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Lecture

ALS Algorithm

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Learning outcomes

- The ALS algorithm
- Treatment of shockable and non-shockable rhythms
- Potentially reversible causes of cardiac arrest

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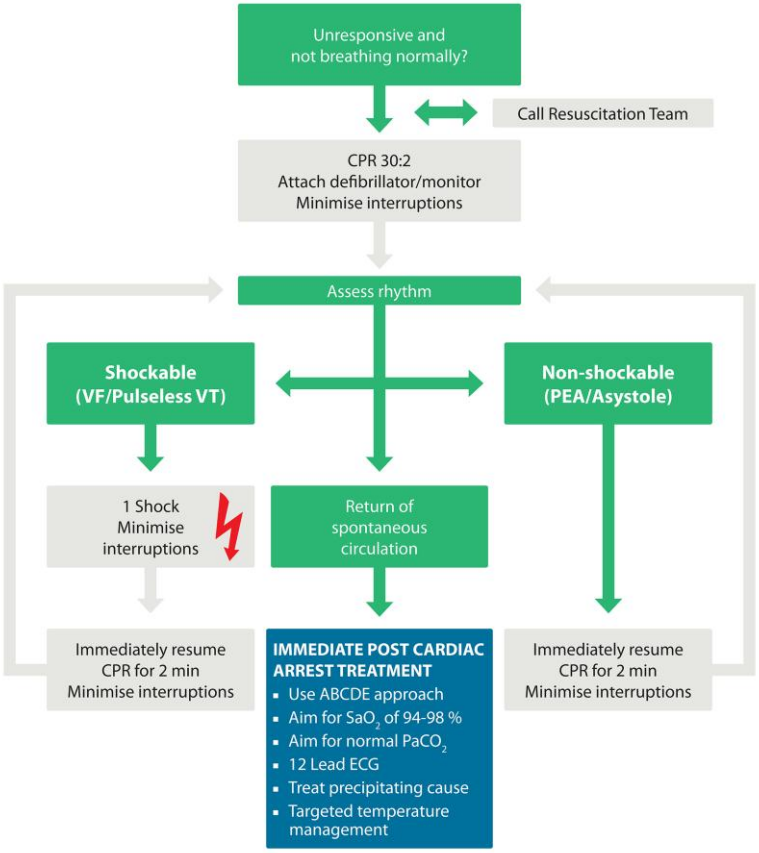
Adult ALS Algorithm



DURING CPR

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

TREAT REVERSIBLE CAUSES

Hypoxia	Thrombosis – coronary or pulmonary
Hypovolaemia	Tension pneumothorax
Hypo-/hyperkalaemia/metabolic	Tamponade – cardiac
Hypothermia/hyperthermia	Toxins

CONSIDER

- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

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To confirm cardiac arrest…

- Patient response
- Open airway
- Check for normal breathing
- Check circulation

Unresponsive?
Not breathing or only occasional gasps?

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To confirm cardiac arrest…

Unresponsive and not breathing normally?

Call Resuscitation Team

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Cardiac arrest confirmed

Unresponsive and not breathing normally?

Call Resuscitation Team

CPR 30:2
Attach defibrillator/monitor
Minimise interruptions

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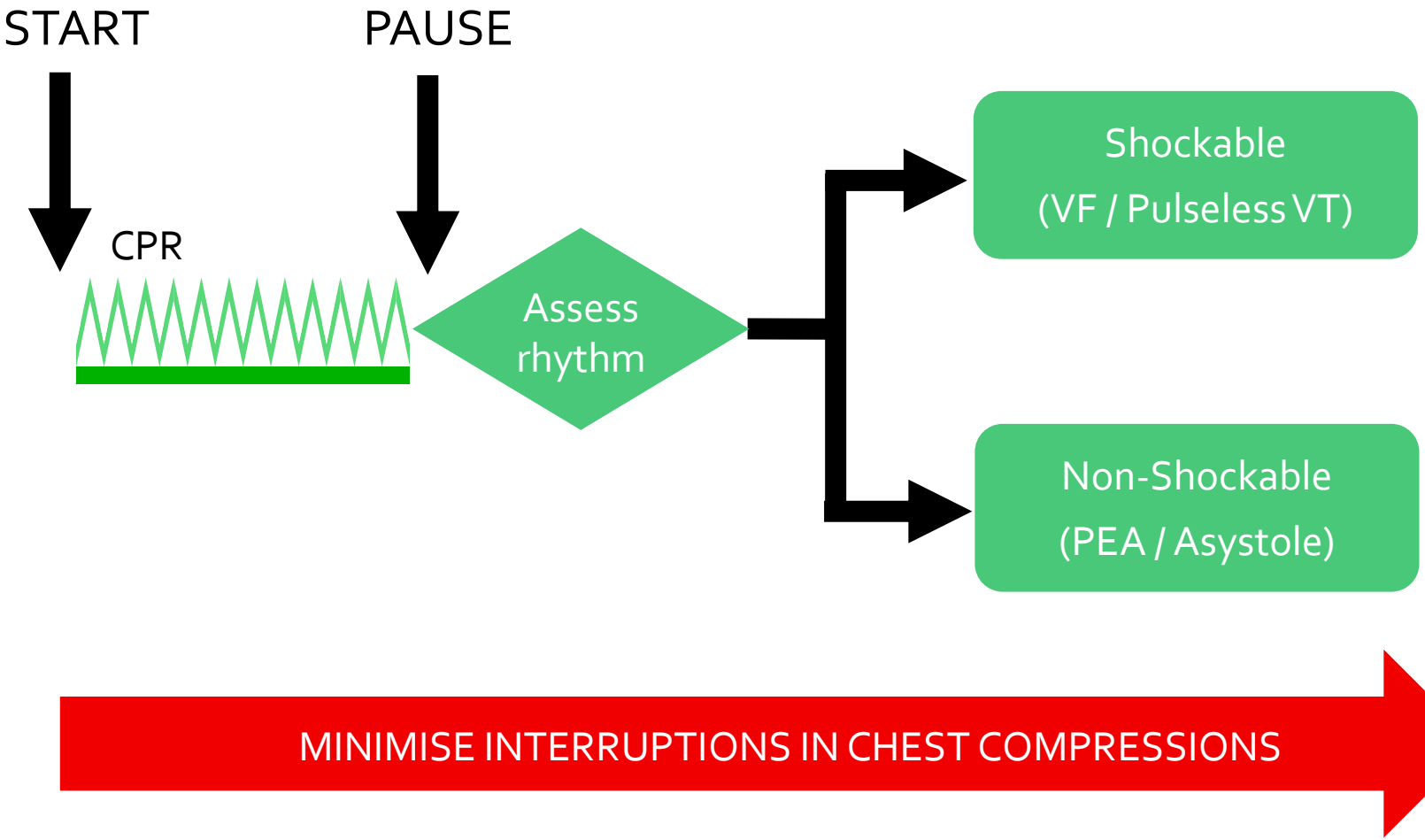
Shockable and Non-Shockable



