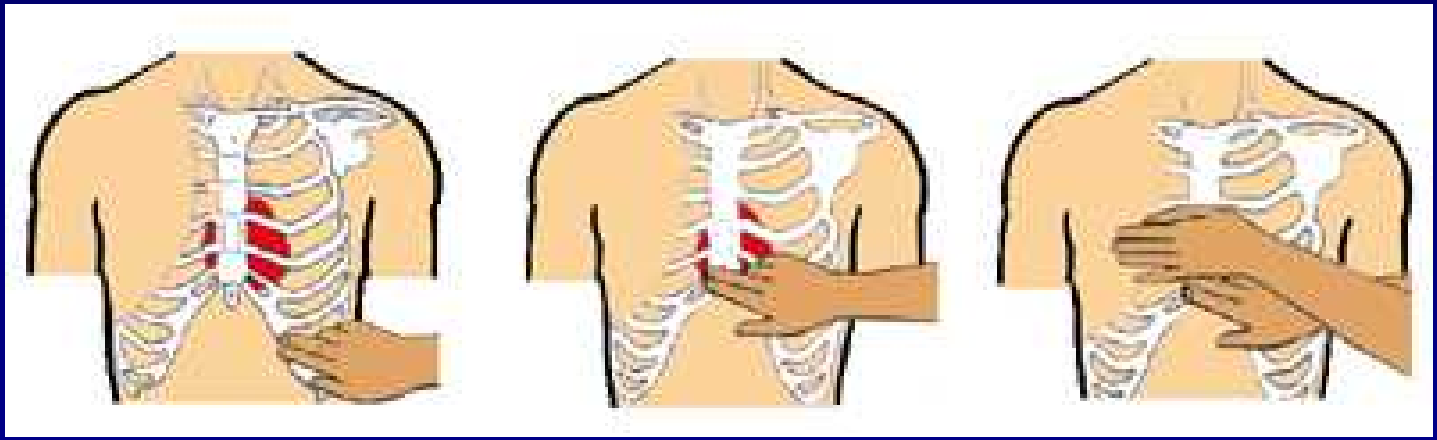
**(absence of vital signs)** → **External chest compressions**

