

# Paediatric Acute Intervention Resuscitation Skills



Welcome back  
to PAIRS two-  
day course

స్వాగత

Bienvenido

Bem vinda

Bienvenue

Fáilte Roimh Chách

MULI MUTYA

Karibu sana

خوش آمدید

Nnabata

Selamat datang

Nnọọ

# Re-introductions & Reflections



# Housekeeping



Groupings



Telephone use



Break times



Lunch  
arrangements



Toilet facilities

# Background



<5 mortality rate:  
40.5 Deaths per  
1,000 live births



17.4 per 1,000 live  
births have neonate  
sepsis



Low workforce to  
patient ratio

- Basic knowledge & skill can prevent this
- Desire to learn
- Focus on most important basics
- Build on skills and knowledge

# Learning outcomes

## Building on Day 1 . . .



- Recognition of a sick child
- ABCDE structured assessment



- Basic/advanced intervention
- Reassessment



- Effective communication – safety huddle
- Work effectively as a team

# Course programme



## CPR<sup>+</sup>/Collapsed Child

- Team dynamics & advanced algorithms

## Advanced skills

- Airway / Circulation / Vital Signs /  
Communication/Neonatal Resuscitation

## Cases

- Simulation practice *plus* testing (MCQ)

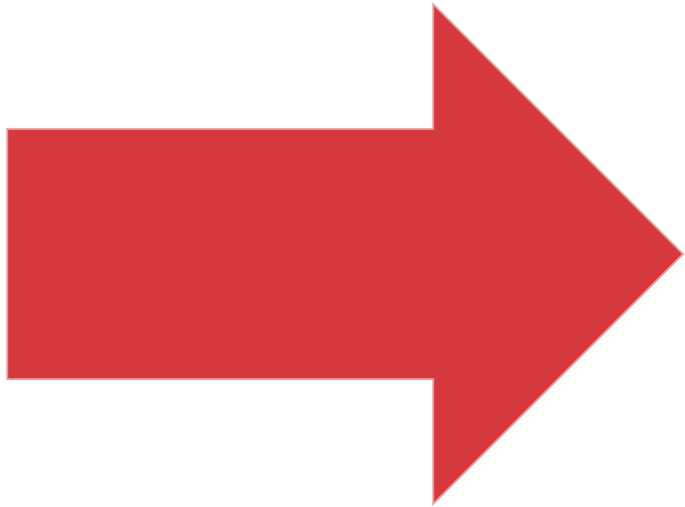
# Summary: Cardiopulmonary Resuscitation



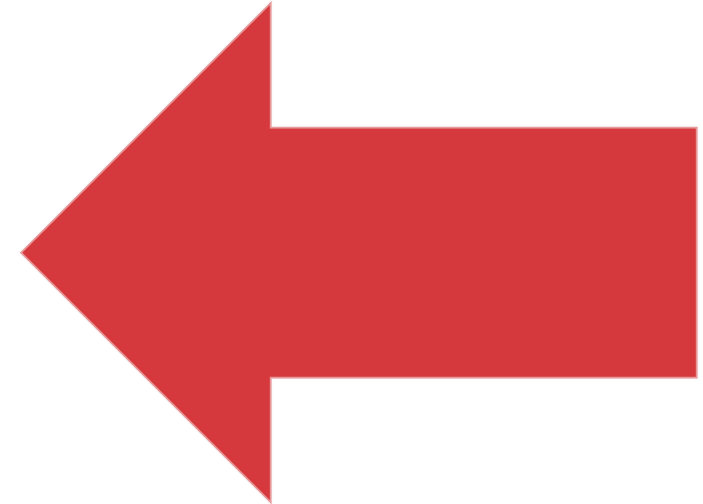
**4S Approach**

**ABC**





Respiratory failure



Circulatory failure

# Causes of cardiac arrest in children

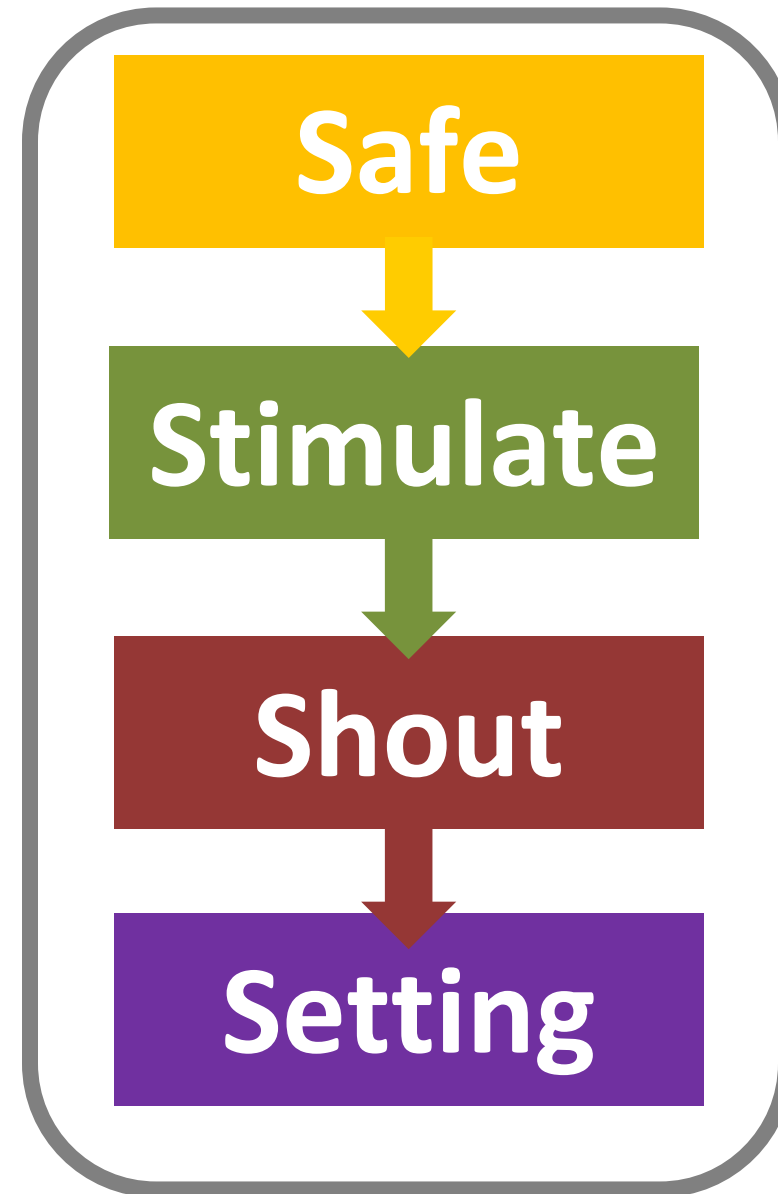
## Respiratory failure

- Pneumonia
- Bronchiolitis
- Chest injuries
- Asthma
- Pleural Effusion/Empyema
- Anaphylaxis

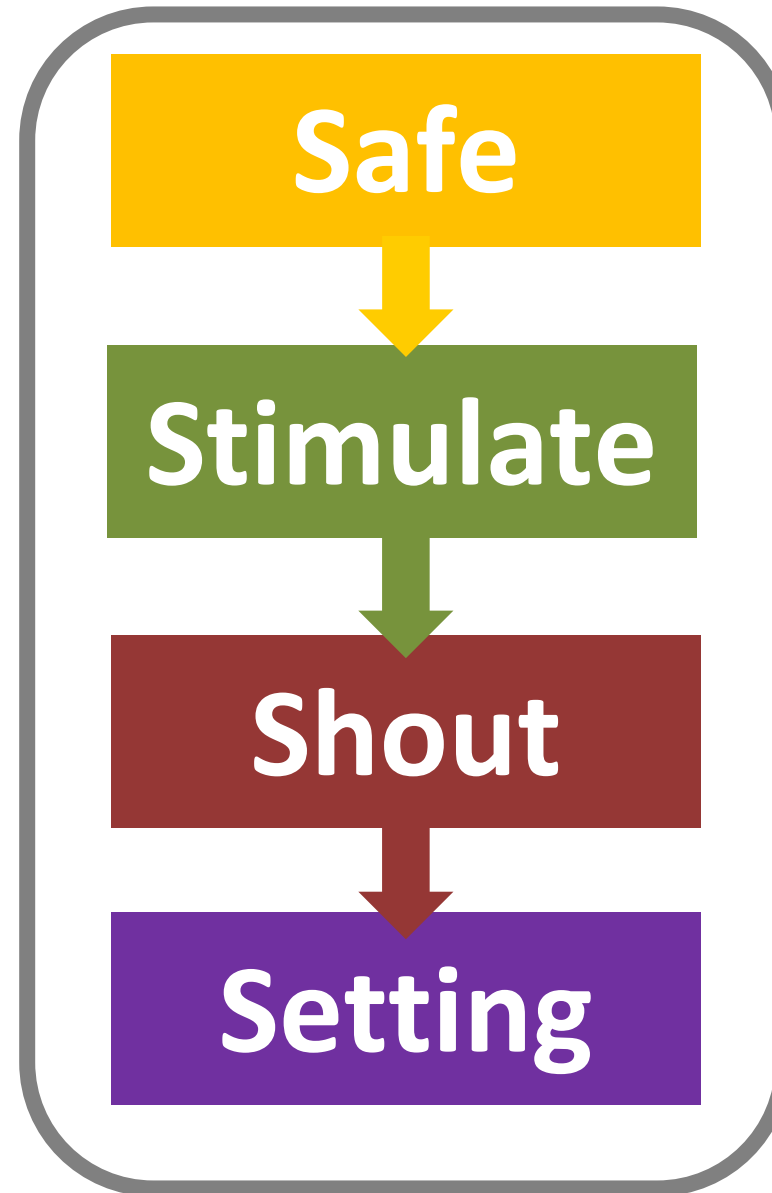
## Circulatory failure

- Sepsis
- Malaria
- Gastroenteritis
- Haemorrhage
- Anaemia
- Malnutrition
- Anaphylaxis

# 4S CPR



# 4S CPR



Ensure Healthcare Providers and Patient are safe

Assess for responsiveness

Shout For Help

Is the child in the correct setting

# Cardiac Arrest first steps

**A & B**

## Check A & B

Open and clear  
airway

Look, Listen & Feel  
for breathing

Apnoea or only  
gaspings :  
**5 rescue breaths**



## Call

**Shout for help if not  
arriving**



**C**

## Check and Compress

Recheck A & B while  
checking large pulse  
(signs of life)

