

# Cardiac arrest and arrhythmias

European Resuscitation Council



# Objectives

- ✓ To know basic elements to evaluate patients with rhythm disturbance
- ✓ To know advanced treatment of paediatric cardiac arrest
- ✓ To know emergency treatment of most frequent pediatric dysrhythmias



# General Considerations

- ✓ In children arrhythmias are more often the consequence of hypoxaemia, acidosis and hypotension
- ✓ Primary cardiac diseases are rare
- ✓ Monitoring cardiac rhythm is mandatory in advanced life support to evaluate cardiac function and response to therapy



# Three Classes of Rhythm Disturbances

Absent pulse – cardiac arrest rhythms

Slow pulse – bradyarrhythmias

Fast pulse - tachyarrhythmias



# Factors Involved

- ✓ Careful evaluation of patient clinical status  
**ABC !!!**
- ✓ Rapid evaluation of the rhythm on the monitor

First law:

**“Treat the patient not the monitor”**



# Useful Questions for a Child With Arrhythmia

- ✓ Is the pulse present ?
- ✓ Is the child in shock ?
- ✓ Is the heart rate fast or slow ?
- ✓ Is the rhythm regular or irregular ?
- ✓ Are QRS complexes narrow or wide ?



# Cardiac Rate

Age	Tachycardia	Bradycardia
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< 1 y

> 180 bpm

< 80 bpm

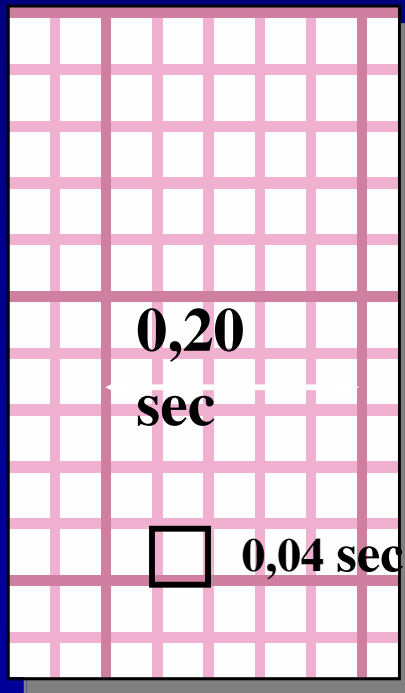
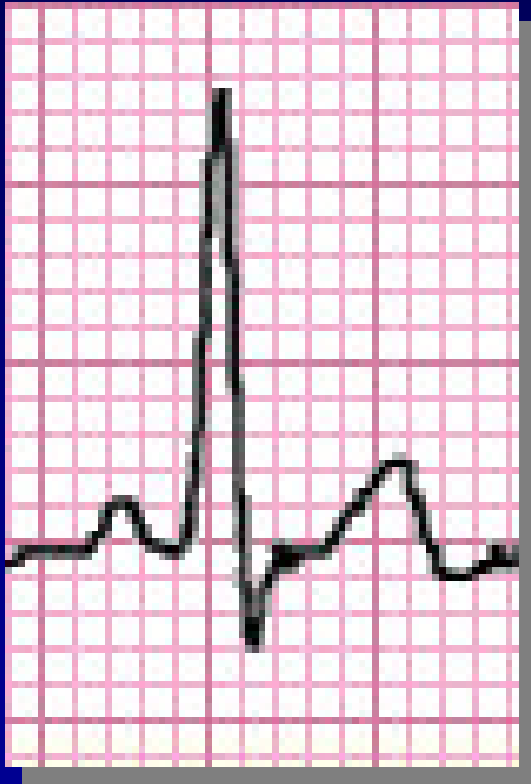
> 1 y

>160 bpm

< 60 bpm



# QRS (0.08 sec)





# ECG



Narrow QRS



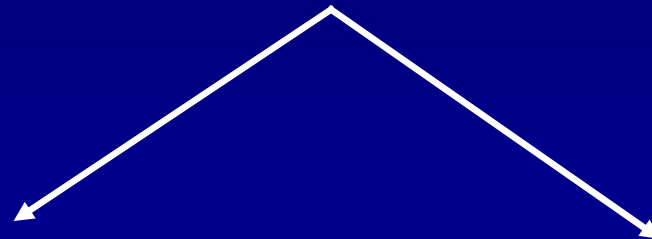
Wide QRS

# Cardiac Arrest

## ABC

Check the pulse

Attach monitor/defibrillator



**NON VF/ VT**

**VF/ VT**

Asystole / Pulseless  
Electrical Activity (PEA)