**ECC also in case of HR < 60 /min with signs of poor perfusion**

C

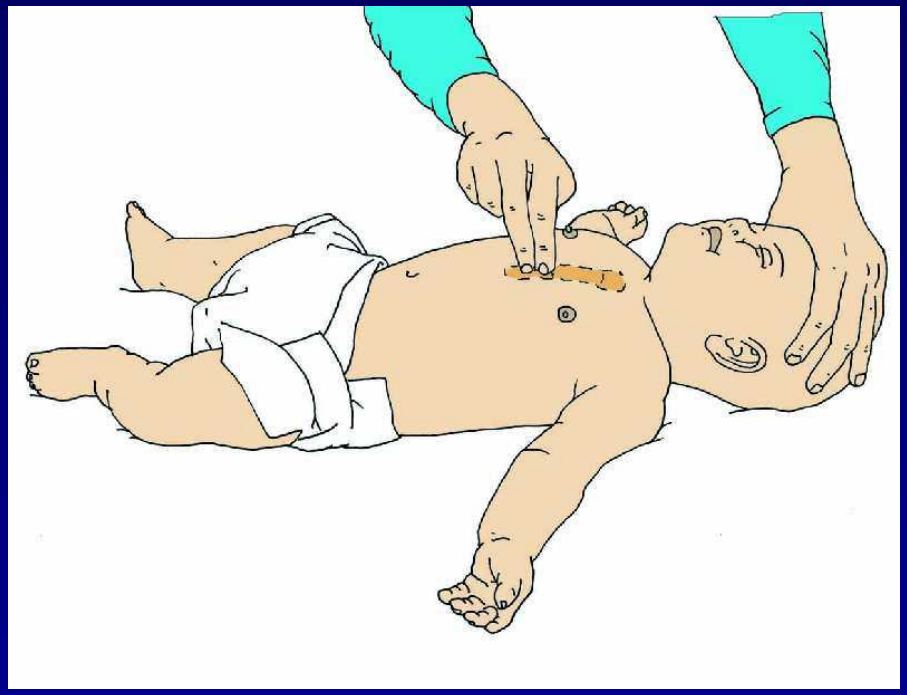
# INFANT AND CHILD

## ECC landamarks

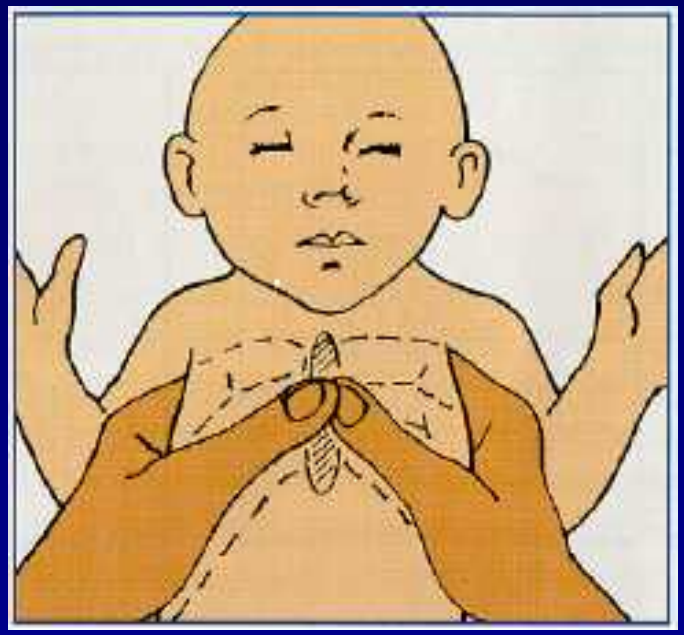


# INFANT

## ECC landmarks



Two fingers technique

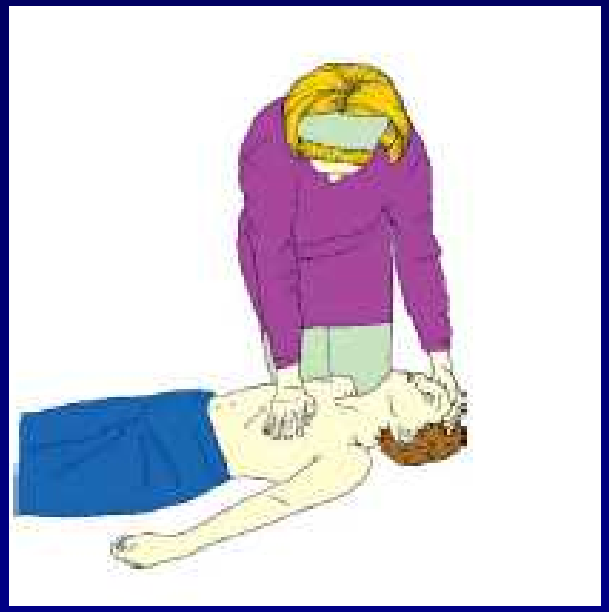


Encircling technique

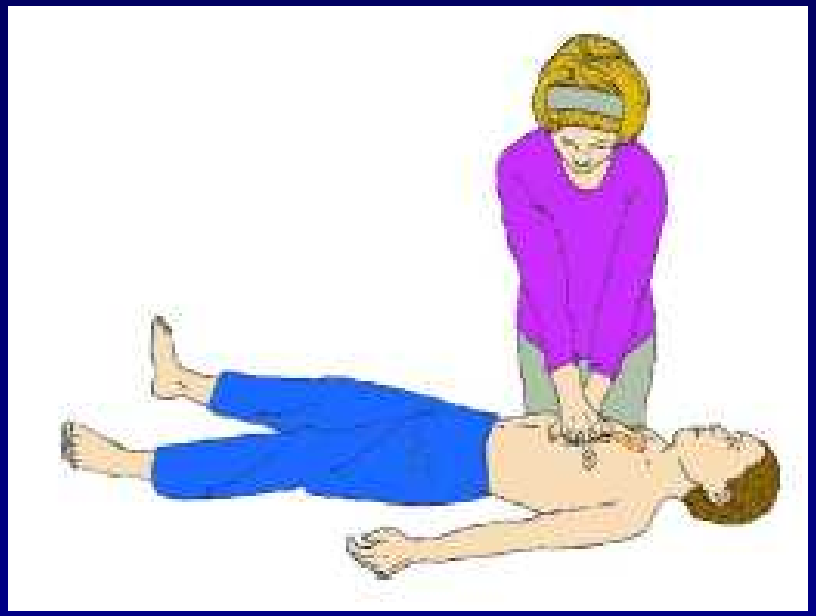
C

# CHILD

## ECC technique



One hand



Two hands

# ECC landmarks

- Lower third of the sternum
- Follow the lower margin of rib cage
- 1 cm (finger) above xiphisternum
- Depth 1/3 of the chest
- Release the pressure completely
- Time for compression/release: 1 : 1
- Rate of 100 compressions per minute
- Ratio compressions / ventilations 15 :2 (lone rescuers 30:2)