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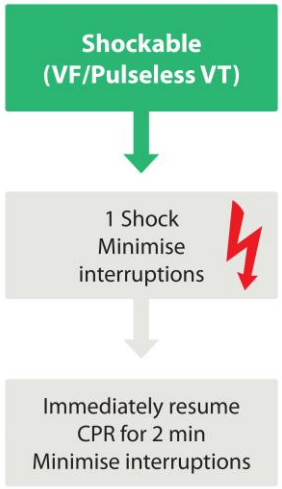

Shockable (VF)

- Bizarre irregular waveform
- No recognisable QRS complexes
- Random frequency and amplitude
- Uncoordinated electrical activity
- Coarse/fine
- Exclude artefact
  - Movement
  - Electrical interference

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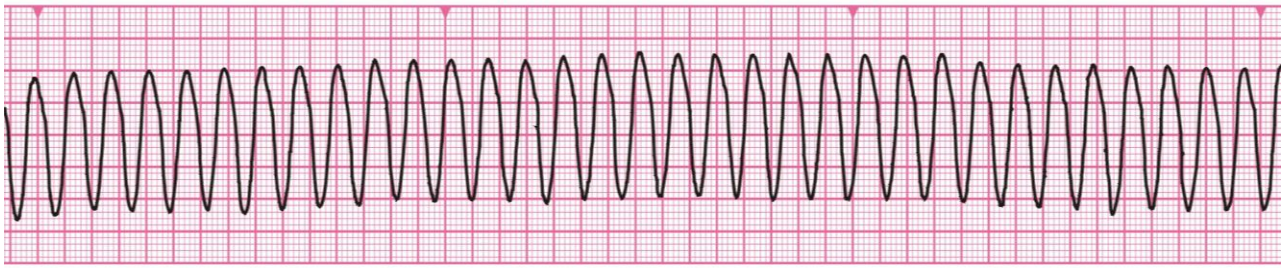
Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

Shockable (VT)



- Monomorphic VT
  - Broad complex rythm
  - Rapid rate
  - Constant QRS morphology
- Polymorphic VT
  - Torsade de pointes

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Shockable (VF / VT)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

STOP CPR

RESTART CPR

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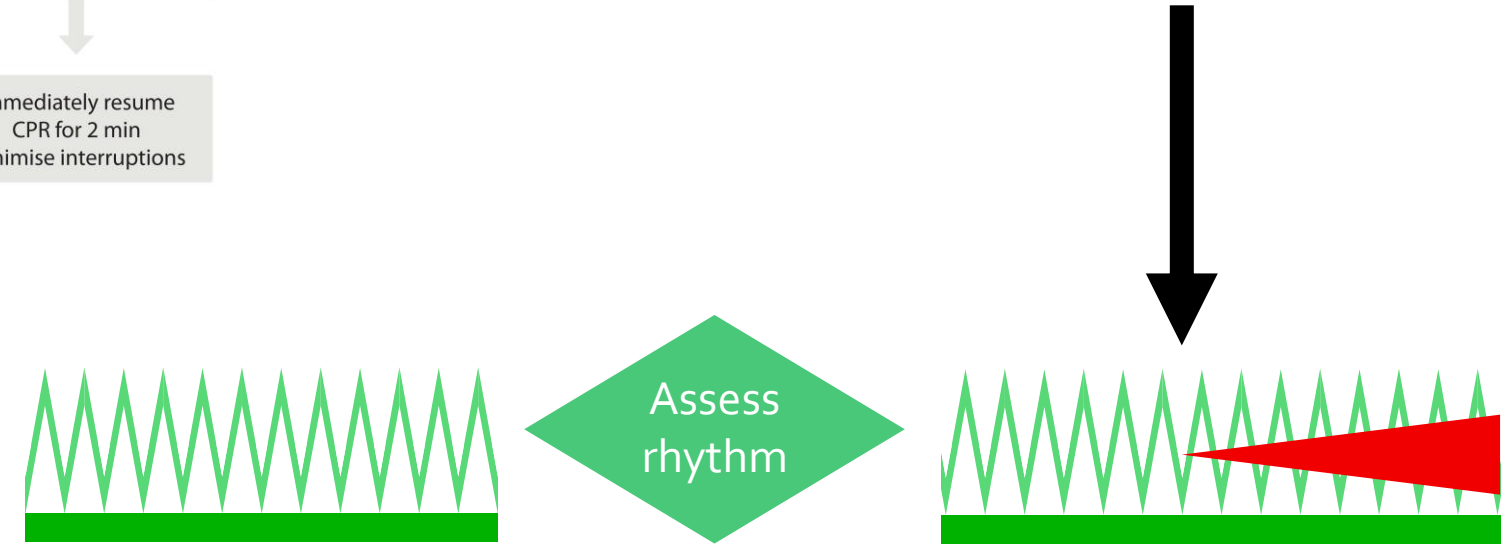
Shockable (VT)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