Absent pulse or  
<60bpm:  
**Start compressions**

Rate of 120 per min  
Ratio 15:2



# Paediatric CPR

## Infant

**<1 year or <10kg**



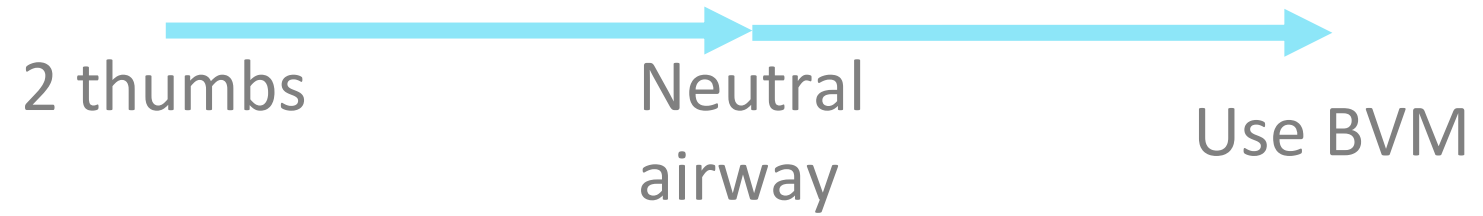
## Child

**>1 year or >10kg**





## Infant BLS technique



- 120 per min
- 1/3 chest depth



Infant or  
child size  
BVM



## Child BLS Technique



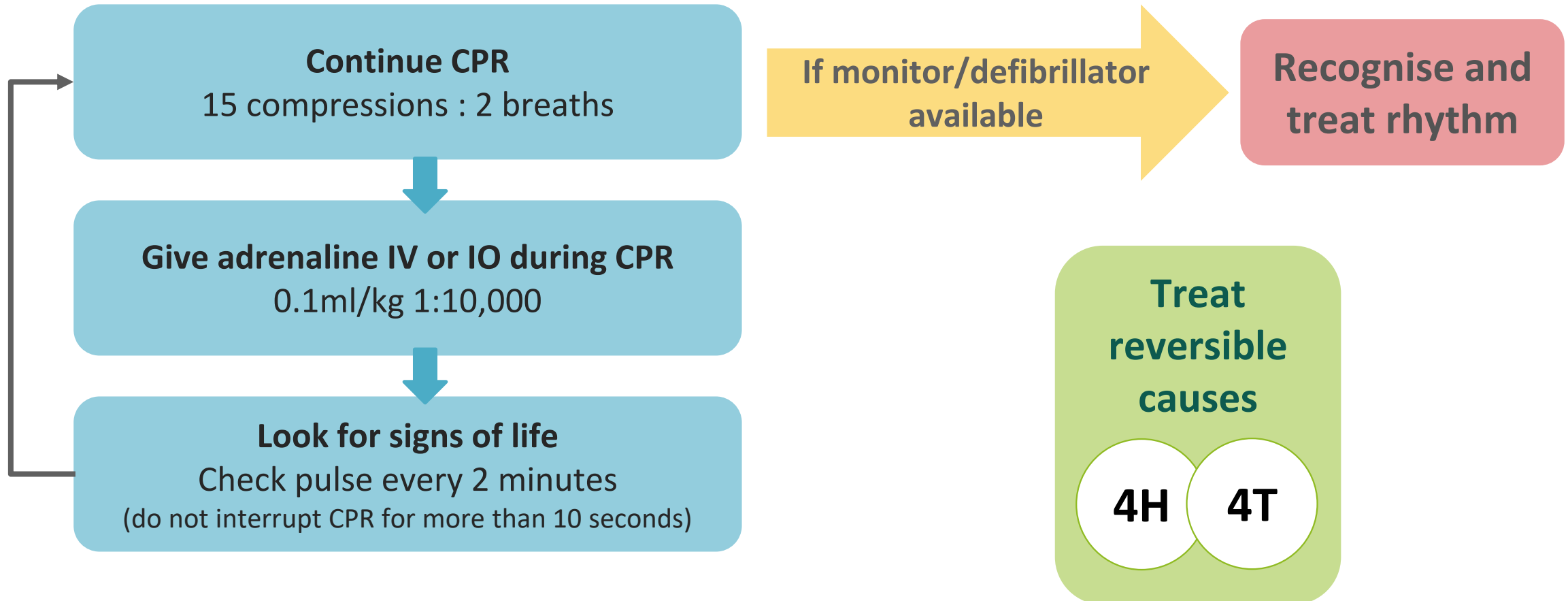
- 120 per min
- 1/3 chest depth



# Management of cardiac arrest



# Cardiac arrest management



# Reversible factors

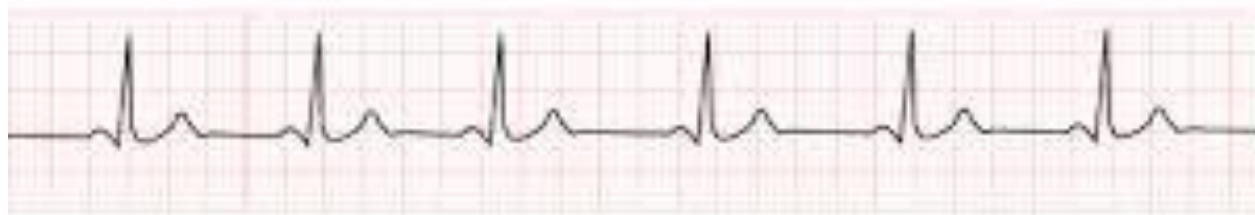
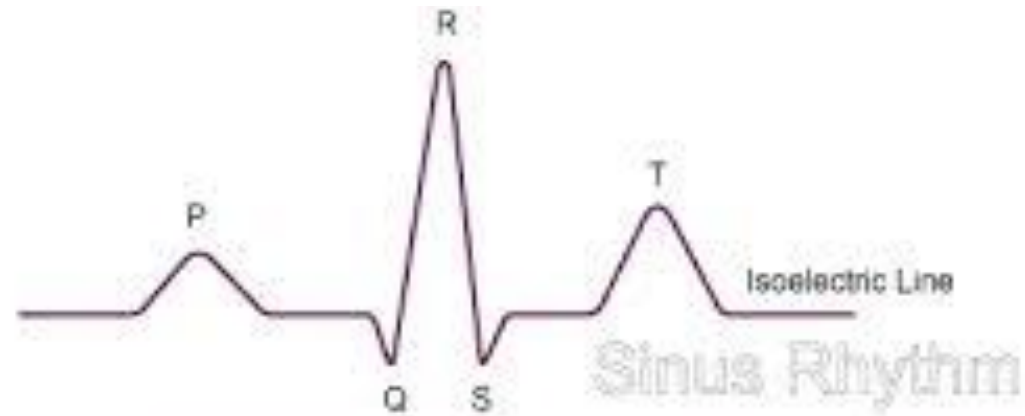
## 4H

- Hypoxia
- Hypovolaemia
- Hydrogen ions
  - Hypokalaemia
  - Hyperkalaemia
  - Hypoglycaemia
- Hypothermia

## 4T

- Tension Pneumothorax
- Thromboembolism
- Toxins
- Cardiac Tamponade

# Rhythm recognition



# Rhythm recognition - treatment

- Non shockable rhythm  
- asystole



Rhythm is not shockable

Continue CPR  
15:2

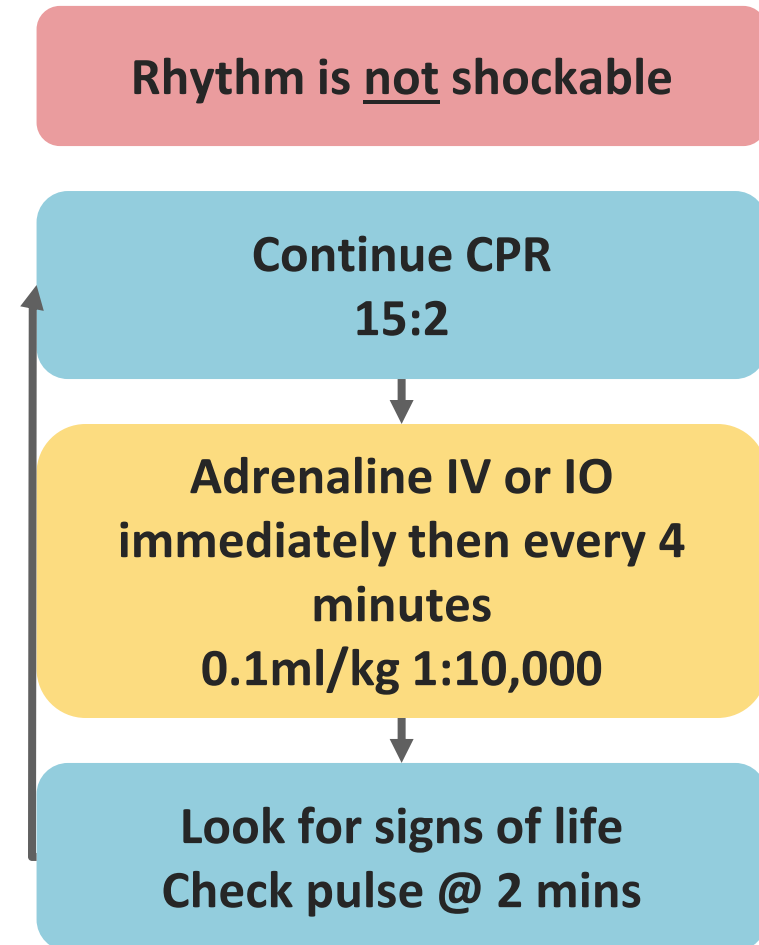
Adrenaline IV or IO  
immediately then every 4  
minutes  
0.1ml/kg 1:10,000

Look for signs of life  
Check pulse @ 2 mins

**REMEMBER**  
Treat H&Ts  
High flow O<sub>2</sub>  
IV/IO access  
Intubate

# Rhythm recognition - treatment

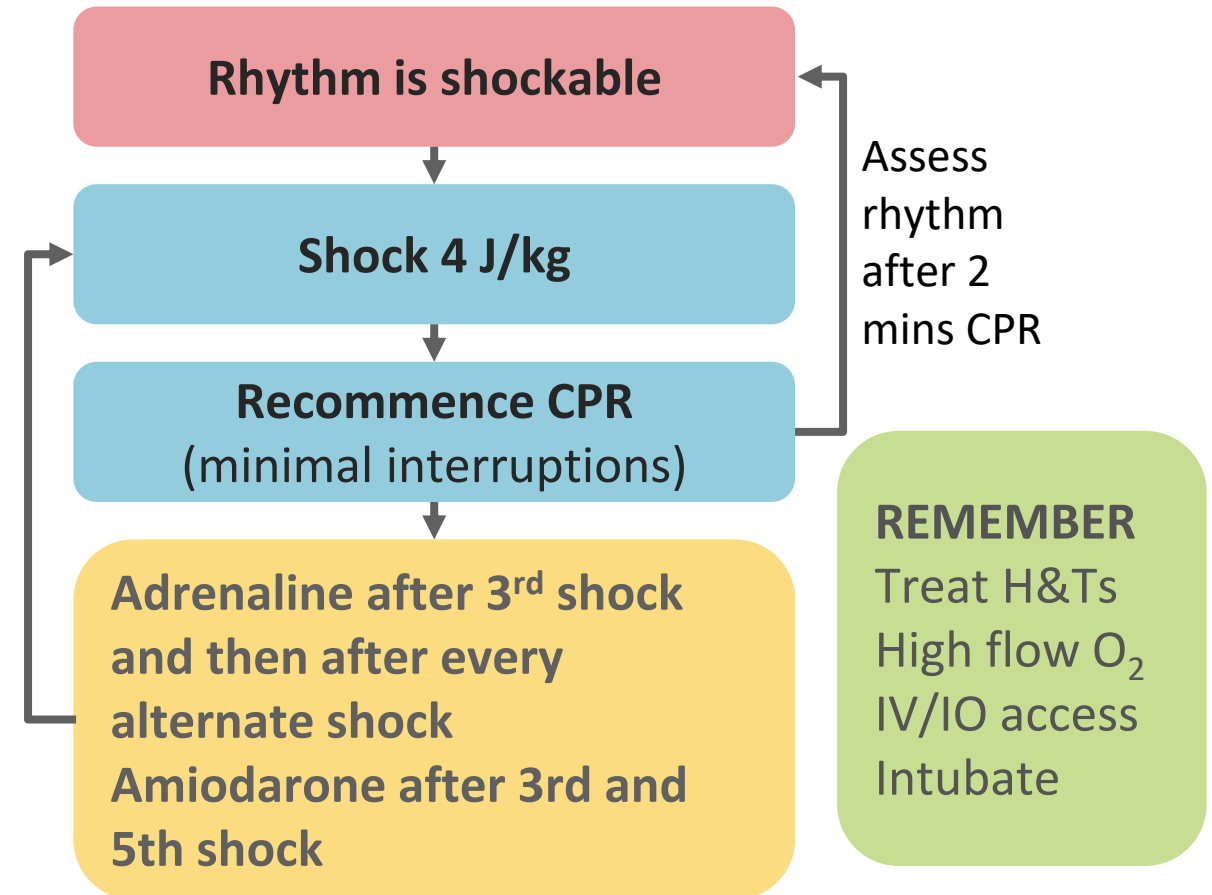
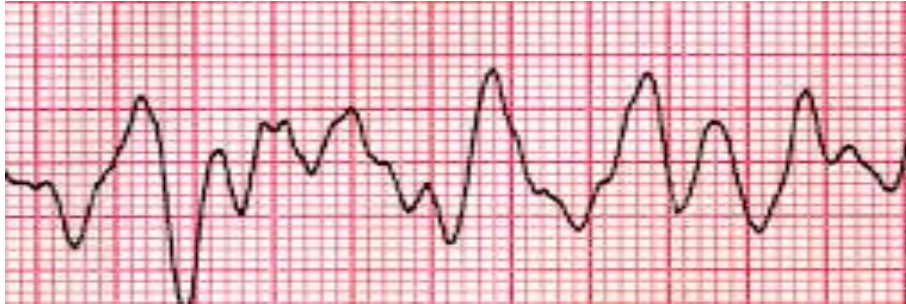
- Non shockable rhythm
  - pulseless electrical activity (PEA)



**REMEMBER**  
Treat H&Ts  
High flow O<sub>2</sub>  
IV/IO access  
Intubate

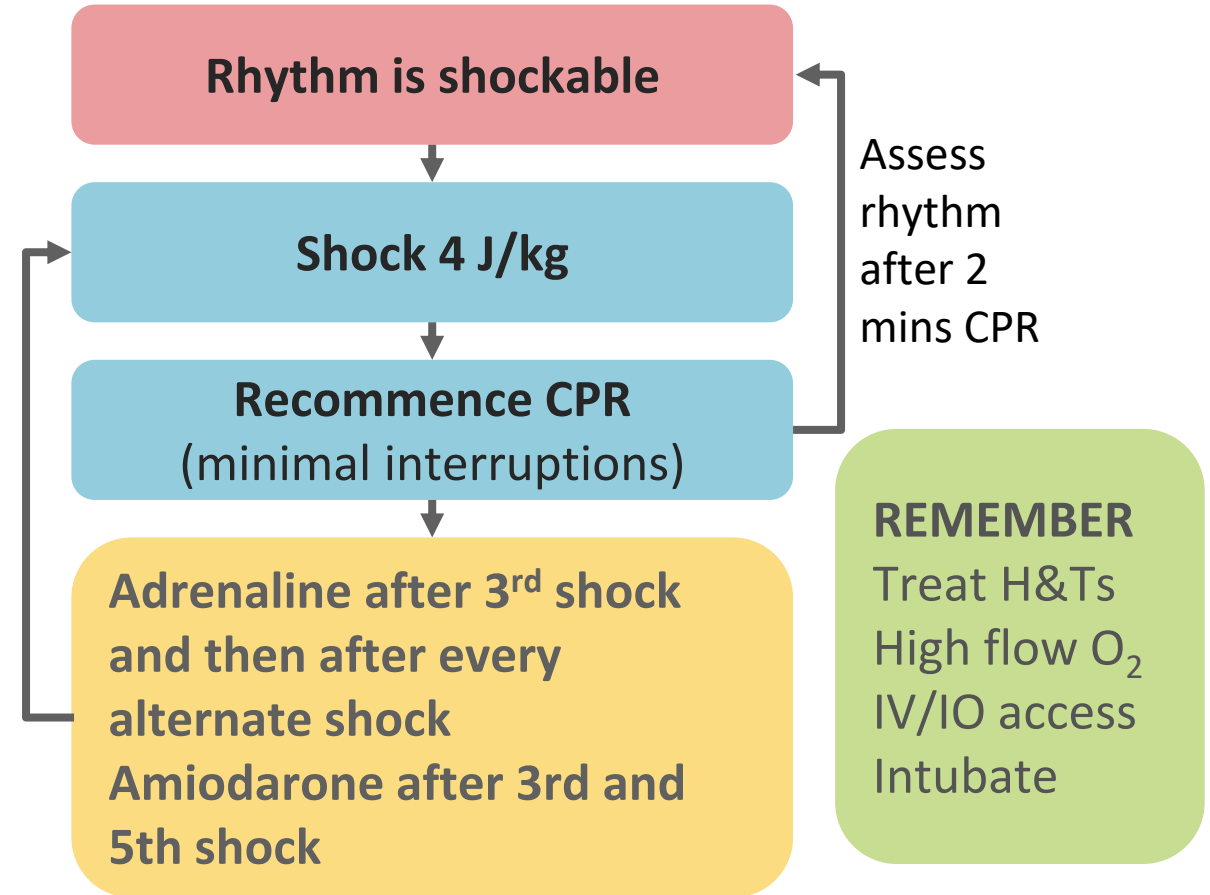
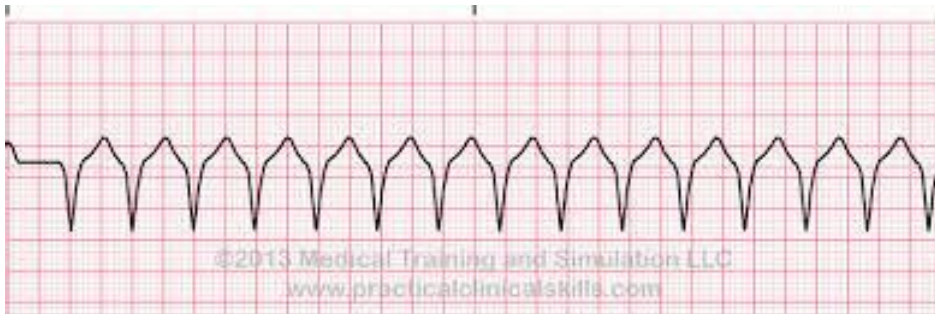
# Rhythm recognition - treatment

- Shockable rhythm
  - Ventricular Fibrillation (VF)



# Rhythm recognition - treatment

- Shockable rhythm
  - Ventricular Tachycardia (VT)





# Emergency Calculations

Check allergy status!