Ventricular Fibrillation (VF)  
Ventricular Tachycardia (VT)



# Cardiac arrest rhythms

Asystole 80%

PEA 14%

FV/TV 6%

Magyzel - 1995

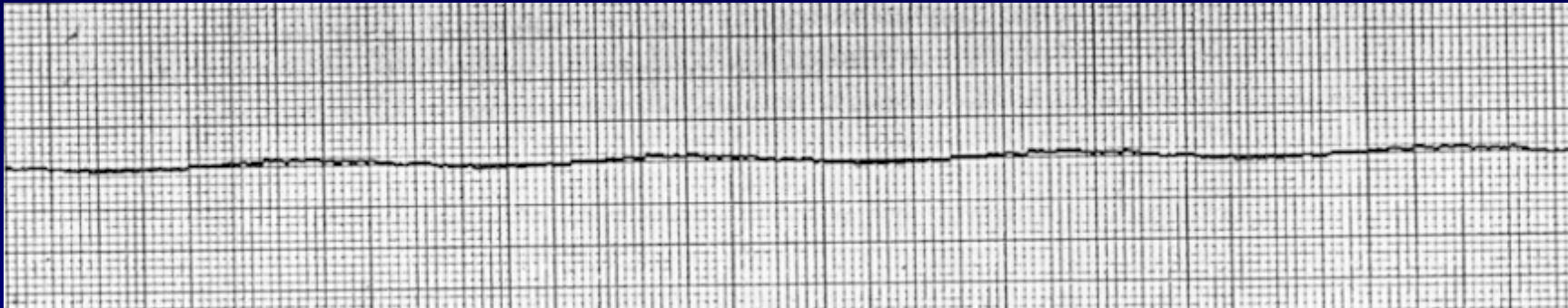
VF 0-8 y 3%

VF 8-30 y 17%

Appleton - 1995



# No Pulse

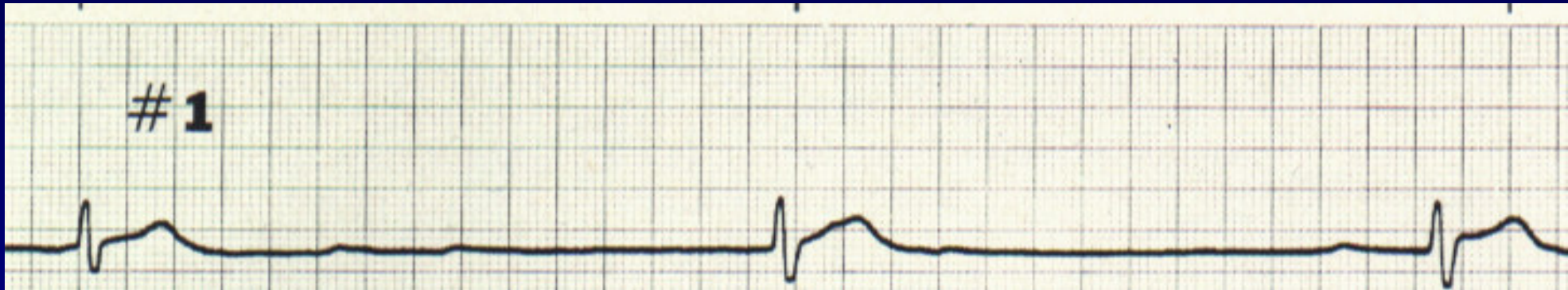


## Non – VF/ VT

## Asystole



# No Pulse



Non – VF/ VT

Pulseless Electrical Activity  
(PEA)



# Evaluate Rhythm ←

Non VF/ VT



CPR



Adrenaline



CPR 3'