CHARGE DEFIBRILLATOR



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Shockable (VF / VT)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

DELIVER SHOCK

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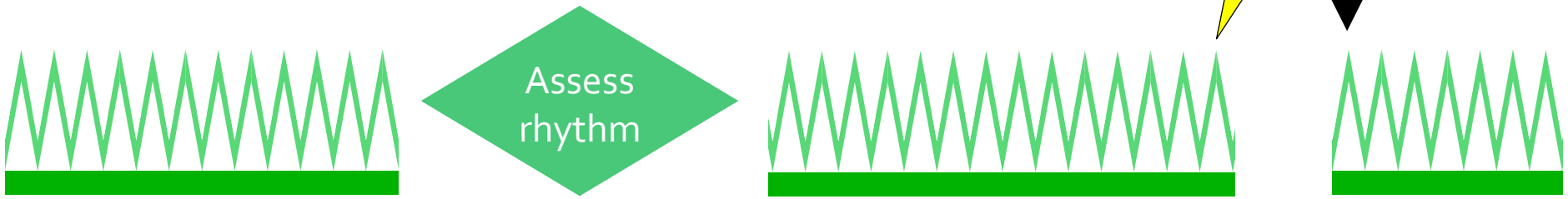
Shockable (VF / VT)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

IMMEDIATELY RESTART CPR



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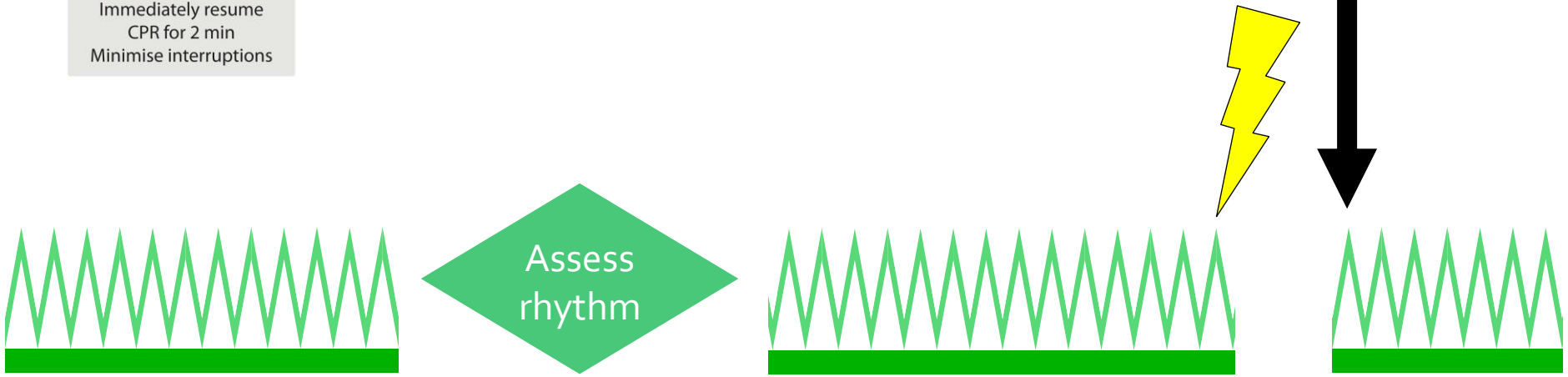
Shockable (VF / VT)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

IMMEDIATELY RESTART CPR



MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

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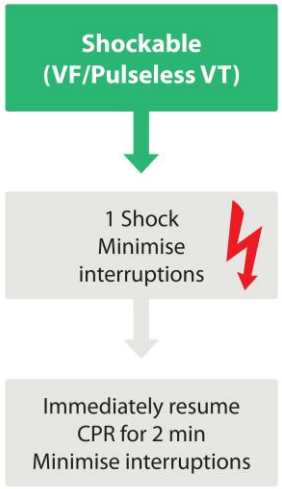

Defibrillation energies

- 150 J – 360 J biphasic (360 J monophasic)
- If unsure, deliver highest available energy
- DO NOT DELAY SHOCK

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Persisting VF / VT (2nd shock)