		Calculation	Unit
<b>W</b>	<b>Weight</b>	1-12months $(0.5 \times \text{age in months}) + 4$ 1-5yrs $(2 \times \text{age in years}) + 8$ 6-12yrs $(3 \times \text{age in years}) + 7$	<b>Kilograms</b>
<b>E</b>	<b>Energy (defibrillation)</b>	$4 \text{ J} \times \text{kg weight}$	<b>Joules</b>
<b>T</b>	<b>Tube size (ETT)</b>	0 -11mths 3mm - 3.5mm Internal Diameter = $\text{Age} / 4 + 4$ Length (oral) = $\text{Age} / 2 + 12$ Length (nasal) = $\text{Age} / 2 + 15$	<b>Centimetres</b>
<b>F</b>	<b>Fluids</b>	$10 \text{ ml} \times \text{kg weight}$	<b>Millilitres</b>
<b>L</b>	<b>Lorazepam</b>	$0.1\text{mg} \times \text{kg weight}$	<b>Milligrams</b>
<b>A</b>	<b>Adrenaline (cardiac arrest)</b>	$0.1\text{ml} \times \text{kg weight of } 1:10,000 \text{ Adrenaline}$	<b>Millilitres</b>
<b>A</b>	<b>Adrenaline (anaphylaxis)</b>	$0.01 \text{ mL/kg of } 1:1000 \text{ (maximum } 0.5 \text{ mL)}$	<b>Millilitres</b>
<b>A</b>	<b>Amiodarone</b>	$5\text{mg} \times \text{kg weight}$	<b>Milligrams</b>
<b>G</b>	<b>Glucose</b>	$3\text{ml} \times \text{kg weight of } 10\% \text{ Dextrose}$	<b>Millilitres</b>

# Further considerations - ROSC

Return of  
spontaneous  
circulation  
(ROSC)

Rhythm indicates sinus pattern?

Signs of life indicate ROSC?

## **Post cardiac arrest management**

- Aim for SpO<sub>2</sub> of 94-98% and normal pCO<sub>2</sub>
- Avoid hypotension
- Targeted temperature management
- Glucose control

## Ceasing Resuscitation

- Hs and Ts should be addressed
- Unlikely to be successful if no signs of life after 20 minutes of resuscitation, in the absence of refractory VF/pVT
- Team Leader decision
  - Consult specialists as helpful/required
  - Document decisions
- Maintain dignity and respect for child and family

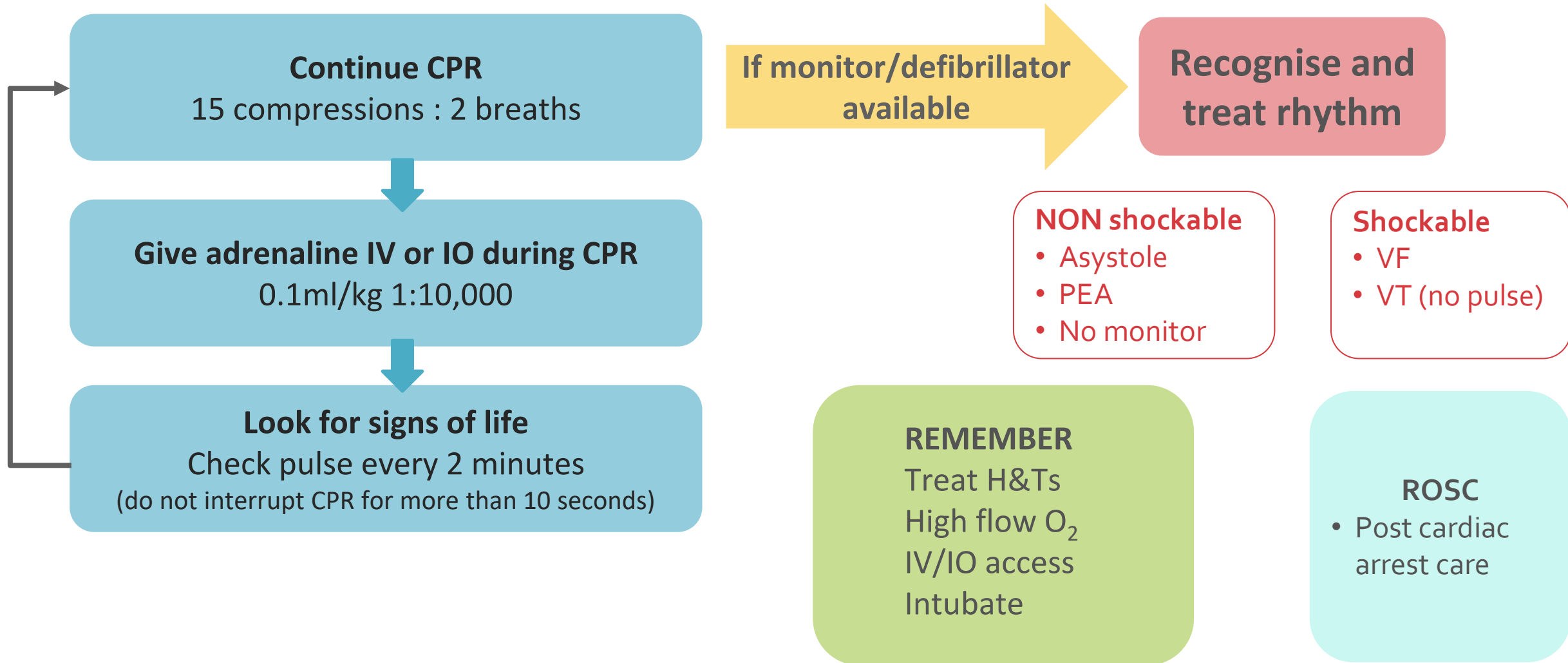
## Family presence during resuscitation

- Allocate a designated staff member to support & interpret events
- Team Leader has responsibility for decisions
- If family presence is impeding medical efforts, parents may be sensitively asked to leave – with support
- After the event, a debriefing session to support staff and reflect on practice is very beneficial

## Debriefing

- 'Hot debrief' occurs soon after an event
  - Identify learning
  - Allows a check in with staff
- 'Cold debrief' occurs some time after event
  - Facilitated session
  - Identify learning & key pointers for the future

# Summary cardiac arrest management





Time to practice!  
CPR | Safe defibrillation

**Break  
time!**





# Team dynamics



# Team dynamics

- Human factors affect the performance of the resuscitation team
- Training can help to improve communication, team dynamics, role identification and task delegation



# Team dynamics

## Qualities of a “poor” Resuscitation Event:

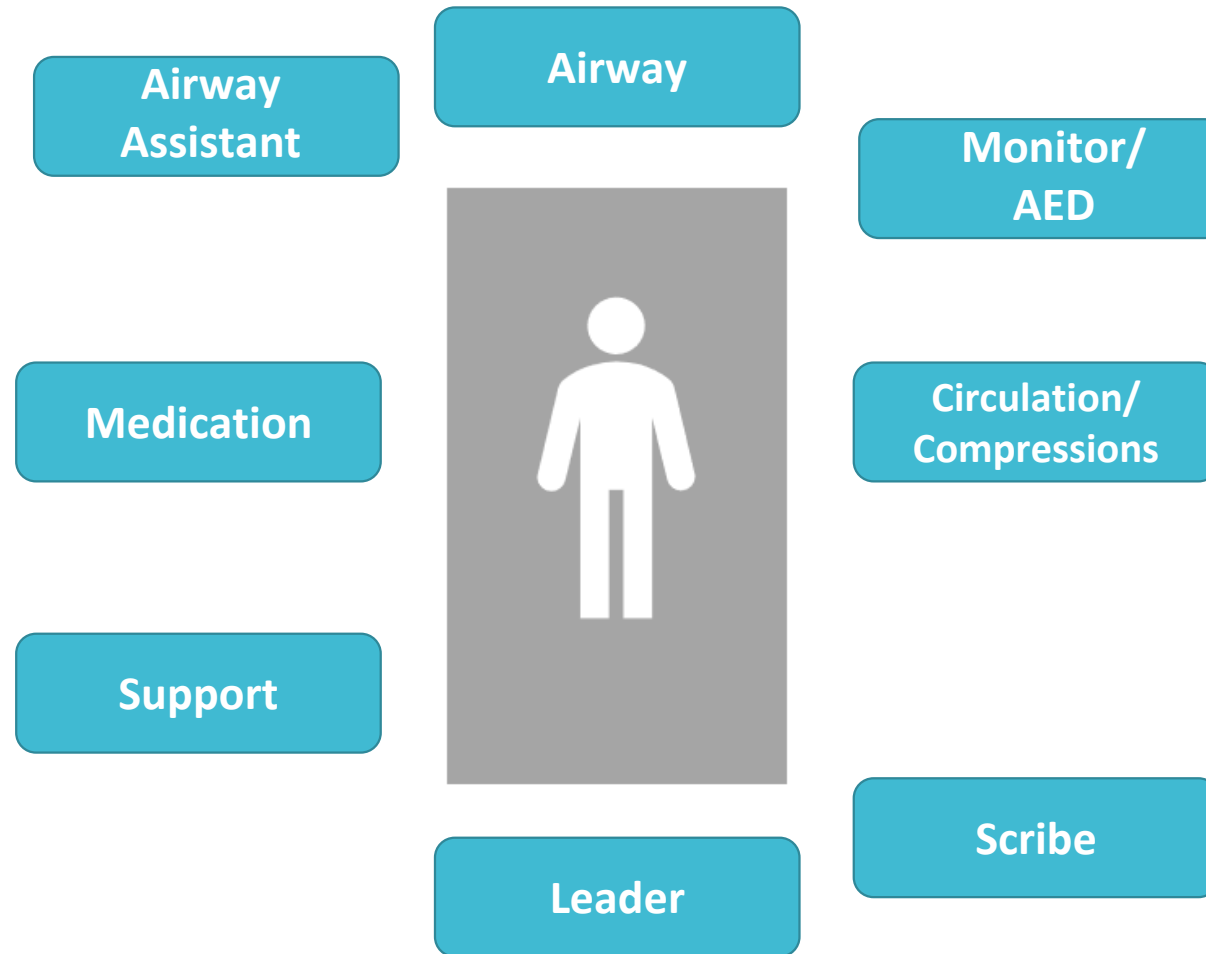
- Chaos
- No defined leader
- Conflict among leaders or over leadership
- Confusing and/or inaccurate communication
- Deviation from standard guidelines
- Loud
- Crowded
- Safety issues

# Team dynamics

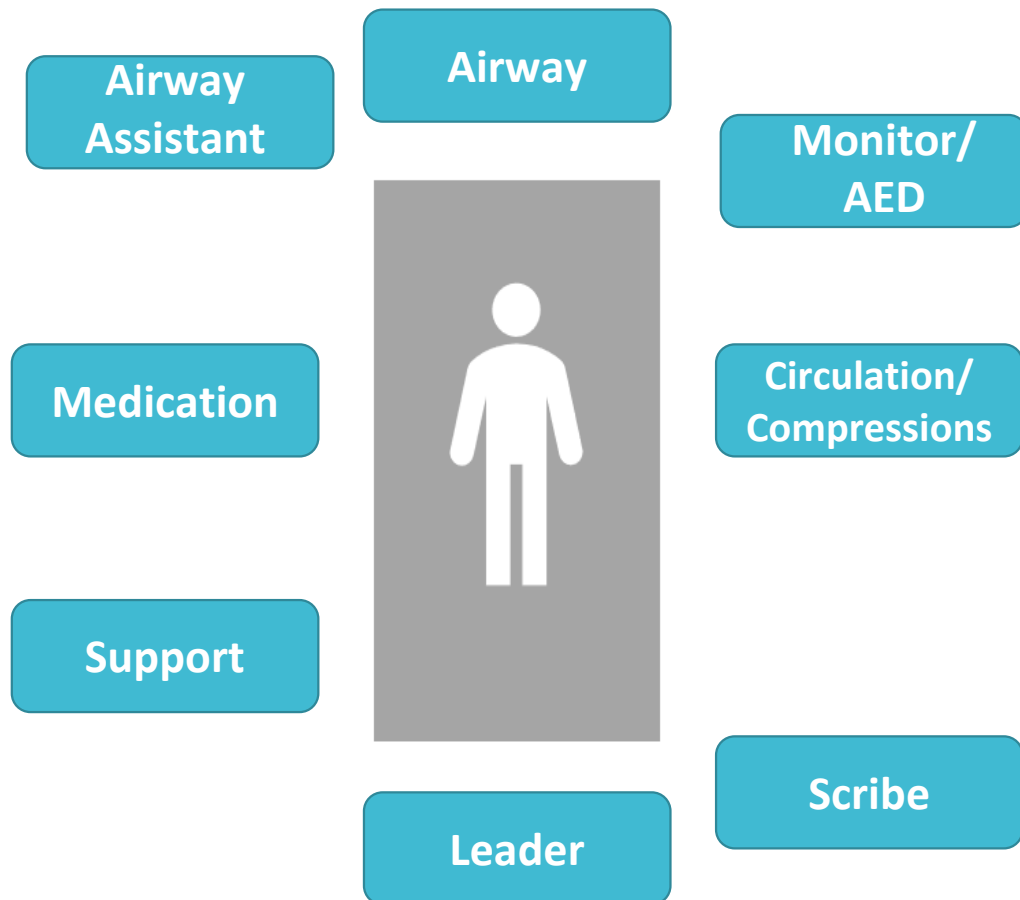
## Qualities of a “good” Resuscitation Event:

- Closed loop communication
- Clear messages
- Clear roles & responsibilities
- Knowing limitations
- Knowledge sharing
- Constructive intervention
- Re-evaluation & summarising
- Mutual respect