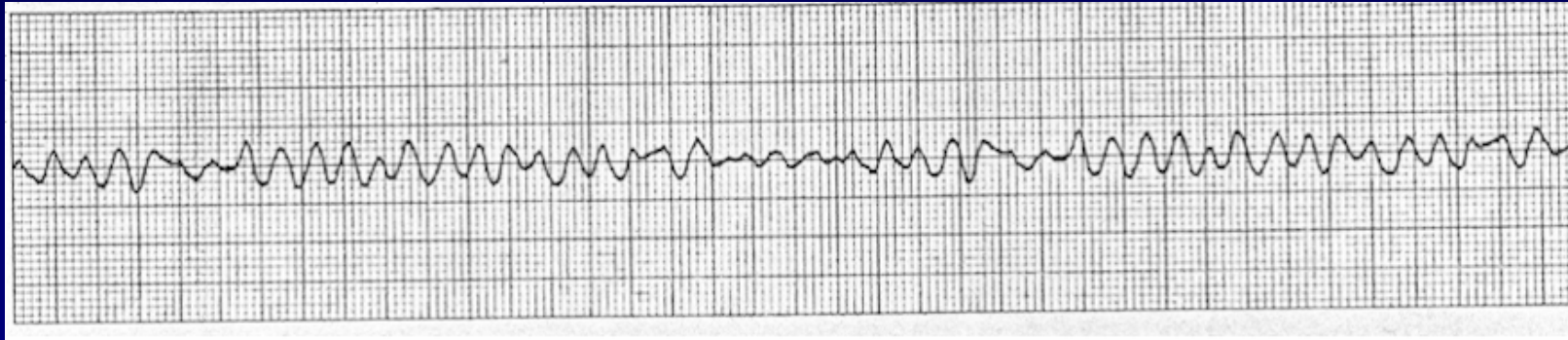


# Adrenaline

- ✓ I.V / I.O                      10 mcg /kg  
0.1 ml/kg    of    1:10 000 solution
- ✓ E.T                                100 mcg/kg  
0.1ml/kg        of        1:1 000 solution
- ✓ May be repeated every 3-5 minuts



# No Pulse



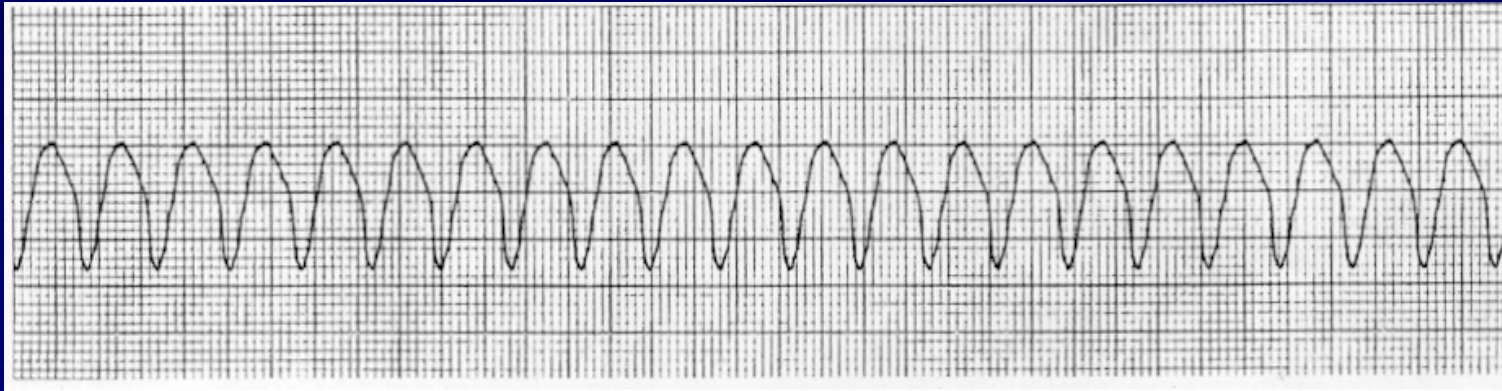
## VF/VT

# Ventricular Fibrillation





# No Pulse



## VF/VT

# Ventricular Tachycardia



# Evaluate Rhythm

VF/VT

## Defibrillate

1st : 2 J/Kg - 2 J/Kg - 4 J/Kg

2nd : 4 J/Kg - 4 J/Kg - 4 J/Kg

## Adrenaline

- After 1st 3 shocks
- Repeat every 3 min.

## Other drugs

CPR

1 minute



# Drugs

- Amiodarone 5 mg/Kg I.V /I.O in bolus
- Lidocaine 1 mg/Kg I.V /I.O in bolus
- Magnesium sulfate 25-50 mg/Kg I.V /I.O (max 2gr)  
Indication: torsades de pointe, hypomagnesaemia
- Sodium Bicarbonate 1 mEq/Kg I.V /I.O



# Absent Pulse

## CPR

Attach defibrillator/monitor

← **Rhythm ?** →

VF/VT



Defibrillate

Up to 3 shocks



CPR

1 minute



Reassess



← Drugs

During CPR

Non VF/VT



CPR



Adrenaline



CPR

3 minutes



Reassess

# During CPR

- Attempt /Verify
  - Check
  - Give
  - Consider antiarrhythmics
  - Consider acidosis
  - Correct reversible causes ( 4H/4T)
- Tracheal intubation  
Intraosseus /Vascular access  
Electrodes/Paddles position and contact  
Adrenaline every 3 minutes
- Consider giving Bicarbonate