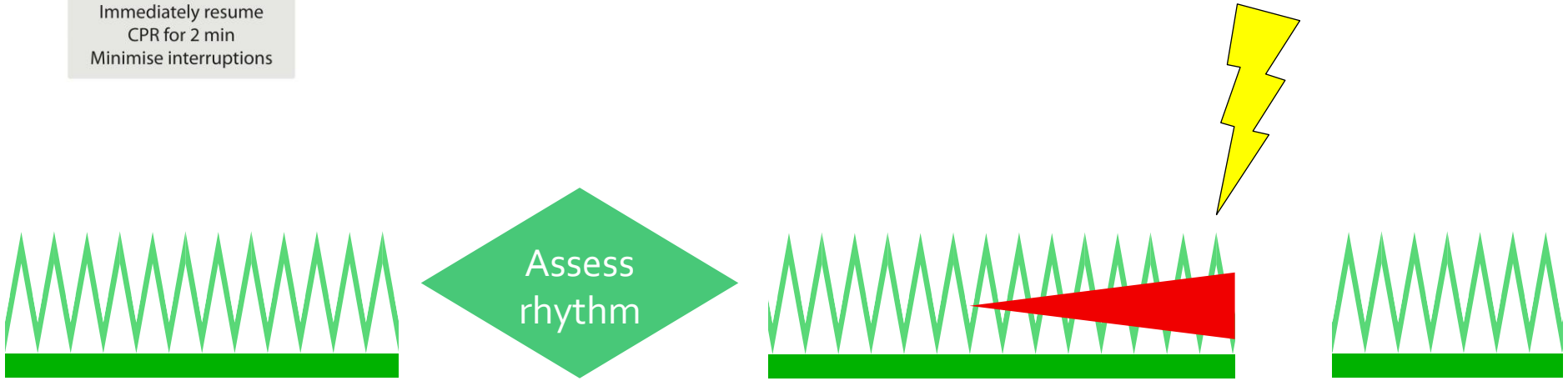
Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

2nd and subsequent shocks

- 150 – 360 J biphasic
- 360 J monophasic



MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

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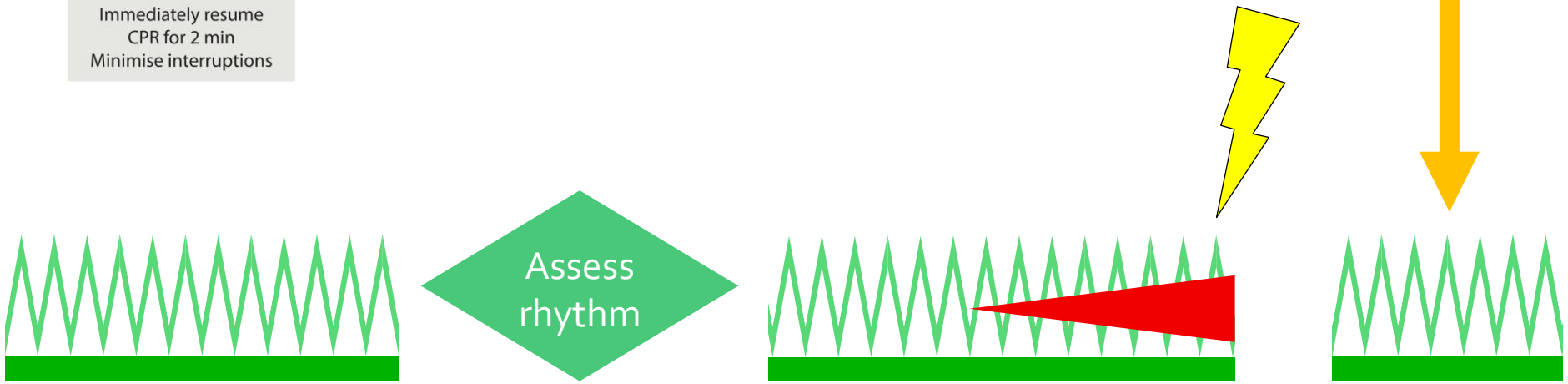
Persisting VF / VT (3rd shock)

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

Give adrenaline and Amiodarone after 3rd shock during CPR



MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

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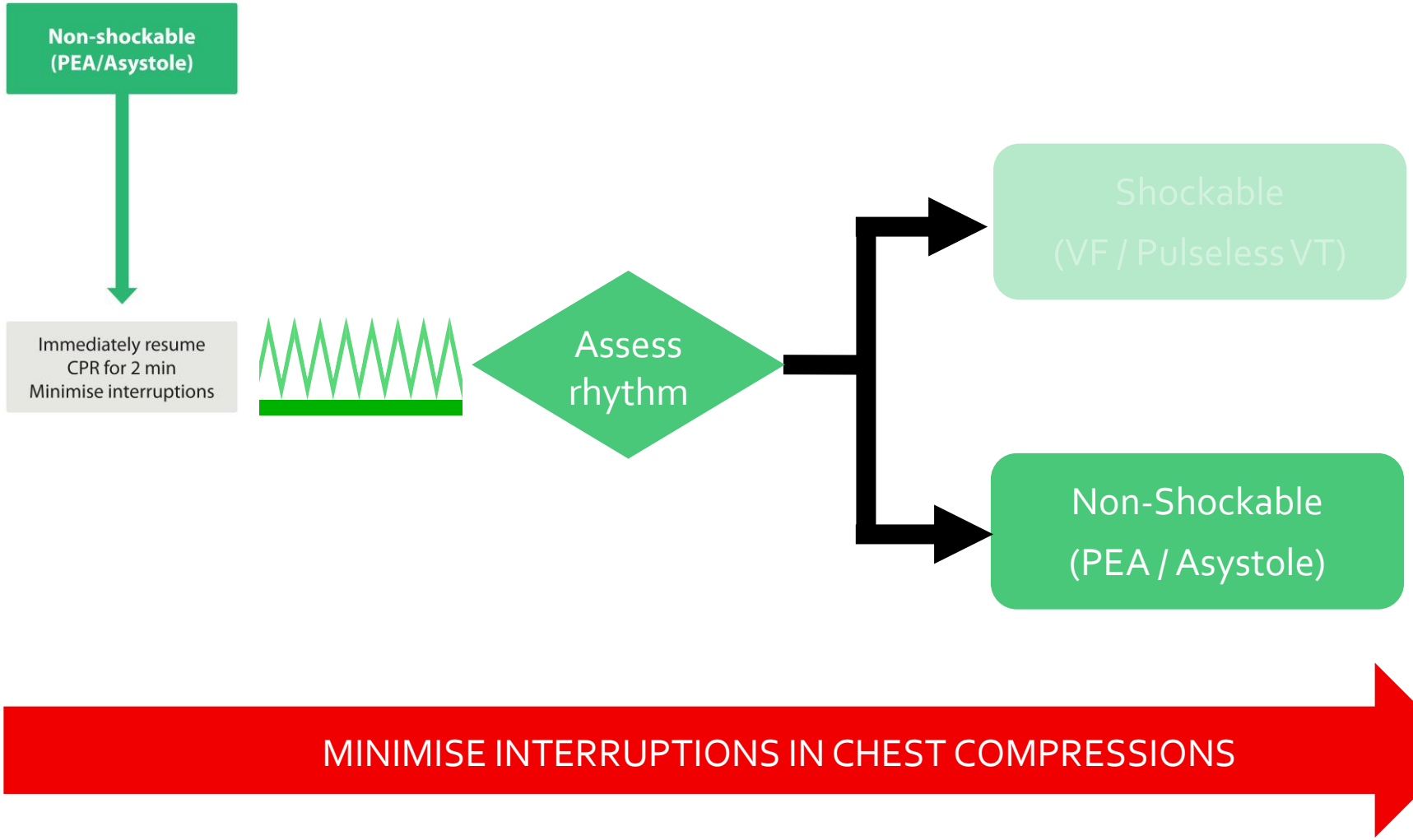
Non-Shockable



MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

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Non-shockable (PEA/Asystole)

Immediately resume CPR for 2 min
Minimise interruptions

Non-Shockable (Asystole)

- Absent ventricular (QRS) activity
- Atrial activity (P waves) may persist
- Rarely a straight line trace
- Adrenaline 1 mg IV then every 3-5 min

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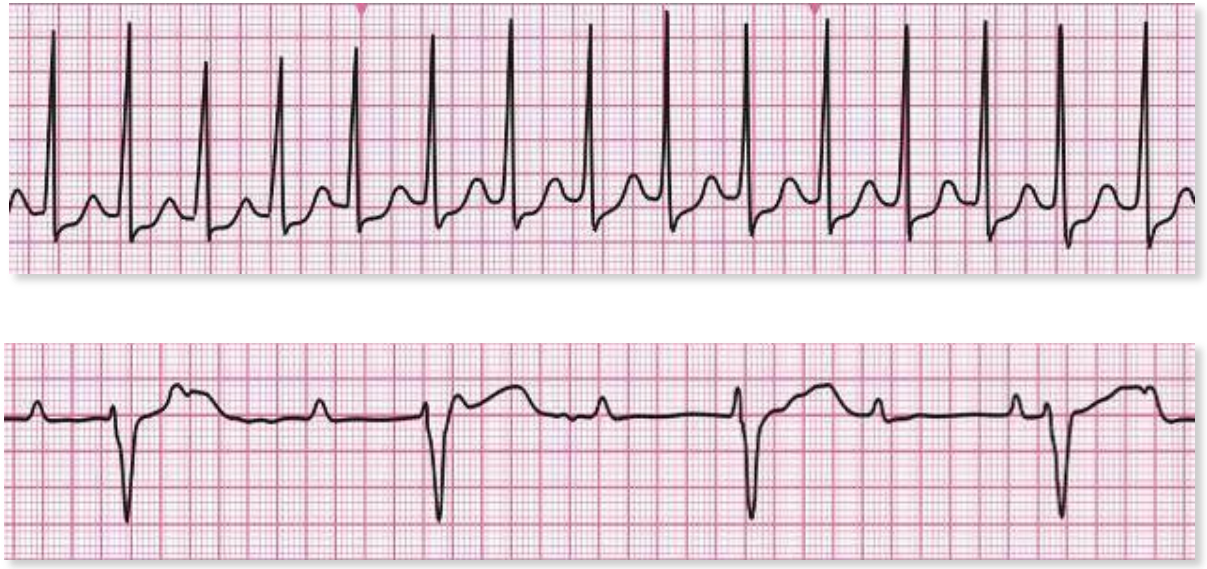
Non-shockable (PEA/Asystole)

Immediately resume CPR for 2 min
Minimise interruptions

Non-shockable (Pulseless Electrical Activity)



- Clinical features of cardiac arrest
- ECG normally associated with an output
- Adrenaline 1 mg IV then every 3-5 min

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During CPR

DURING CPR

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

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Resuscitation team

- Roles planned in advance
- Identify team leader
- Importance of non-technical skills
  - Task management
  - Team working
  - Situational awareness
  - Decision making
- Structured Communication