# Resuscitation Team Roles

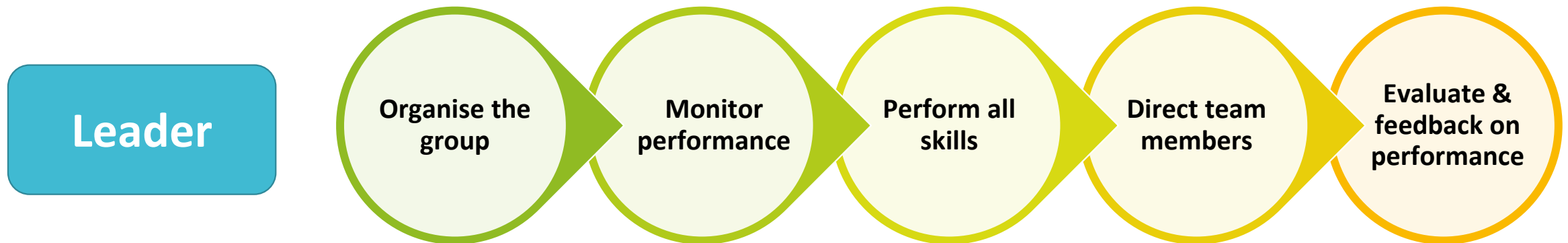


# Resuscitation Team Roles

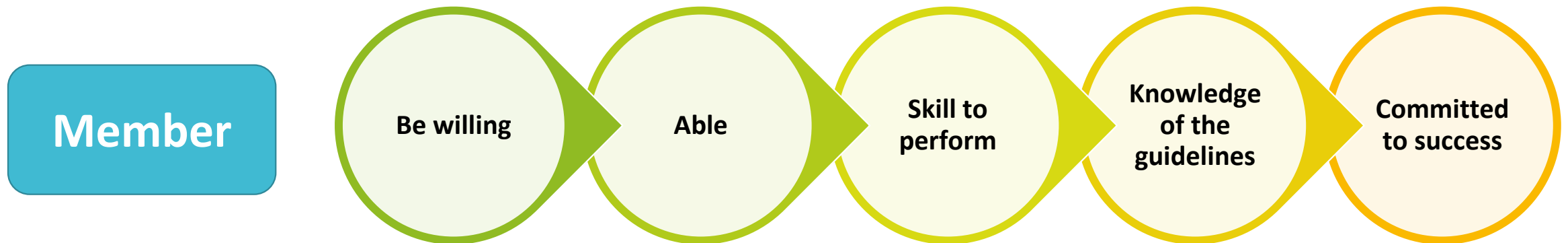


- Clear roles and responsibilities
- Knowing limitations
- Constructive interventions
- Knowledge sharing summarising and re evaluating
- Closed loop communication
- Clear messages
- Mutual respect

# Resuscitation Team Roles

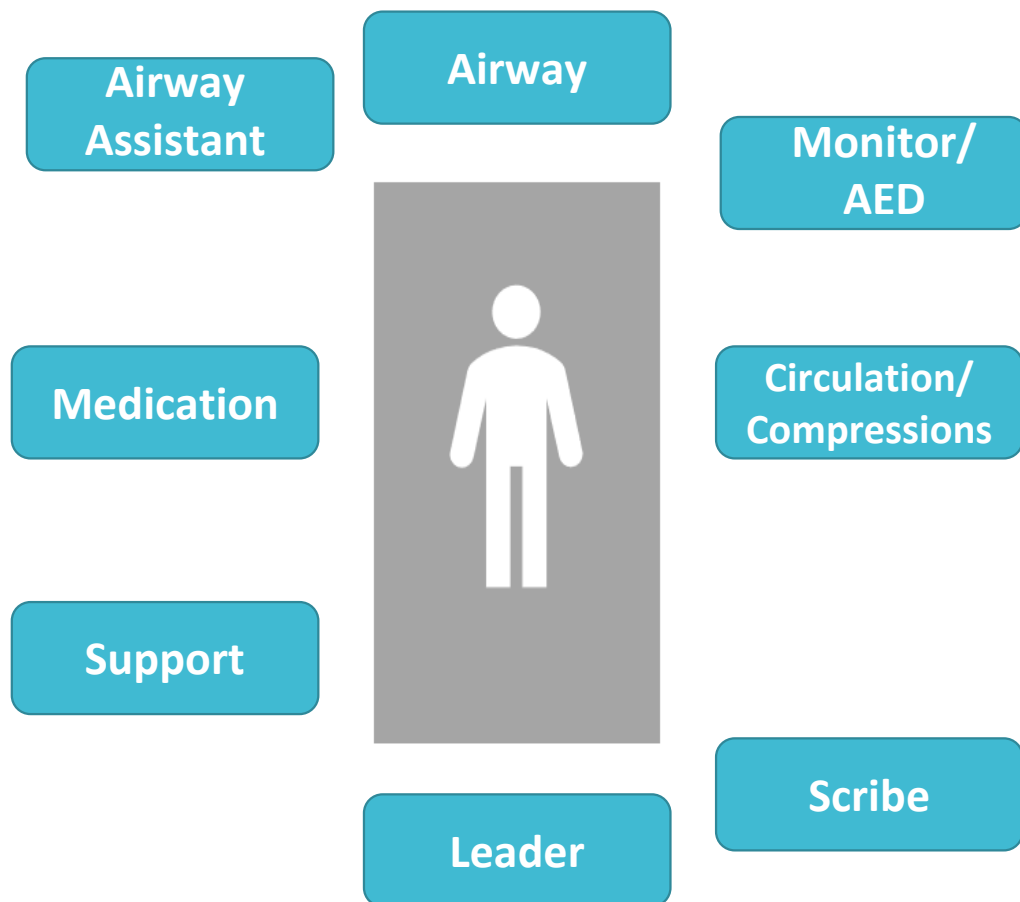


# Resuscitation Team Roles





# Resuscitation Team Roles



- Airway Practitioner and Assistant
- Circulation/Compressions
- Monitor/AED
- Assessment/Medication
- Scribe
- Runner/Family support/Other

# Questions?



# Summary



Continuous, effective CPR & ventilation



Identify & treat rhythm



Treat reversible causes



Seek senior paediatric advice early



Work as an effective team

# Team Dynamics Demonstration

Time to practice!



Shockable

Non-  
shockable

Lunch time



# Summary Assessment & Management of Deterioration

ABCDE

# What could we have done differently for Joseph?

- Identify the seriousness of the deterioration in Joseph's clinical condition
- Intervene early
- Communicate effectively
- Vital Signs Documentation
- Plan appropriate management
- Escalate care promptly



# Improvement ideas

1

Education and training must be provided to ensure staff are competent

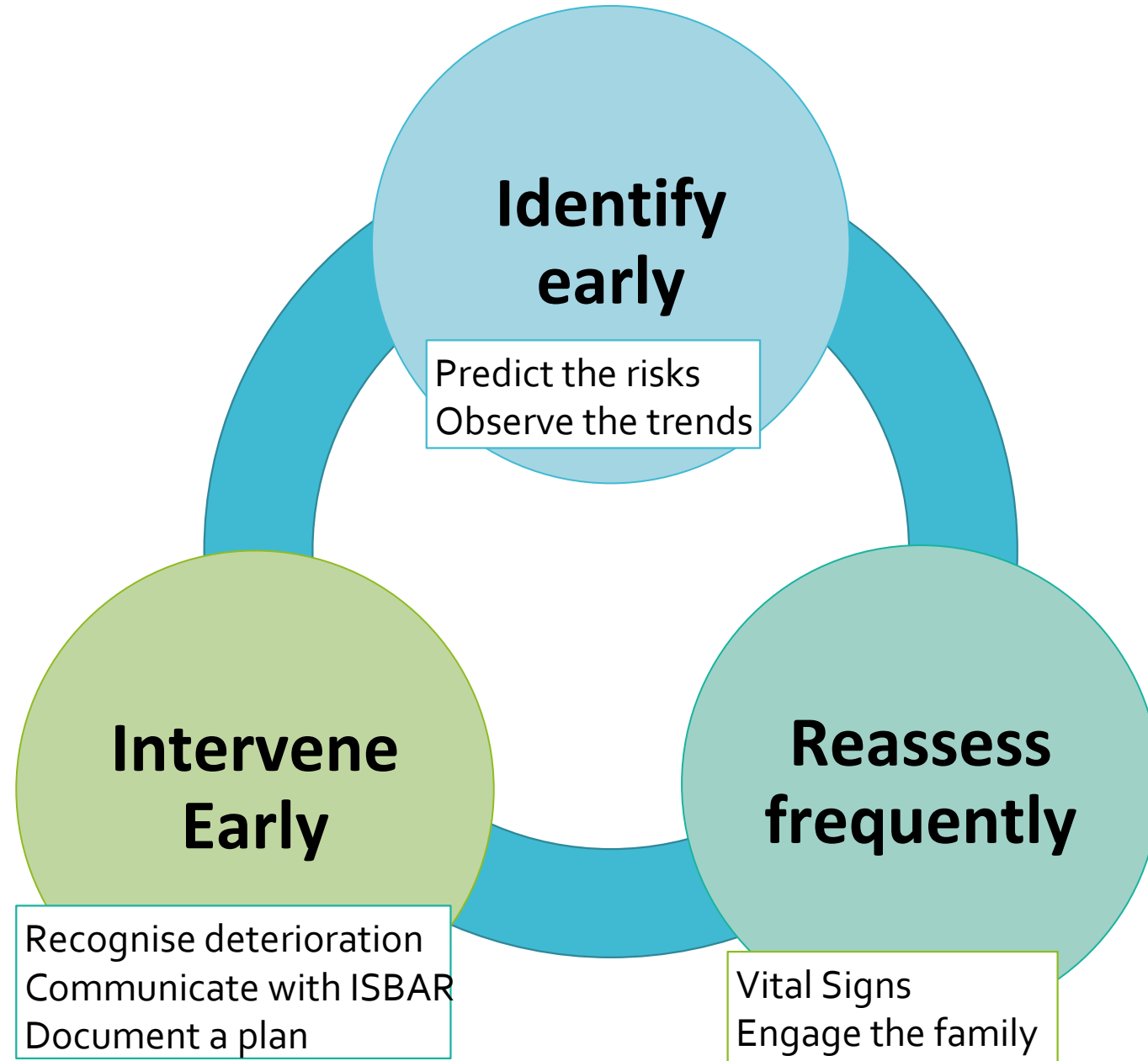
2

Vital signs must be recorded using PEWS

3

Timely call for help should occur when indicated

# Acute Illness Intervention Cycle



# High Risk Groups

- <3 months old
- Prematurity
- Pre-existing conditions
  - Asthma
  - Diabetes
  - Sickle Cell Disease
  - Cancer
  - Malnutrition
  - HIV