Hypoxia  
Hypovolaemia  
Hyper/hypokalaemia  
Hypothermia

Tension Pneumothorax  
Tamponade  
Toxic/therapeutic medic  
Thromboemboli



# Slow Pulse



Bradycardia



# Slow Pulse - Bradyarrhythmias

- ✓ Most frequent pre-terminal rhythm in the critically ill child
- ✓ In paediatric age, most frequently caused by hypoxia, acidosis, hypotension, hypothermia and hypoglycaemia, rather than of primary cardiac origin
- ✓ Increased vagal tone and CNS insults also may lead bradycardia



# Bradycardia <60 bpm

Oxygenate/ventilate

Poor perfusion ?



Chest Compression



Adrenaline  
Atropine

1st choice if vagal tone or AV block



reassess

## During CPR

- Intubation
- Vascular Access IO/IV
- Treat possible causes
- Consider continuous infusion adrenaline/dopamine
- Consider cardiac pacing





# Drugs for Bradycardia

✓ Oxygen !!!!!

✓ Adrenaline

✓ I.V/ I.O                    10 mcg/kg (1:10000 , 0.1 ml/kg)

✓ E.T                            100 mcg/kg (1:1000, 0.1ml/kg)

✓ Atropine

✓ I. V                            0.02 mg/kg

✓ Minimum dose :            0.1 mg

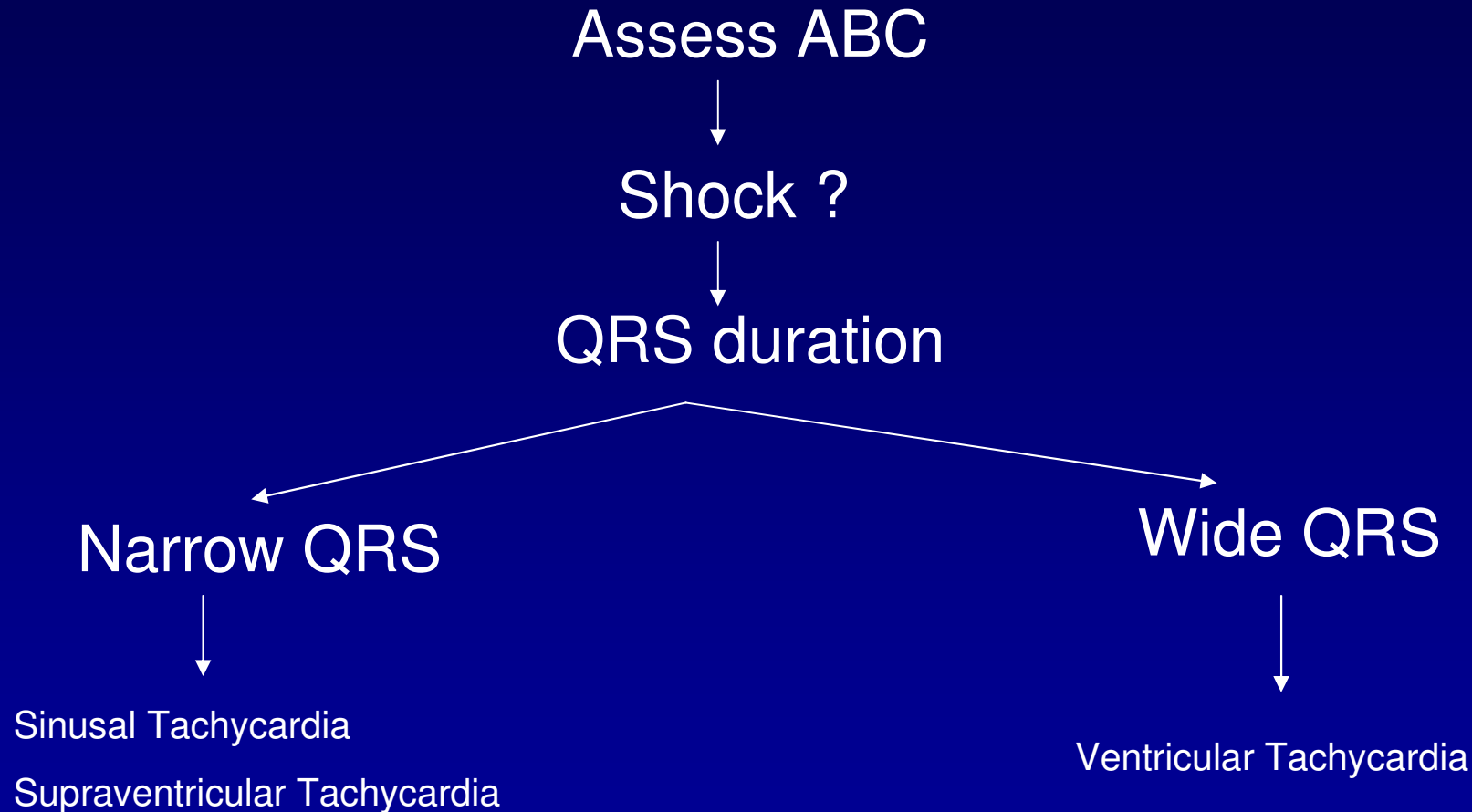
✓ Max single dose :        0.5 mg child  
    1 mg adolescent