Effectiveness of ventilation–compression ratios 1:5 and 2:15 in simulated single rescuer paediatric resuscitation *E. Dorph, L. Wik and P. A. Steen. Resuscitation 2002;54:259*

# Most frequent causes for inadequate ECC and complications

**Too strong and abrupt ECC**
**Incorrect compression site**

**(hands too up or too down on the sternum)**

→ **Sternum or costal fractures, injuries of internal organs (lungs, liver, spleen)**

**Too superficial ECC**

→ **Inadequate circulation**

# Reassessment

- After the first minute of CPR
- Call for help if not come
- Every 3 minutes as long as the pulse is absent
- If breath only is needed, reassess the pulse after each minute and every 3 minutes, perform a complete reassessment (C-B-A)

S afety

S timulate without shaking

S hout

A irway

B reathing

C irculation

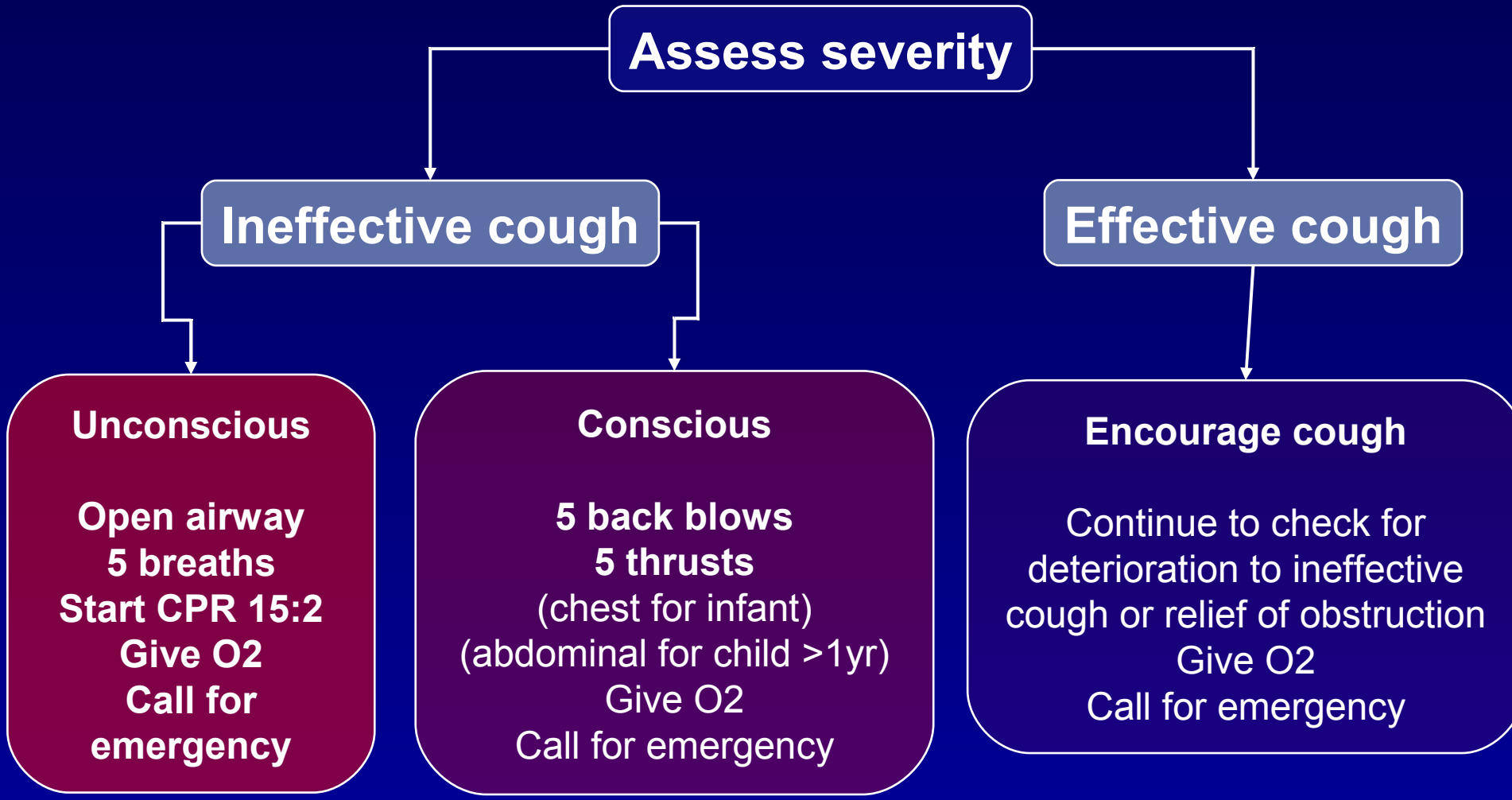
R eassess

# General signs of FBAO

Witnessed episode
Coughing or choking
Sudden onset
Recent history of playing with or eating small objects

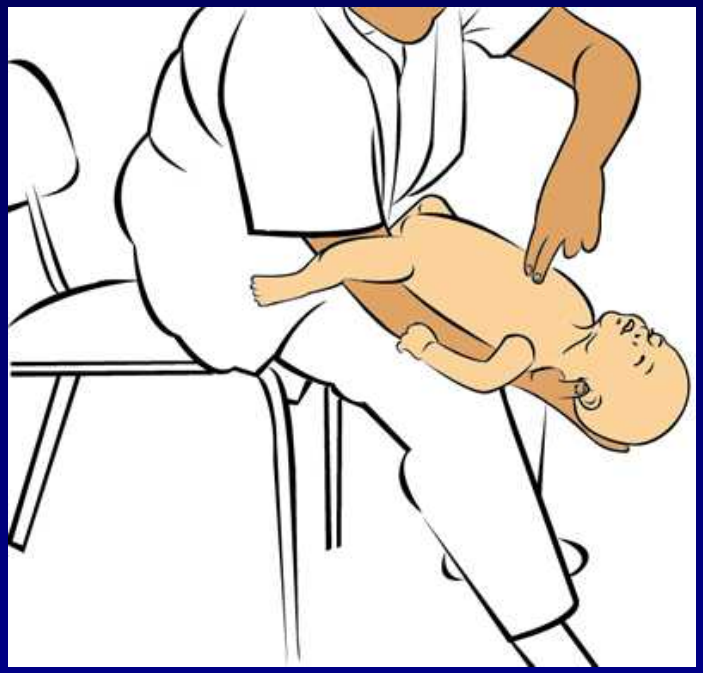
| **Ineffective coughing** | **Effective cough** |
| --- | --- |
| Unable to vocalize | Crying or verbal response to questions |
| Quiet or silent cough | Loud cough |
| Unable to breathe | Able to take a breath before coughing |
| Cyanosis | Fully responsive |
| Decreasing level of consciousness | |