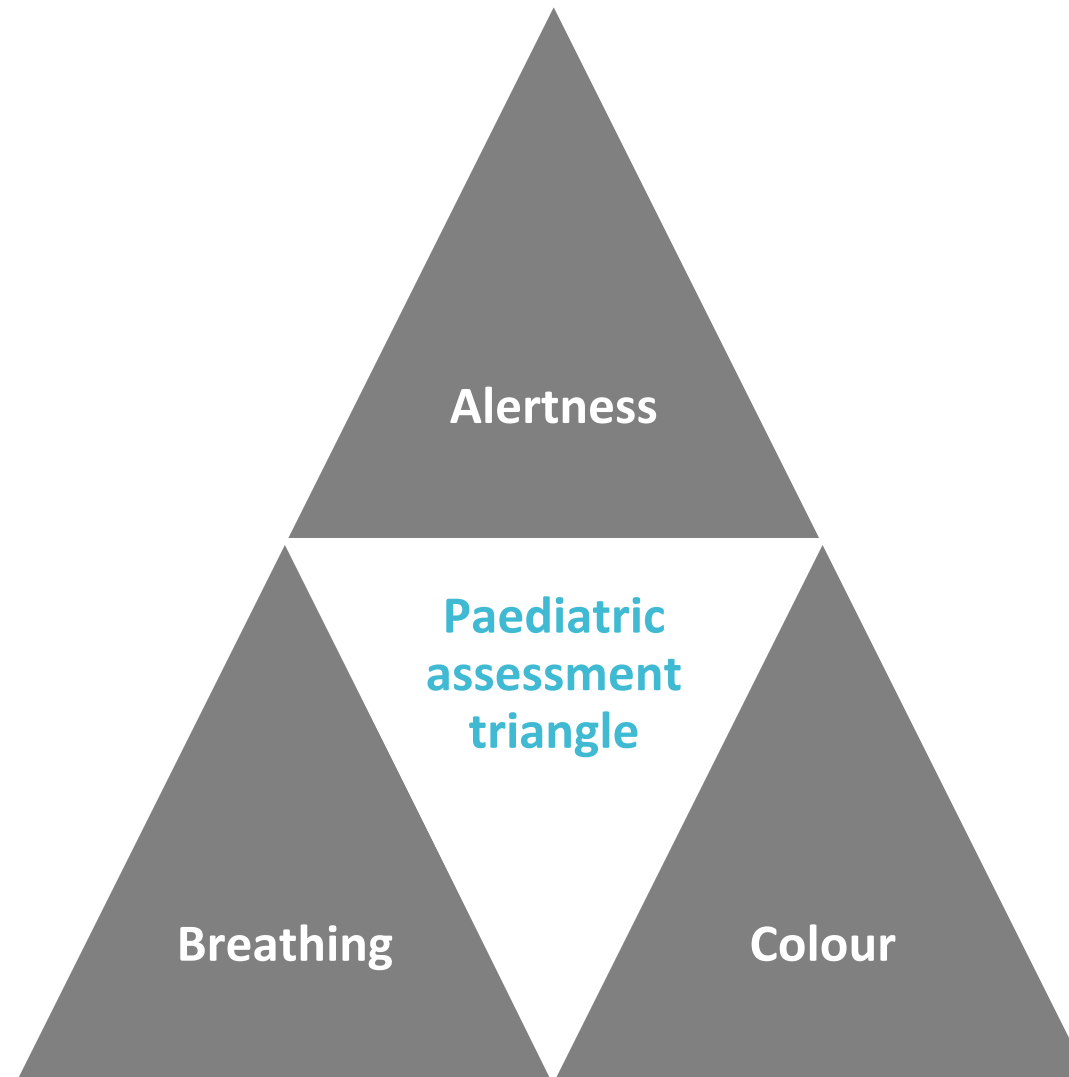


# Children Are Different

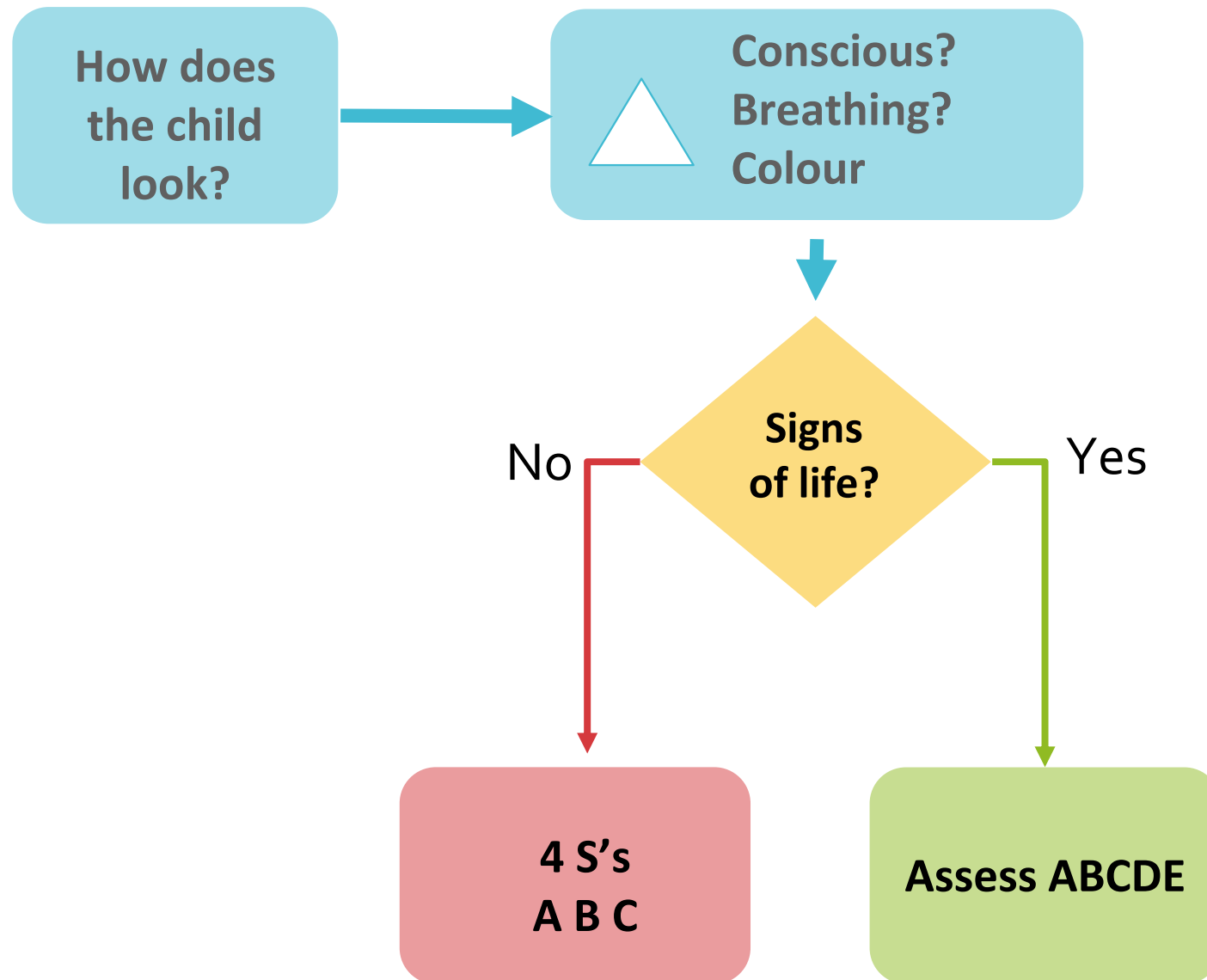
- Different physiology, anatomy and psychology
- Children initially compensate and can quickly deteriorate
- Talk to parents – They know their children



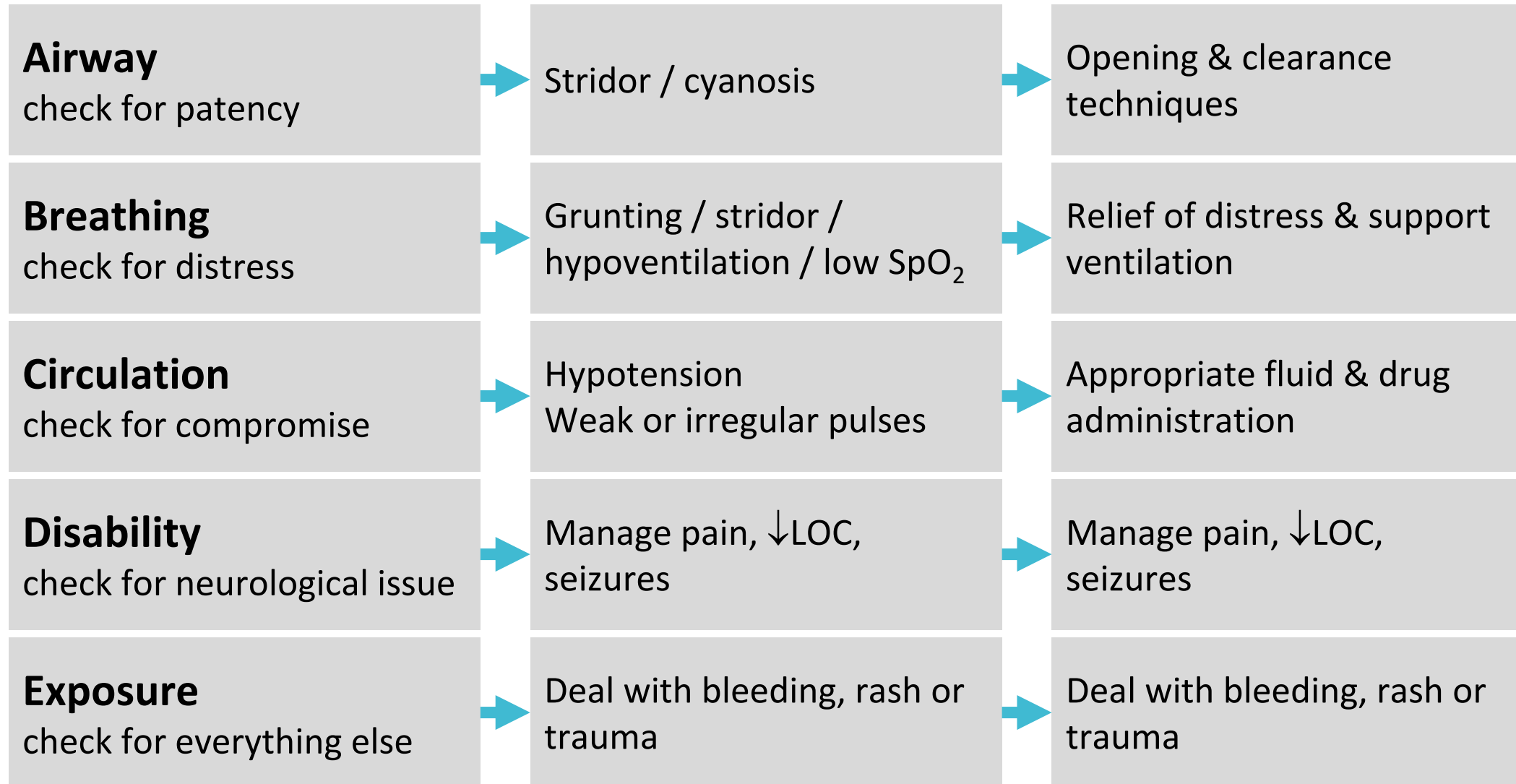
# Structured Assessment



# Structured Assessment

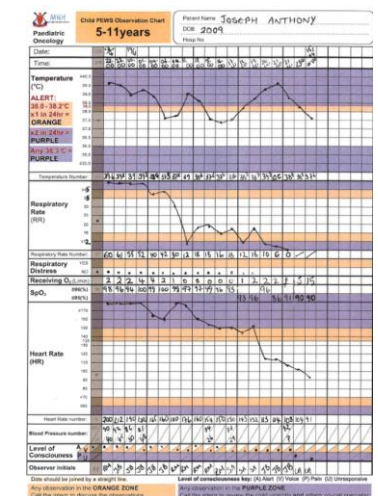


# Summary ABCDE assessment



# Monitoring

- Repeat assessment regularly
- Agree action plan
- Decide how to monitor
  - SpO<sub>2</sub> continuously or intermittent?
  - BP set to automatic or intermittent?
  - Move to a closer bed?
  - Access to ECG monitor?
- Ask parent or child to help





## Referral & Escalation

- **Always use clinical judgement**
- **Review child regularly**
- **Act on concern**
- **Be aware of non-improvement & the child who is tiring**

- **Who can you call?**
- **Record all decisions & actions**

Communicate  
effectively

ISBAR

**I**dentify

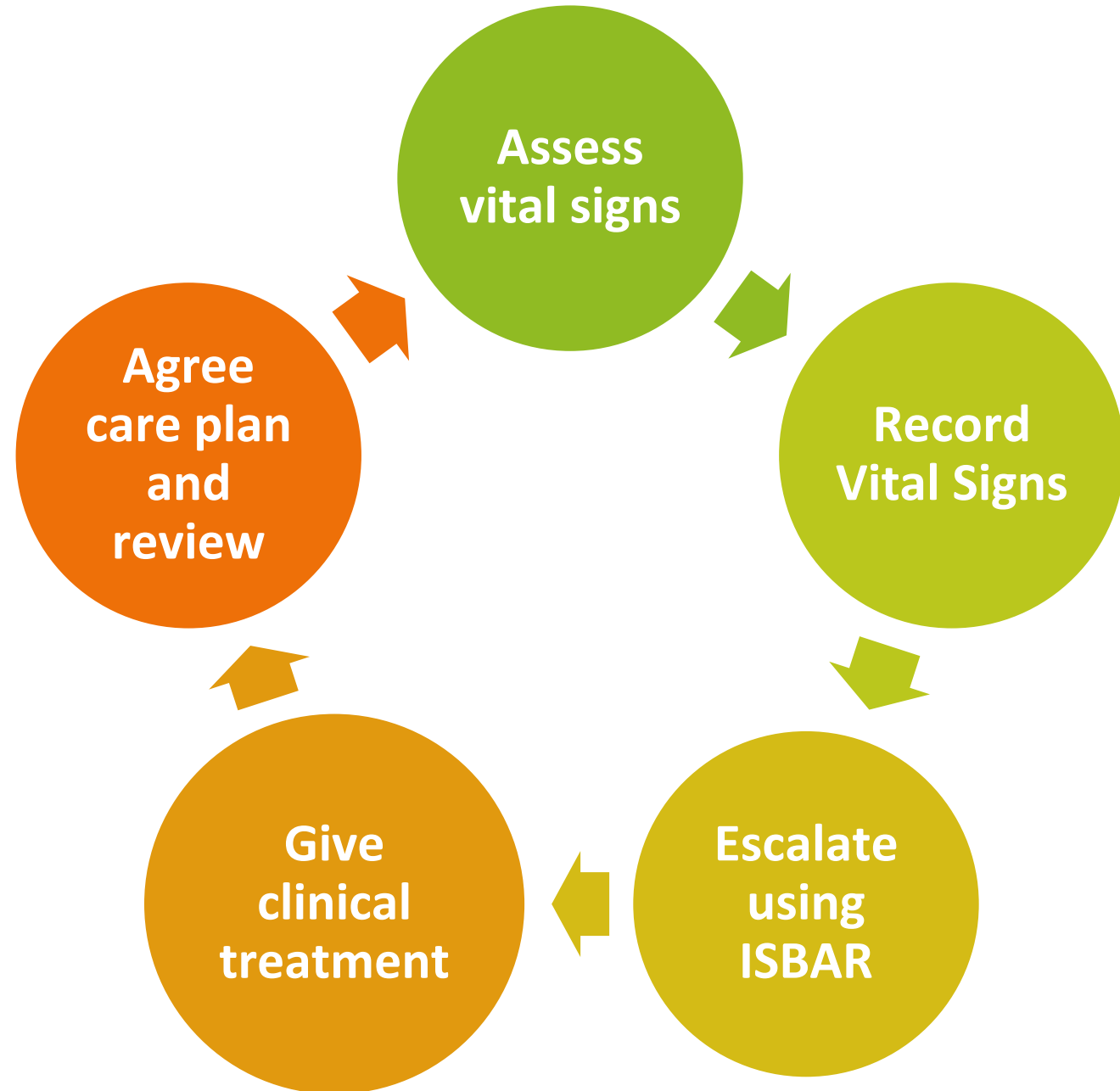
**S**ituation

**B**ackground

**A**ssessment

**R**ecommendation

Reassess  
frequently



# Introducing the safety huddle

# Communicate effectively

The **safety huddle** is...

- A core safety intervention to
  - Increase situation awareness
  - Improve team communication
- Short
- Structured
- Takes a team to implement

# The huddle rules

1. Always occurs in the same place at the same time
2. Start & finish on time (max 10 minutes)
3. The Huddle is protected, with no interruptions
4. Attendance is monitored to ensure compliance
5. Everyone's contribution is equally valuable

# The huddle script

1. Standardised introduction
2. Are there any patients at risk of deterioration?
  - Why is the patient at risk?
  - What is the management plan?
  - Who should their care be escalated to?
3. Does anybody wish to identify any other concerns which have not been raised, or offer a different perspective on anything we've discussed?
4. Standardised closure of the huddle

## The huddle 'Watcher'

Identify patients who do not have worrying vital signs but who the team may feel is at risk of getting sicker:

- A gut feeling or instinct
- Family have expressed concern
- Communication concerns around the patient's care
- Patient is on high-risk or unfamiliar treatment





Would a Safety Huddle  
be useful in your place  
of work?





Recognise the risk of acute illness in children  
(**ABCDE, Vital Signs**)



Communicate effectively with **ISBAR**



Follow the **acute illness intervention** cycle to  
identify, intervene and reassess



Discuss and record the **plan** of care



Consider implementing a safety huddle

## Summary

## Skill stations

- Advanced airway & breathing
- Advanced circulation
- Advanced communication
- Advanced Neonatal Resuscitation



Airway/Breathing DAY 2

Acute Respiratory Distress in Children

# Objectives

- Identify and manage childhood illnesses presenting with respiratory distress
- Describe pneumonia management
- Explain asthma treatment strategies

# Causes of Respiratory Distress

## *Lung & Airway Diseases:*

- Pneumonia (bacterial, viral, fungal)
  - Tuberculosis (TB)
  - HIV-PCP (Pneumocystis)
- Asthma
- Bronchiolitis
- Croup (LTB)
- Foreign body aspiration

## *Systemic Causes:*

- Severe Malaria
- Severe Anaemia
- Severe Dehydration
- Cardiac Disease
- Renal Disease

# Pneumonia Classification

- Pneumonia is classified by cause (bacterial, viral, fungal) and severity
- Severity is assessed using clinical signs
  - Tachypnoea
  - Chest indrawing
  - Cyanosis
  - Level of consciousness
- Two categories: Severe Pneumonia & Pneumonia (Mild-Moderate)

# Severe Pneumonia

## *Criteria for Severe Pneumonia:*

Oxygen saturation <90%(cyanosis)  
Unable to drink or feed  
Reduced level of consciousness  
Grunting (infants)



Severe  
Pneumonia

Lower chest wall indrawing  
RR-  $\geq 50$  breaths/min (2–11 months)  
RR -  $\geq 40$  breaths/min (1–4 years)



Pneumonia

None of the above



No  
Pneumonia



## Non-Severe Pneumonia (Mild- Moderate)

*Lower chest wall indrawing*

*RR  $\geq$  50 aged 2 –11 months*

*RR  $\geq$  40 aged 1 – 4 yrs*

- Treat with dispersible amoxicillin
- Outpatient management if feeding well.
- Follow up in 2-3 days to check for improvement.
- Seek medical attention if symptoms worsen (inability to drink, difficulty breathing).