■ Can be repeated 1 time after 5 min.

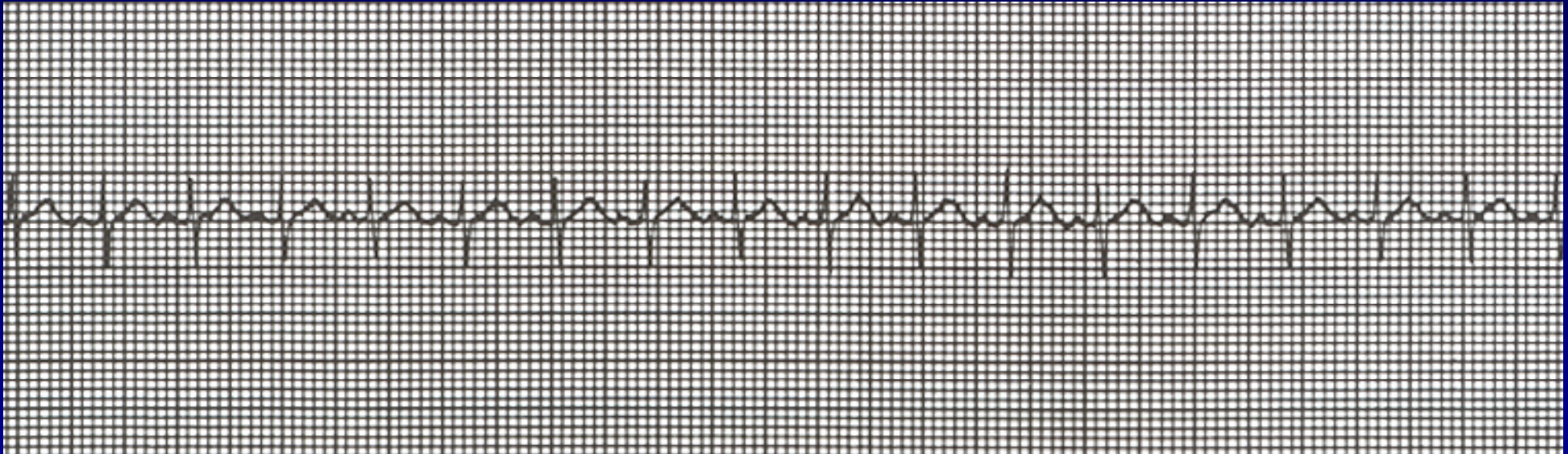
■ Max dose                    1 - 2 mg    c / a