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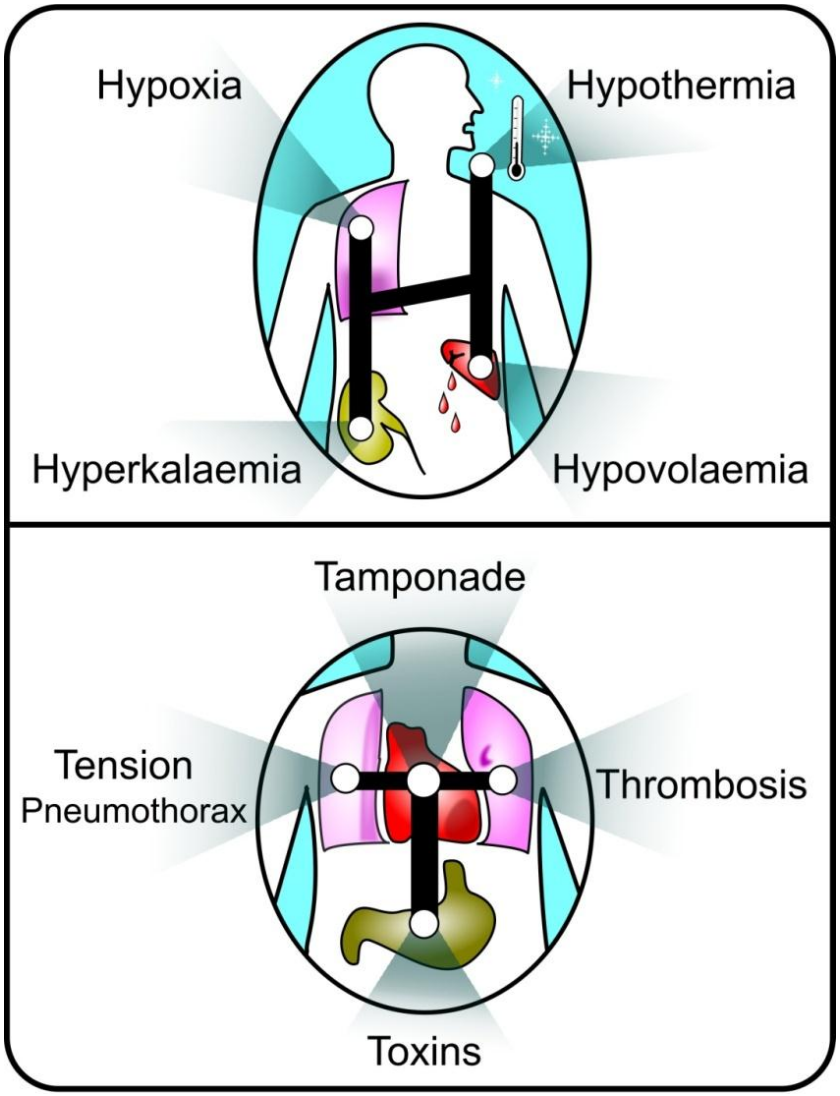
Reversible causes



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Hypoxia

- Ensure patent airway
- Give high-flow supplemental oxygen
- Avoid hyperventilation

Hypovolaemia

- Seek evidence of hypovolaemia
  - History
  - Examination
    - Internal haemorrhage
    - External haemorrhage
    - Check surgical drains
- Control haemorrhage
- If hypovolaemia suspected give intravenous fluids

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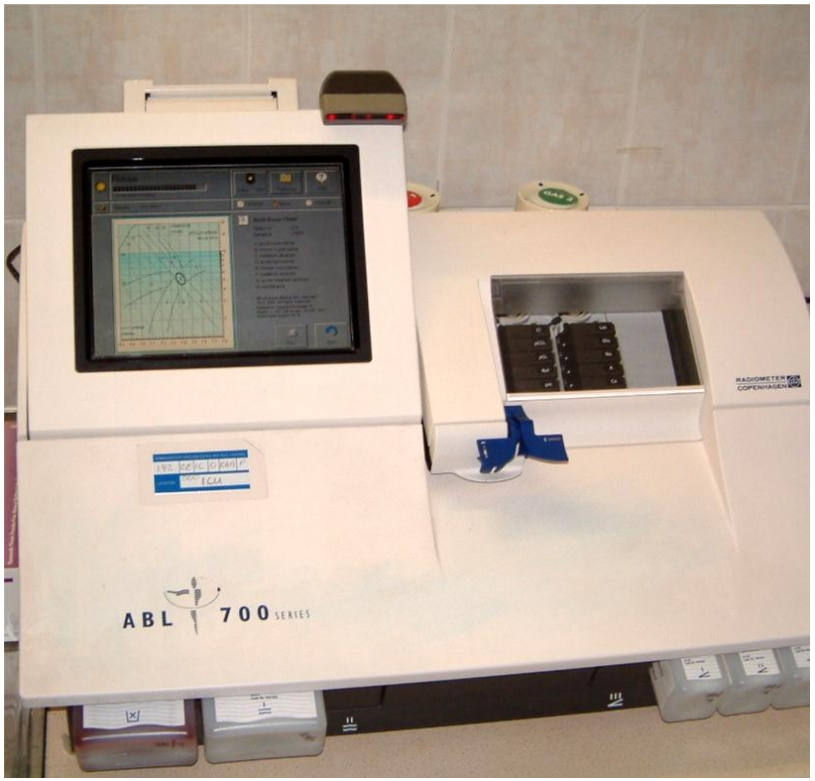
Hypo/hyperkalaemia and metabolic disorders

- Near patient testing for K^+ and glucose
- Check latest laboratory results
- Hyperkalaemia
  - Calcium chloride
  - Insulin/dextrose
- Hypokalaemia/ Hypomagnesaemia
  - Electrolyte supplementation



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Hypothermia

- Rare if patient is an in-patient
- Use low reading thermometer
- Treat with active rewarming techniques
- Consider cardiopulmonary bypass