# Management of Severe Pneumonia

- *Cyanosed/oxygen sat <90%?*
- *Unable to drink?*
- *Reduced level of consciousness?*
- *Grunting (infants)?*

## ***Hospital Management:***

- - Oxygen therapy (if SpO<sub>2</sub> <90%)
- -IV antibiotics:
  - - 1st line: Benzylpenicillin/Ampicillin + Gentamicin.
  - - 2nd line: Ceftriaxone + Cloxacillin
- - Supportive care: IV fluids, nutrition support
- - Close monitoring for deterioration.

# Asthma Classification

Asthma severity is assessed using clinical signs:

- Mild-Moderate Asthma: Wheezing, difficulty breathing but can talk.
- Severe Asthma: SpO<sub>2</sub> <90%, speaks in words only, chest indrawing.
- Life-Threatening Asthma: Silent chest, cyanosis, drowsy or confused.

# Management of Asthma

## *Mild-Moderate Asthma:*

- Nebulized Salbutamol or inhaler with spacer + mask.
- Oral/MDI Steroids if necessary.
- Reassess after 20-60 minutes.

## *Severe Asthma:*

- Oxygen therapy
- Nebulized Salbutamol + Ipratropium
- Steroids (Oral/IV/MDI)
- Consider Magnesium Sulphate
- Reassess frequently.

# Life- Threatening Asthma

- Urgent ICU referral
- Aggressive oxygen therapy.
- Continuous salbutamol nebulization
- IV hydrocortisone or oral prednisolone

# Administering Salbutamol

## Nebulizer

- 2.5 mg for children <5 years.
- Up to 3 doses in first 1 hour, reassess after each dose

## Inhaler + Spacer + Mask for children <5 years

- 1 puff per 5-6 breaths every 3 minutes (Max 10 puffs in 30 min)

# Summary

- Use clinical signs to assess respiratory distress severity.
- Initiate oxygen therapy if  $\text{SpO}_2 < 90\%$
- Severe pneumonia: Hospitalize, start IV antibiotics.
- Mild pneumonia: Treat with amoxicillin po
- Asthma: Manage with salbutamol + steroids and reassess frequently

Paediatric  
Acute  
Illness  
Resuscitation  
Skills

**Advanced  
Newborn  
Resuscitation**





# Objectives

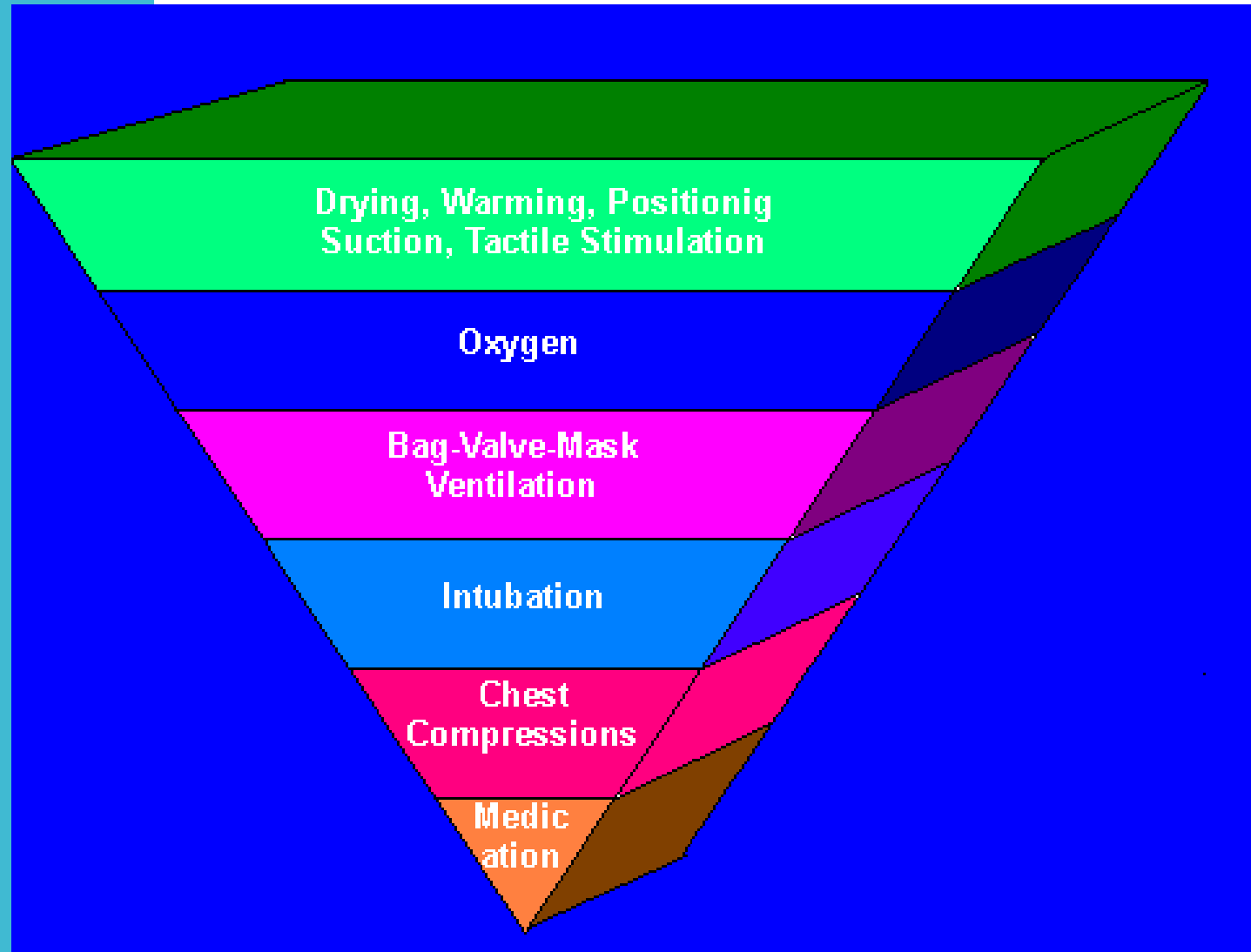


Core knowledge of newborn resuscitation

Recognition of newborn who is not breathing

Practical interventions required

Focus on 'Golden Minute'



# Preparing for Newborn Resuscitation

## Essential Equipment

### ***Warmth:***

- Overhead Warmer
- Warm, Dry Towels
- Stable Surface and Proper Lighting
- Clock/timer

### ***Airway and Breathing:***

- Suitable Bag-Valve-Mask (BVM).
- Suction Device
- Pulse Oximeter

### ***Medications and Other Supplies:***

- Gloves
- Umbilical access supplies

If the hospital can provide advanced care-  
Laryngoscope, ET tubes, Scissors and tape  
Drugs-Adrenaline, IV Fluid (Volume)