# Fast Pulse - Tachyarrhythmias



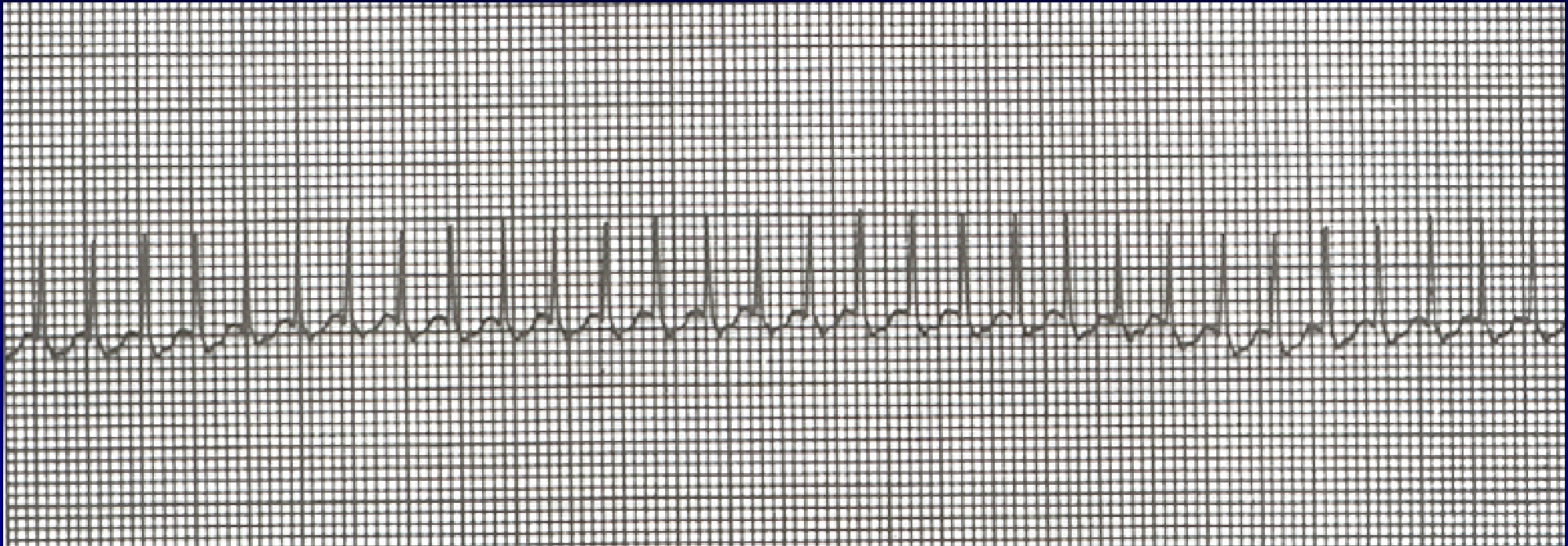
# Fast Pulse - Narrow QRS



Sinusal tachycardia



# Fast Pulse - Narrow QRS



Supraventricular Tachycardia



# Fast Pulse Narrow QRS

## Probable TS

- ✓ P present and normal
- ✓ Variable RR
- ✓ < 1 y HR < 220 bpm
- ✓ > 1 y HR < 180 bpm