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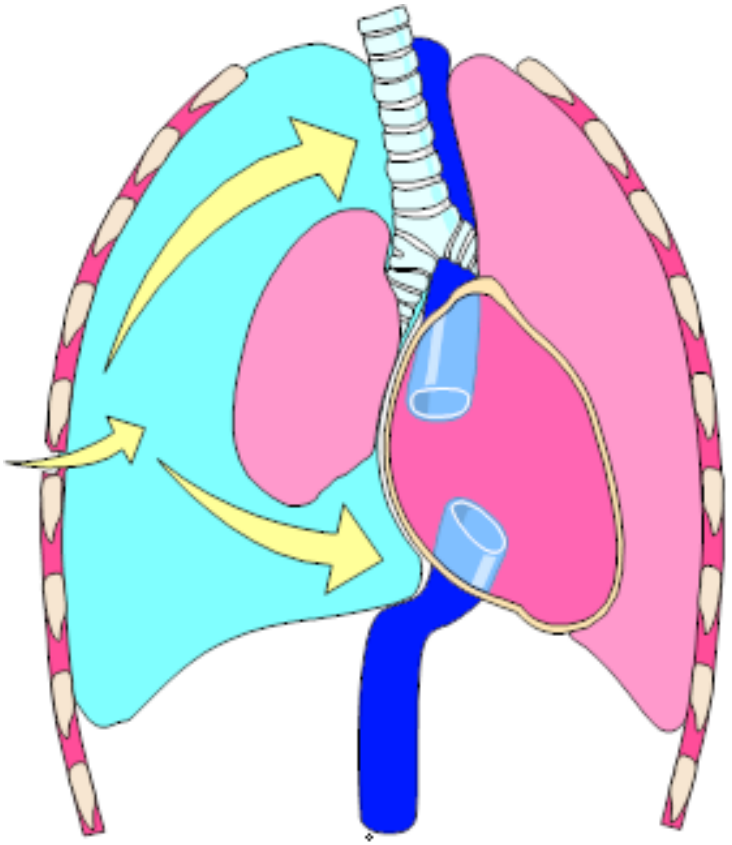
Tension pneumothorax

- Check tube position if intubated
- Clinical signs
  - Decreased breath sounds
  - Hyper-resonant percussion note
  - Tracheal deviation
- Initial treatment with needle decompression or thoracostomy



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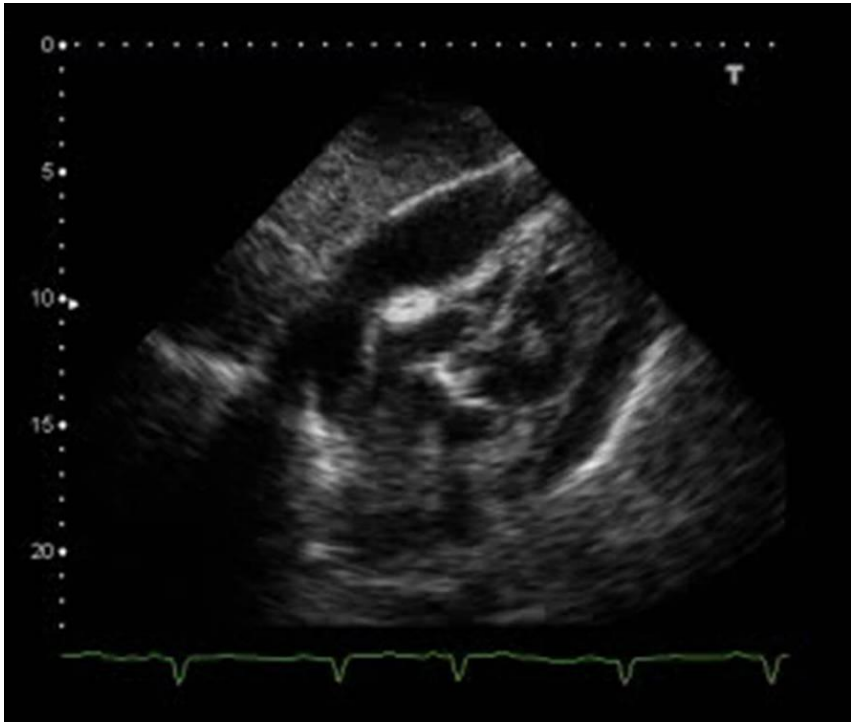
Tamponade, cardiac

- Difficult to diagnose without echocardiography
- Consider if penetrating chest trauma or after cardiac surgery
- Treat with needle pericardiocentesis or resuscitative thoracotomy