# Helping Babies Breathe

\*In the absence of  
meconium

DRY thoroughly

Crying

Keep warm  
Check breathing

Cut cord

Monitor with mother

Not crying

Keep warm  
Clear airway (if needed)  
Stimulate

Not breathing

Cut cord  
Commence  
ventilation  
5 inflation breaths

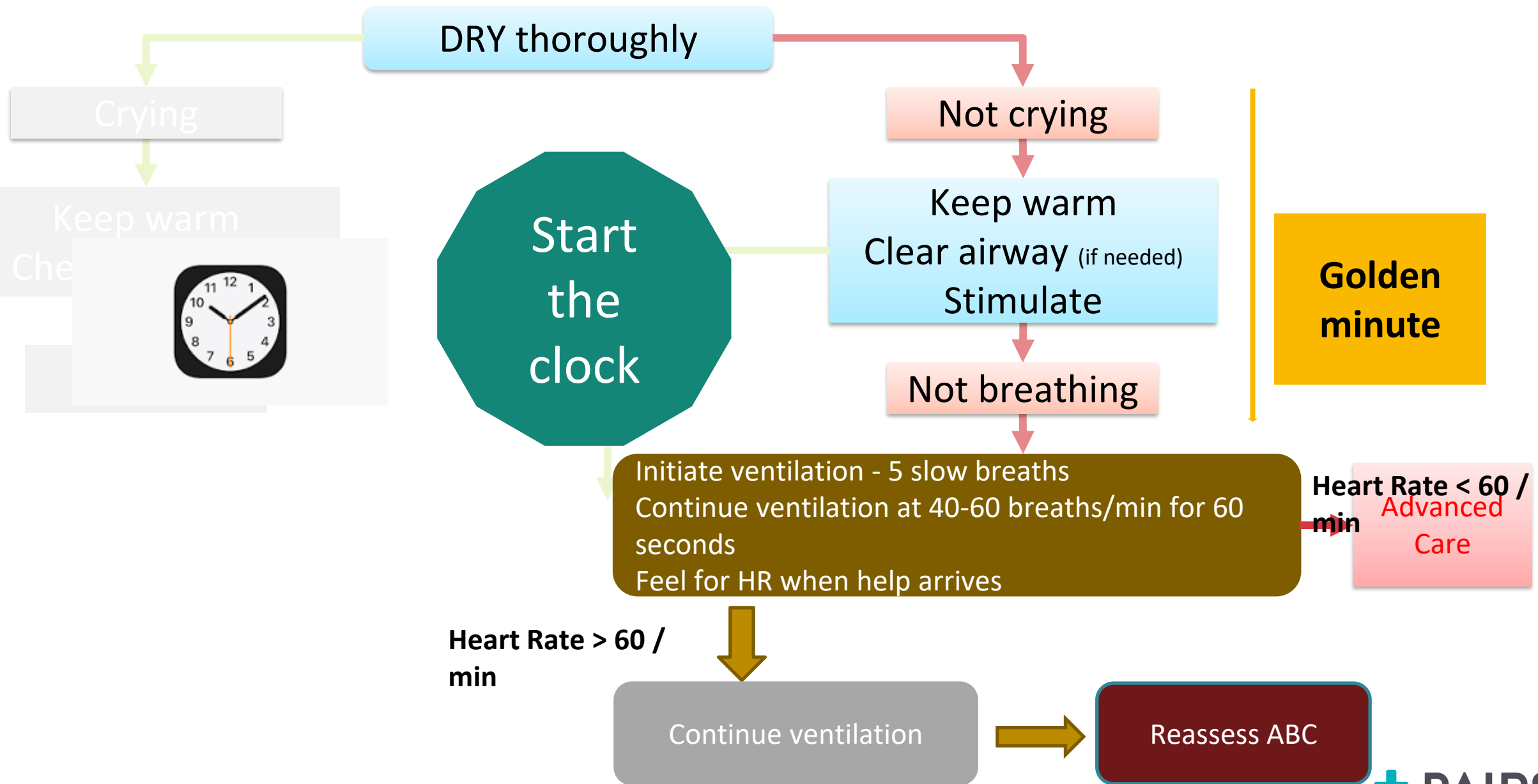
Not breathing

Improve ventilation -  
Continue breaths

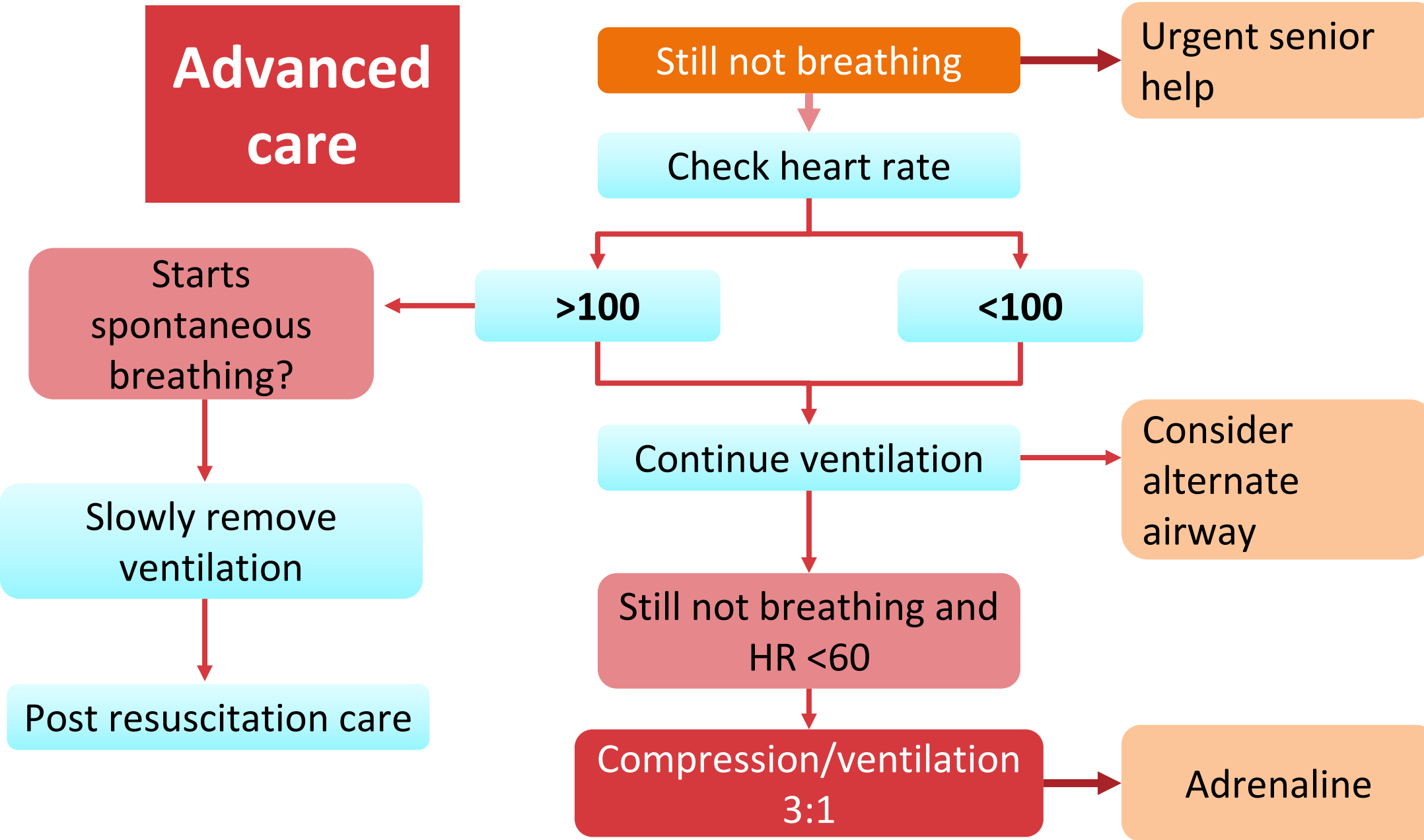
Breathing

Call for help  
Check HR  
Advanced care

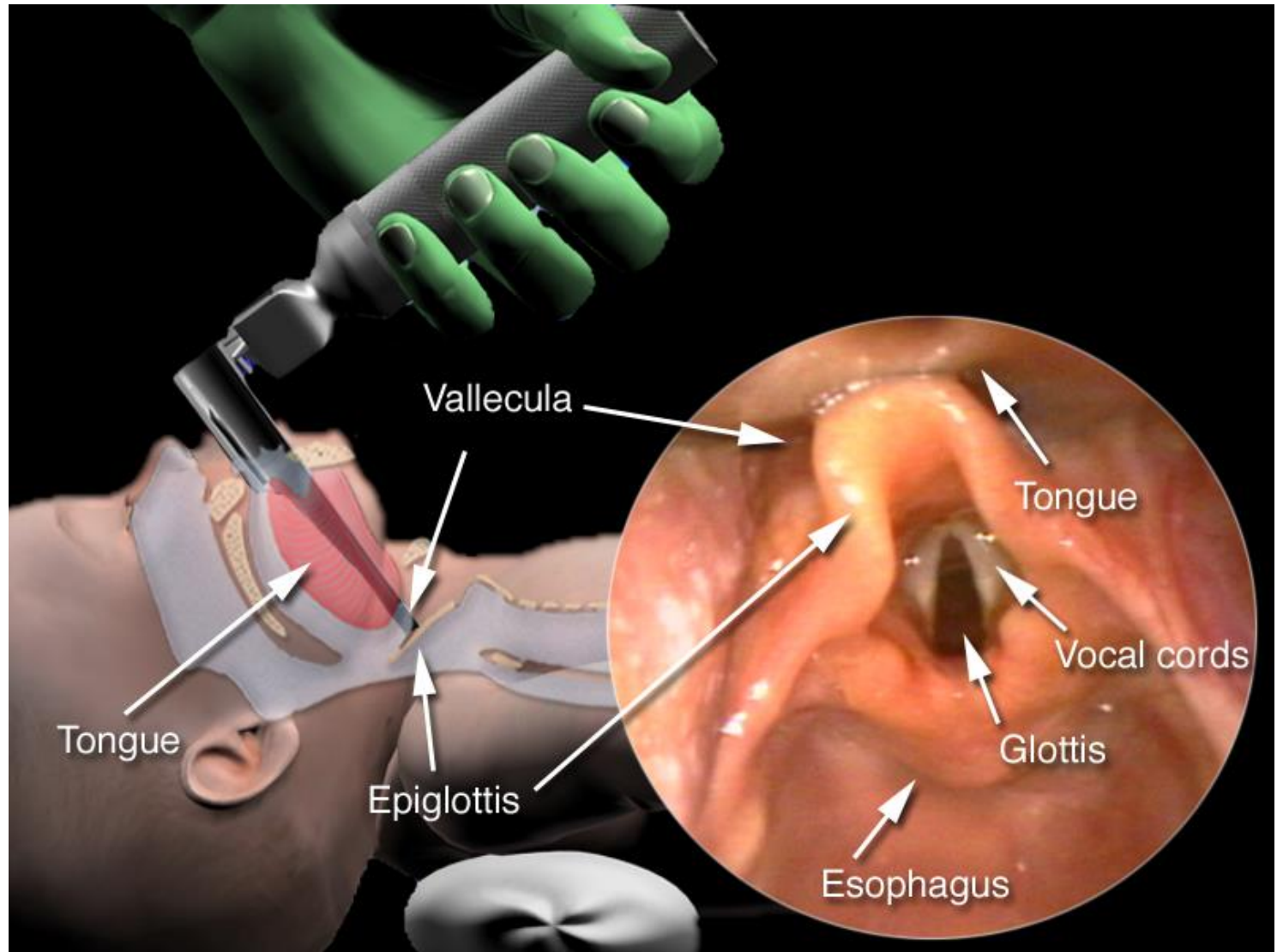
# Helping Babies Breathe



# Helping Babies Breathe

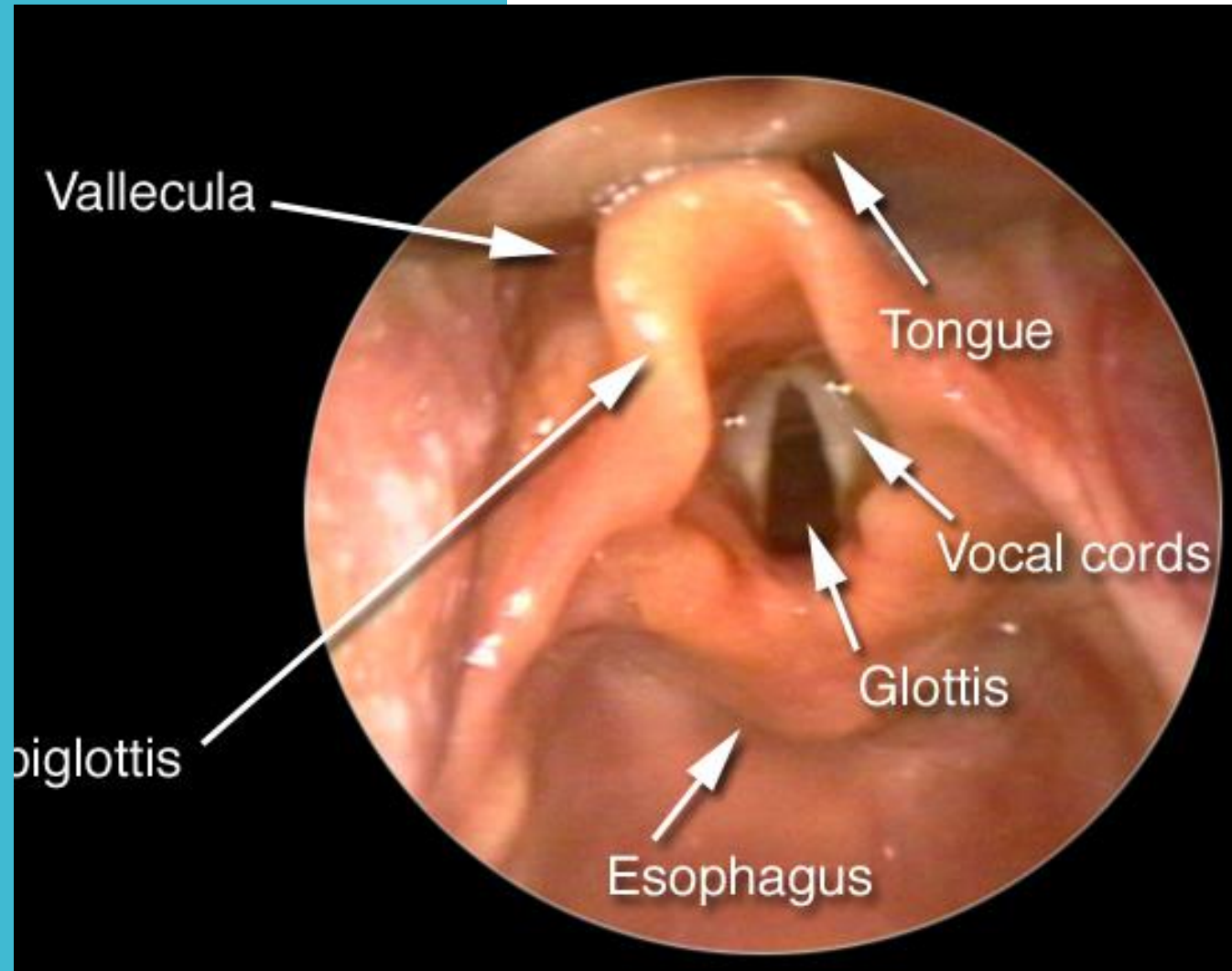


# Endotracheal Intubation: Anatomic Landmarks



## Endotracheal Intubation: Visualize Landmarks

- Vocal cords should appear as vertical stripes on each side of the glottis or as an inverted letter "V"
- Applying downward pressure on cricoid may help bring glottis into view
- Suction, if necessary, for visualization





# Endotracheal Intubation: Checking Tube Position

## Signs of correct tube position

Improved vital signs (heart rate, color, and activity)

Presence of exhaled CO<sub>2</sub> as determined by CO<sub>2</sub> detector

Breath sounds over both lung fields but decreased or absent over stomach

No gastric distention with ventilation

# CO<sub>2</sub> Detection



# Indications for Chest Compressions

Despite adequate stimulation and effective ventilation with 100% oxygen

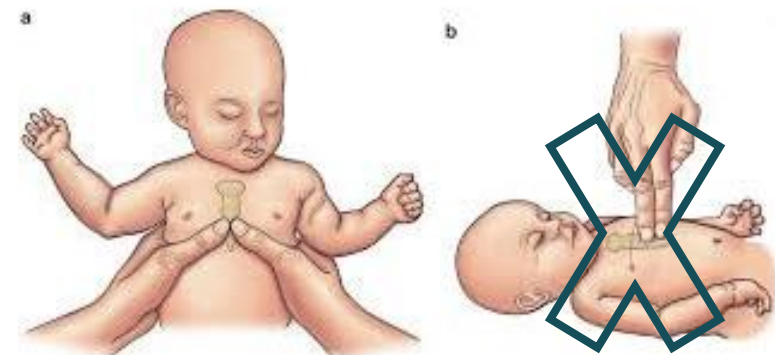
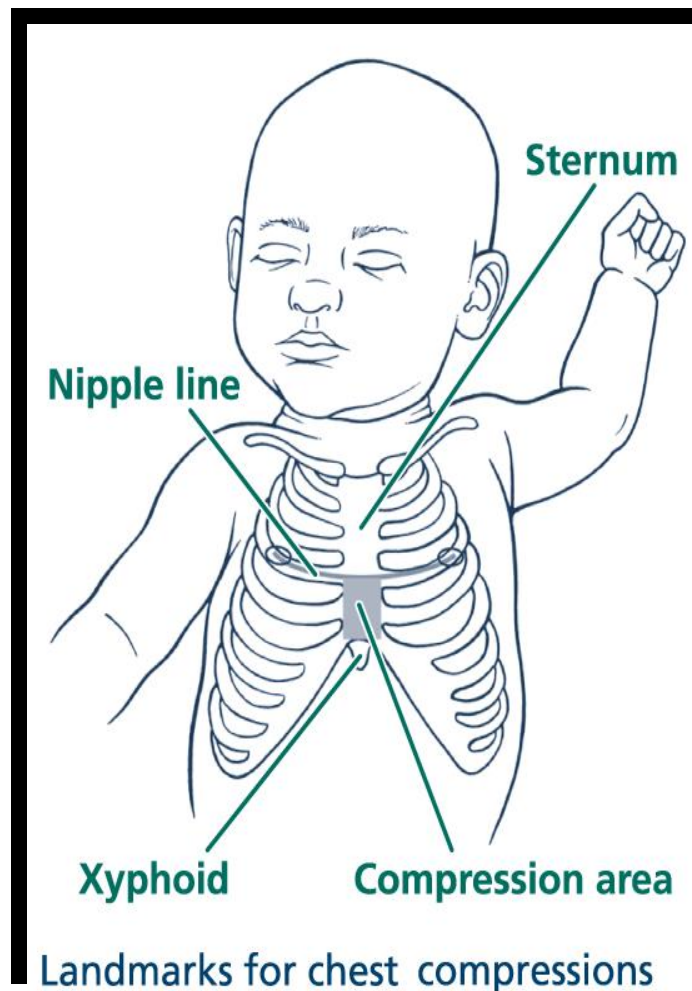
- Heart rate <60 bpm
- or
- Heart rate 60 to 80 bpm but not increasing

# Chest Compressions: Positioning of Thumb

Apply pressure to lower third of sternum

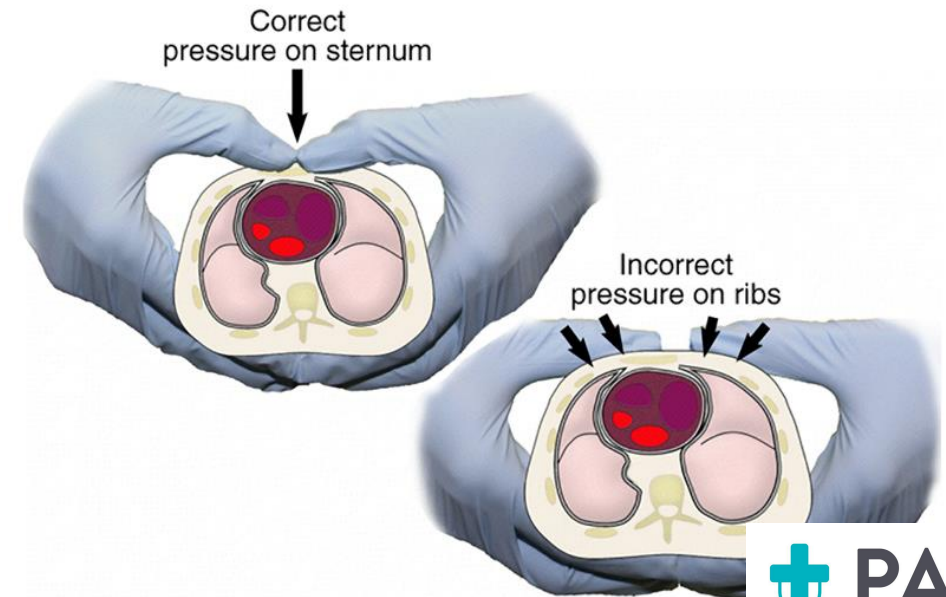
Avoid xiphoid process

Always encircling chest technique rather than fingers

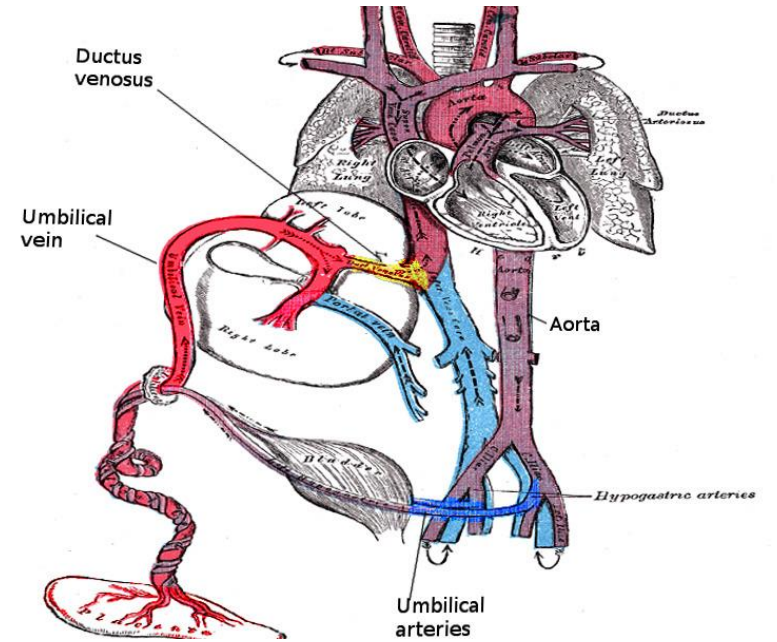
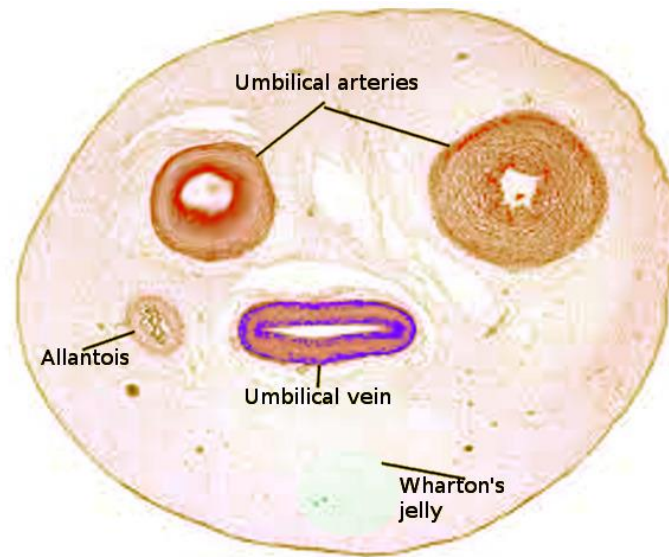