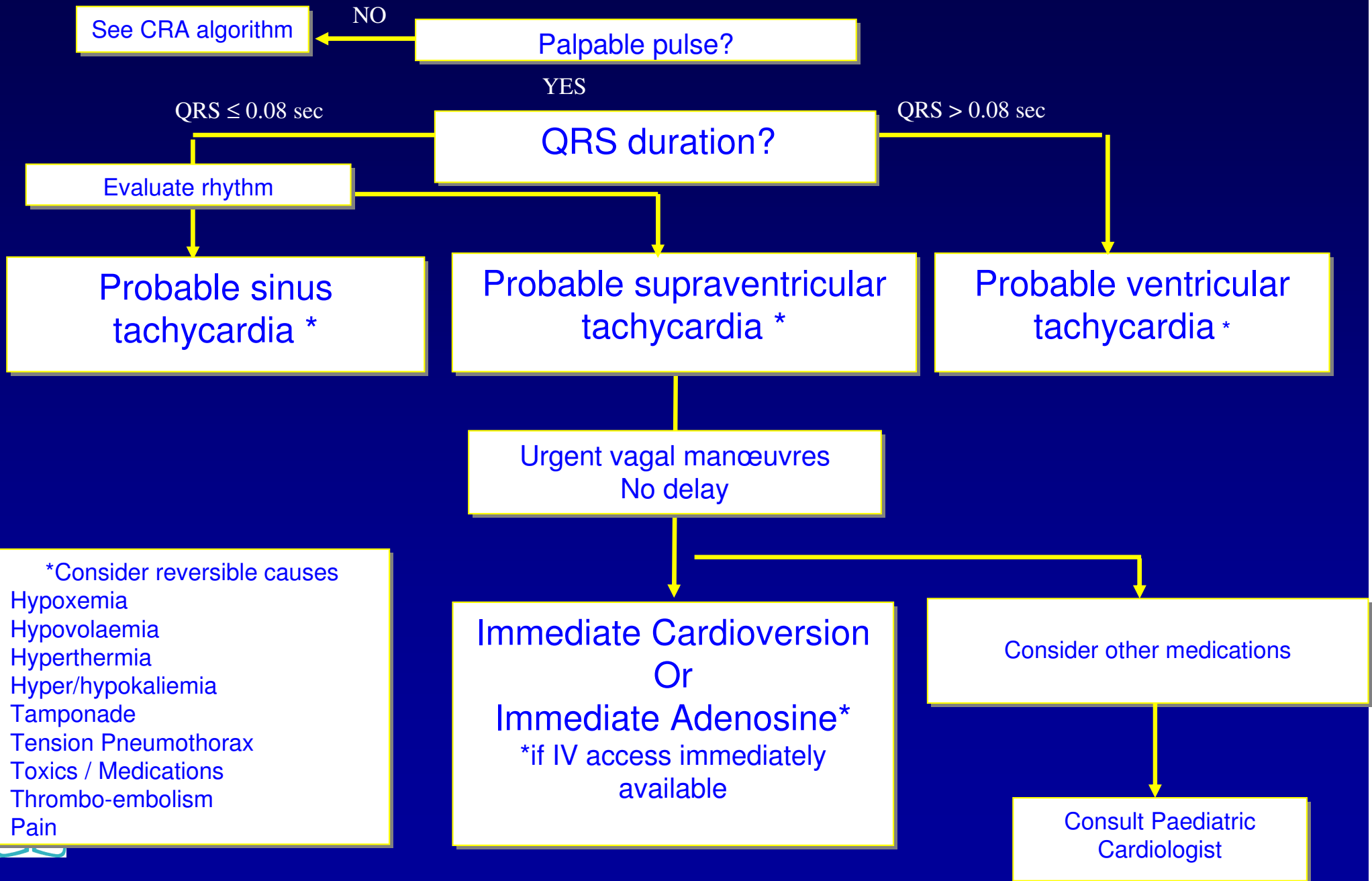
## Probable TSV

- ✓ P absent or abnormal
- ✓ Fixed RR
- ✓ < 1 y HR > 220 bpm
- ✓ > 1 y HR > 180 bpm



# TACHYARRHYTHMIA

## ABC



\*Consider reversible causes

- Hypoxemia
- Hypovolaemia
- Hyperthermia
- Hyper/hypokaliemia
- Tamponade
- Tension Pneumothorax
- Toxics / Medications
- Thrombo-embolism
- Pain

# Vagal Manoeuvres

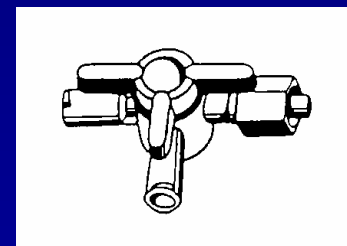
- ✓ Diving reflex
- ✓ Valsalva maneuver
- ✓ Carotid sinus massage



# Adenosine

- ✓ **Action** block AV node
- ✓ **Half-life** 10 sec
- ✓ **Time of action** < 2 min
- ✓ **Dose** 0.1 mg/Kg (max 1st dose 6 mg)  
then 0.2 mg/Kg (max 2nd dose 12 mg)