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Toxins

- Rare unless evidence of deliberate overdose
- Review drug chart

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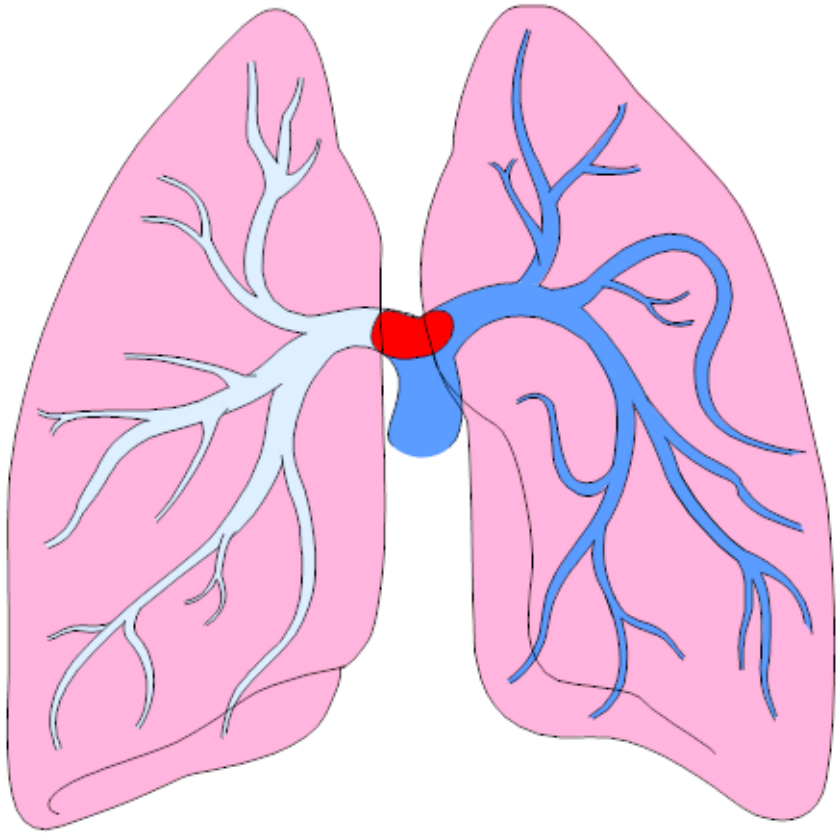
Thrombosis

- If high clinical probability for PE consider fibrinolytic therapy
- If fibrinolytic therapy given continue CPR for up to 60-90 min before discontinuing resuscitation



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Ultrasound

- Do not interrupt CPR
- Obtain images during rhythm checks
- In skilled hands may identify reversible causes

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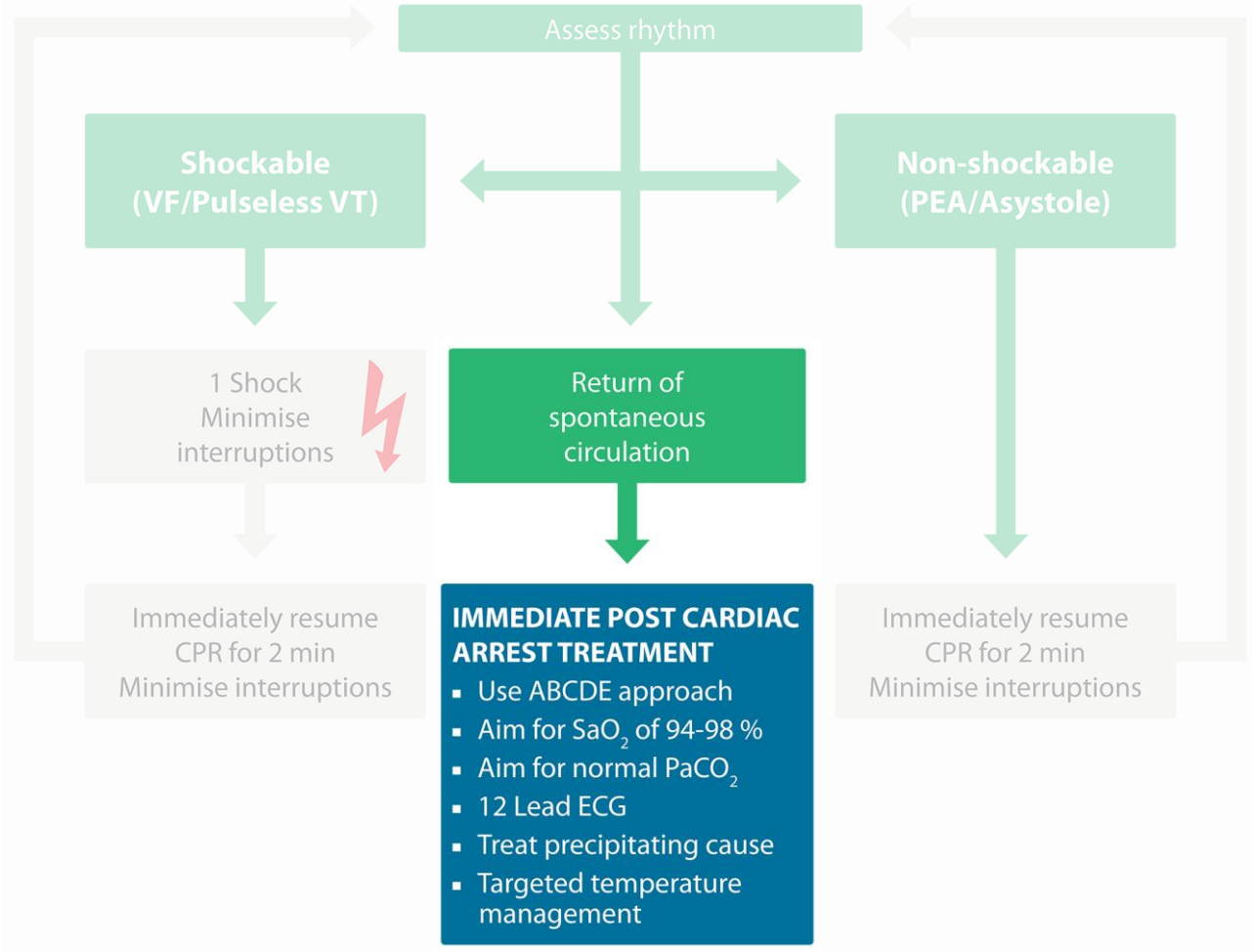
Immediate post-cardiac arrest treatment



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Any questions?

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Summary

- The ALS algorithm
- Treatment of shockable and non-shockable rhythms
- Potentially reversible causes of cardiac arrest