## Chest Compressions:

- Apply pressure during compression on the sternum, releasing pressure to allow chest recoil and ventilation
- Compression/Ventilation 3:1
- 120 events /minute



# Umbilical Access



# Medications

- Epinephrine/Adrenaline 0.2mls/kg of 1:10,000 IV/IO
- Dose may be repeated every 3 to 5 min
- ET route if no IV access:
  - 1ml/kg
  - no flush , PPV to distribute



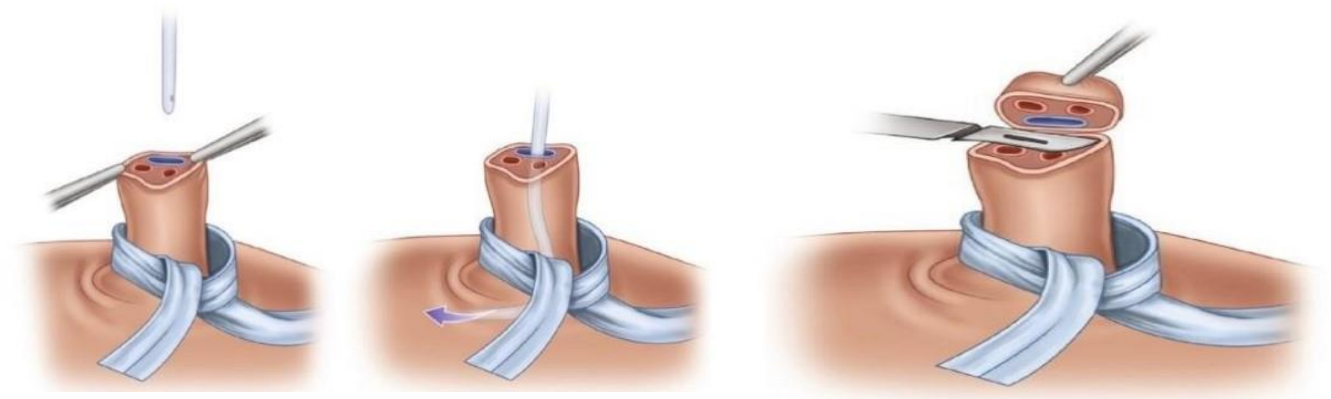
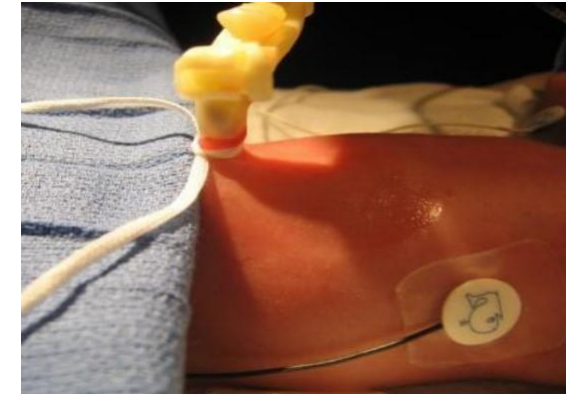
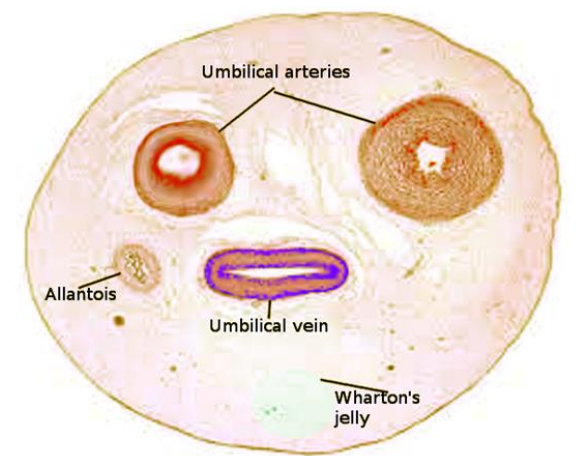
### Neonatal Code Medications

Drug	Dose*	0.5 kg	1 kg	2 kg	3 kg	4 kg	Administration
Epinephrine IV/IO  Concentration: 0.1 mg/mL 1 mg/10 mL	0.02 mg/kg  Equal to 0.2 mL/kg	IV Dose: 0.01 mg  Volume: 0.1 mL	IV Dose: 0.02 mg  Volume: 0.2 mL	IV Dose: 0.04 mg  Volume: 0.4 mL	IV Dose: 0.06 mg  Volume: 0.6 mL	IV Dose: 0.08 mg  Volume: 0.8 mL	IV/IO rapid push  Flush with 3 mL NS  Repeat every 3-5 minutes if heart rate less than 60 bpm
Epinephrine ETT  Concentration: 0.1 mg/mL 1 mg/10 mL	0.1 mg/kg  Equal to 1 mL/kg	ET Dose: 0.05 mg  Volume 0.5 mL	ET Dose: 0.1 mg  Volume 1 mL	ET Dose: 0.2 mg  Volume 2 mL	ET Dose: 0.3 mg  Volume 3 mL	ET Dose: 0.4 mg  Volume 4 mL	May administer while vascular access is being established  ETT rapid push  No need for flush. Provide PPV breaths to distribute into lungs.
Normal Saline IV 0.9% NaCl	10 mL/kg	5 mL IV	10 mL IV	20 mL IV	30 mL IV	40 mL IV	Give over 5-10 min



# UVC insertion

- Put tie around base of umbilicus
- Clean with alcohol swab or sterile solution
- Cut the cord leaving 1-2cm of cord
- Insert line 3-5cms into vein
- Check for withdrawal of blood before use



# Drugs and Oxygen

- Drugs are initially **not recommended**
  - **Ventilation first**
- Immediate resuscitation with oxygen can cause harm.
  - *About ¼ of resuscitated babies may need oxygen after 4-5 minutes of resuscitation.*
- Priority is **ventilation** – do not stop resuscitation to look for oxygen.
- The following drugs have no role in immediate newborn resuscitation
  - Sodium bicarbonate, aminophylline, hydrocortisone, 50%dextrose

# Post-resuscitation Evaluation

- Temperature regulation
- Acid-base status
- Blood glucose
- Laboratory studies
- Chest x-ray

# ISBAR Communication

## Identify

- Hello, my name is...
- Am I speaking with...?

## Situation

- The situation is...(what is the main reason you are calling? )

## Background

- The background (*to this situation*) is...

## Assessment

- My assessment (*of the situation*) is...

## Recommendation

- I recommend that you/we now...



# Review of Learning



# Summary



**Recognise cardiac arrest & start CPR**



**Use structured approach to assessment**



**Use PEWS, continue monitoring**



**Communicate using ISBAR**



**Give clinical treatment**



**Agree care plan and review**



**Recognise acute illness – ABCDE/Vital Signs**



**Communicate effectively with ISBAR**



**Follow the acute illness intervention cycle to identify, intervene and reassess**



**Discuss and record the plan of care**



**Consider implementing a safety huddle**

# Summary

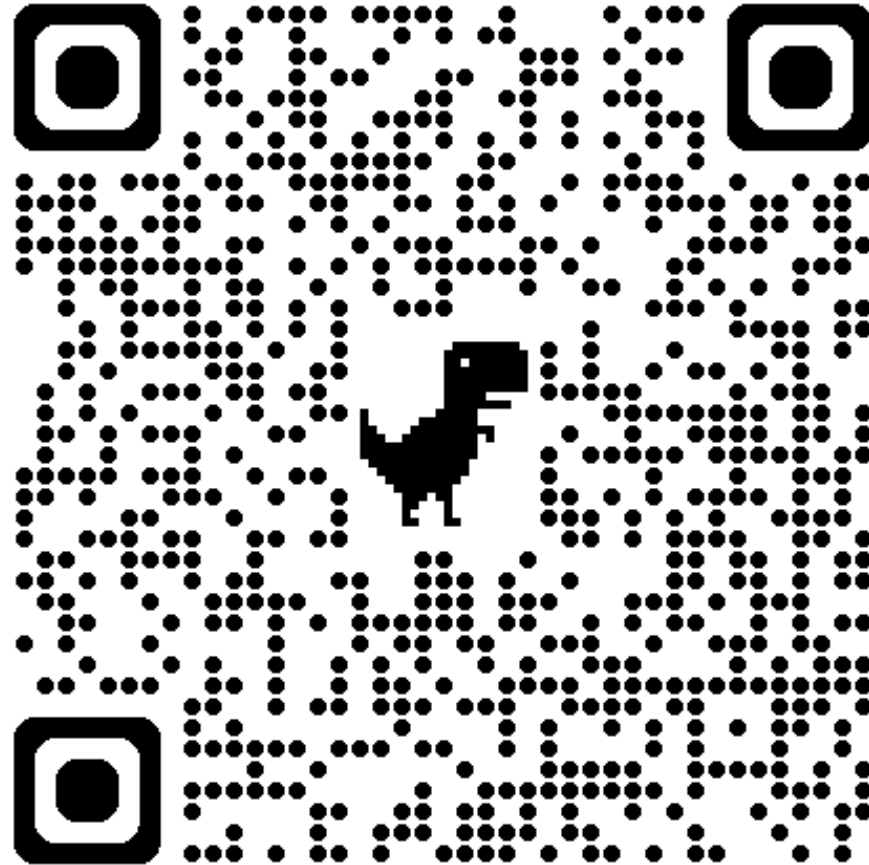


# Case Simulations

# Testing



# Testing

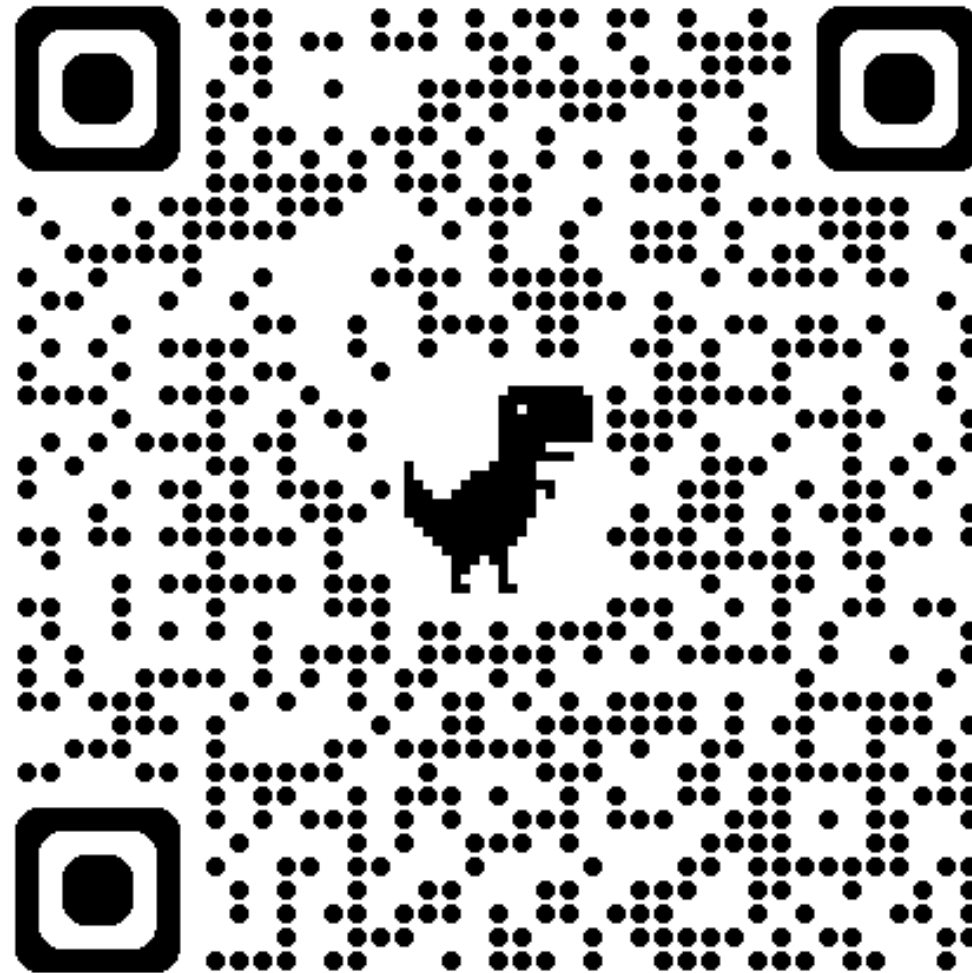


PAIRS basic MCQ Uganda May 2025

# Summary & Evaluation



# PAIRS Evaluation





# Weebale