Fast Bolus I.V/I.O



+ flush 3-5ml NS





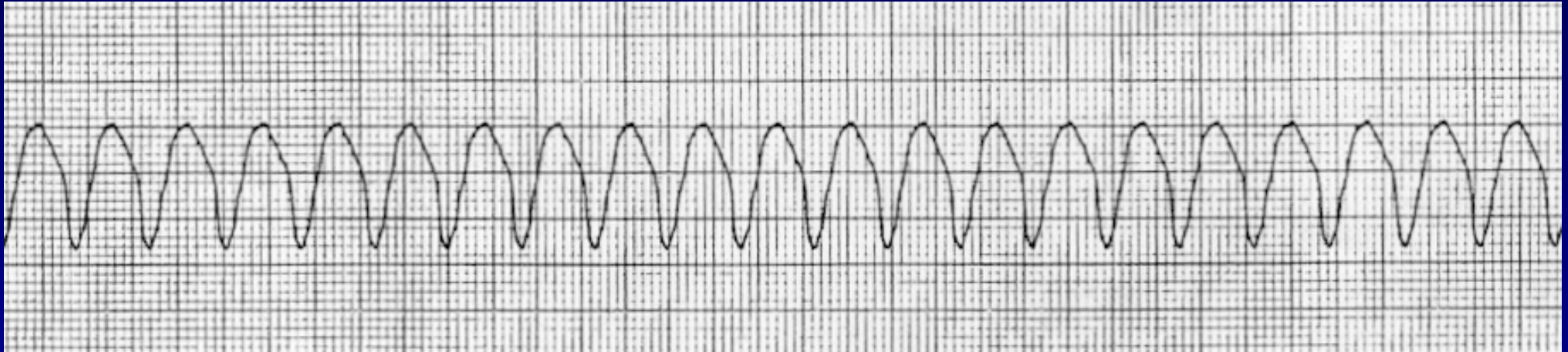
# Synchronized Cardioversion

1st dose 1 J/Kg

if necessary up to 2 J/Kg



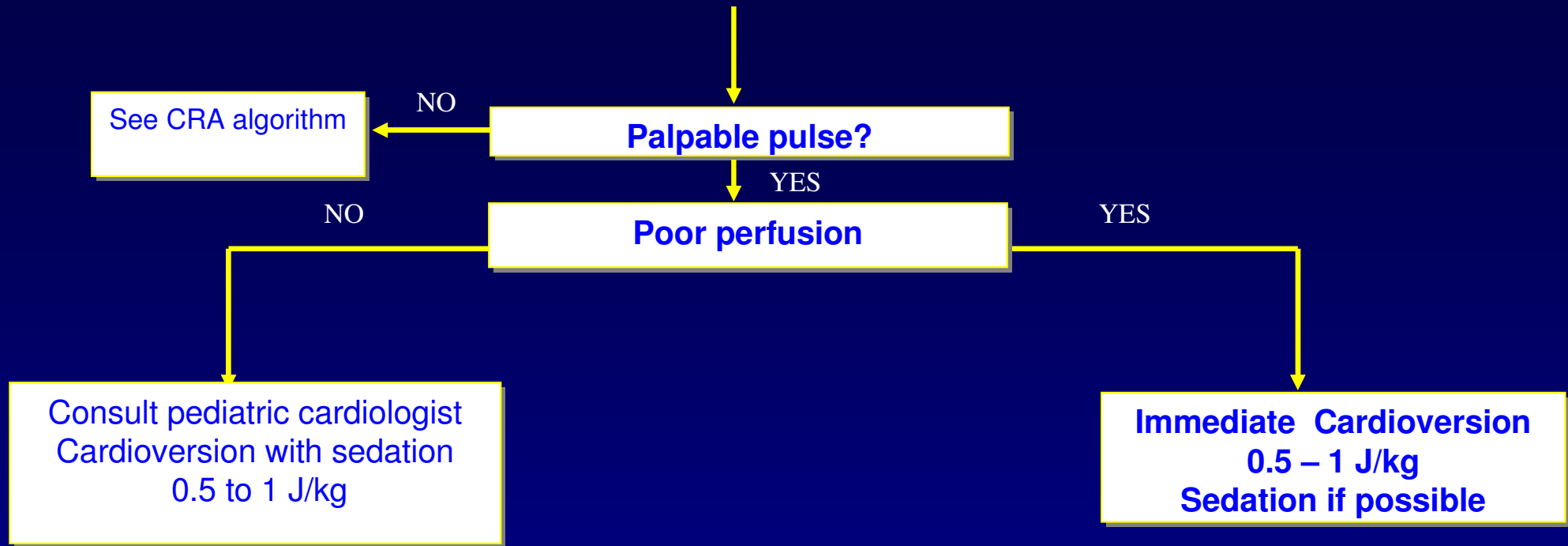
# Fast Pulse - Wide QRS



Ventricular tachycardia



# PROBABLE VENTRICULAR TACHYCARDIA



## Consider other medications

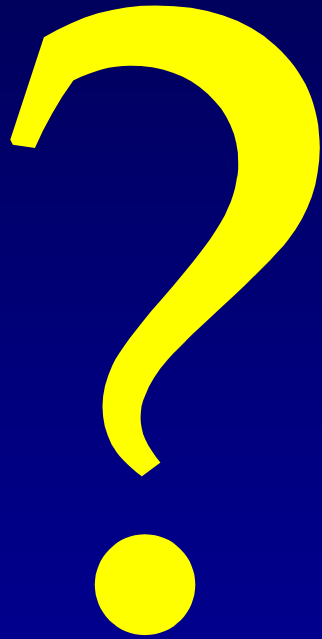
- Amiodarone 5 mg/kg IV in 20-60 min
- Procaïnamide 15 mg/kg IV in 30-60 min
- Lidocaïne 1 mg/kg IV bolus

Don't associate Amiodarone and Procaïnamide

## \*Consider reversible causes

Hypoxemia  
Hypovolaemia  
Hyperthermia  
Hyper/hypokaliemia  
Tamponade  
Tension Pneumothorax  
Toxics / Medications  
Thrombo-embolism  
Pain





# Conclusions

*We discuss about...*

- basic elements to evaluate patients with rhythm disturbance
- advanced treatment of paediatric cardiac arrest
- emergency treatment of most frequent paediatric dysrhythmias