# Pediatric FBAO algorithm



# Conscious infant with ineffective cough

5 Back blows



5 Chest thrusts

**Continue until obstruction is relieved or until the child becomes unconscious**

FBAO

# Conscious Child with ineffective cough

**5 back blows**

**5 abdominal thrusts (Heimlich's manoeuvre) with patient standing or sitting**

**Continue until obstruction is relieved or until the child becomes unconscious**

FBAO

# Trauma

- Avoid abrupt movements in all the phases of PBLS
- Place the collar, if available
- Do not use “head tilt and chin lift” but use “jaw thrust” manoeuvre
- Do not use recovery position

# Automated external defibrillators in children

- ✓ Attach AED after 1 min CPR
- ✓ Paediatric attenuator if available
- ✓ Not in children < 1 year of age

# Complications of CPR

- CPR may cause complications even performed correctly
- The fear for complications should not discourage the care taker from performing the CPR manoeuvres

**The only alternative is the death of the child!!**

# Time limit for CPR

- A time limit does not exist for CPR
- The paramedics should continue CPR **until physical exaustion!**
- With proper tools, a medical doctor only can decide when to stop CPR

# Conclusions

Pediatric Cardiac Arrest

Age definitions

Landmarks for ECC and ventilation

PBLS algorithm

New ratio 15:2

FBAO relief only in conscious child

AED with pediatric attenuator

Video?

Thank you!