ALS Algorithm

Learning outcomes

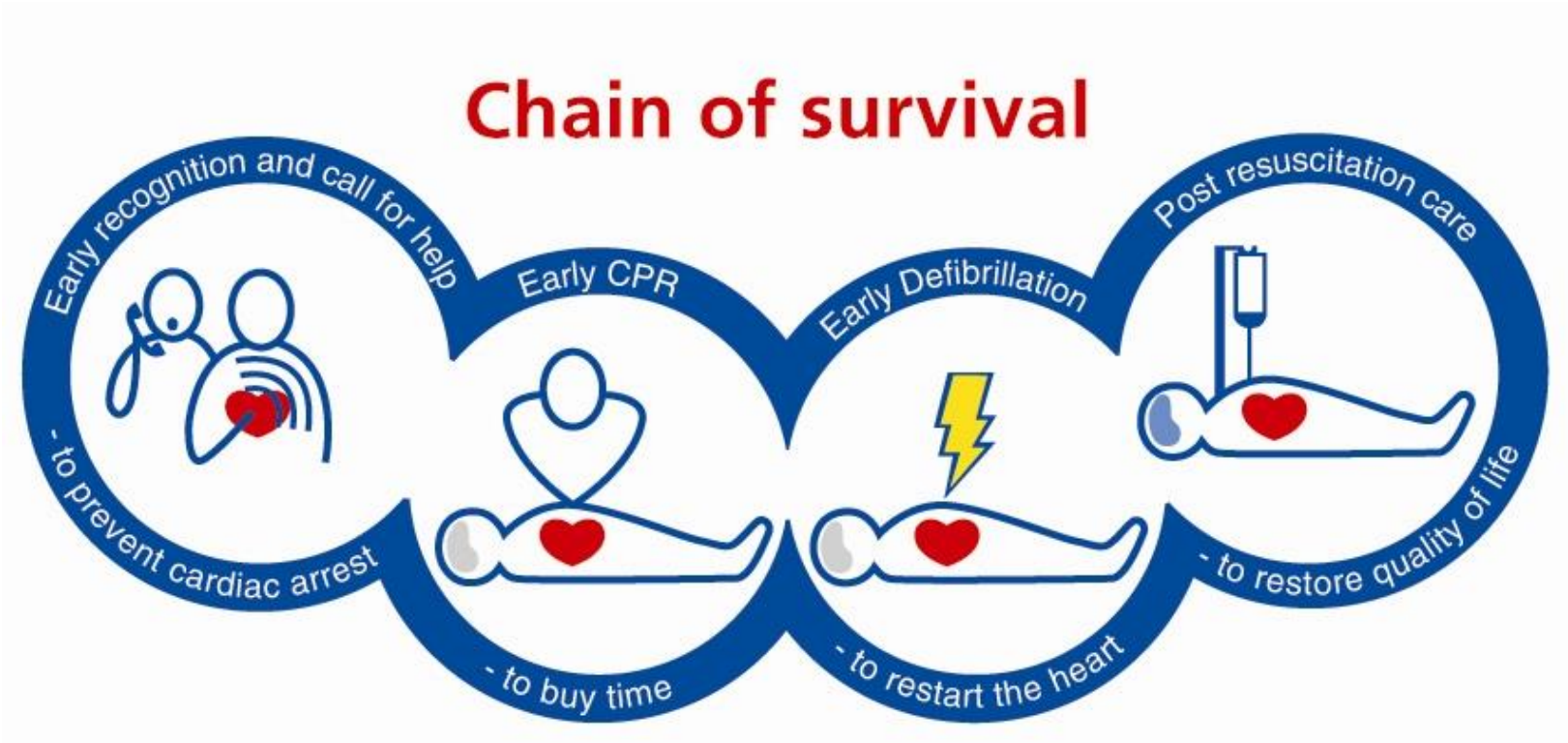
- The ALS algorithm
- Importance of high quality chest compressions
- Treatment of shockable and non-shockable rhythms
- Administration of drugs during cardiac arrest
- Potentially reversible causes of cardiac arrest
- Role of resuscitation team

Resuscitation team

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

Defibrillation energies

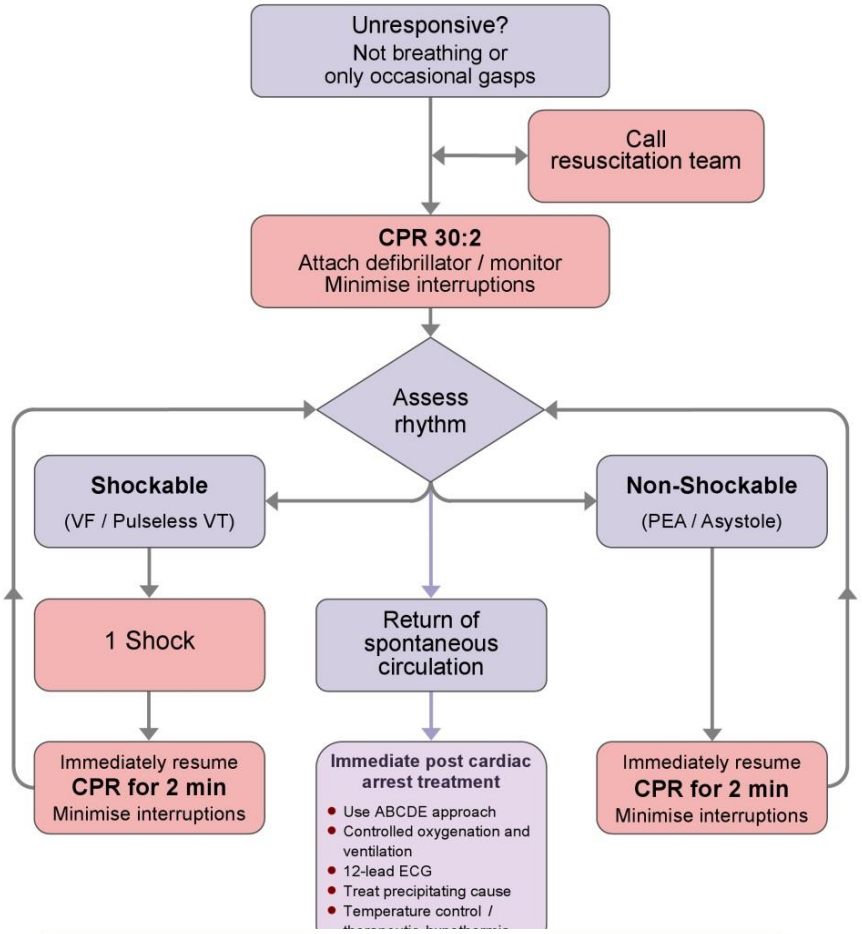
- Vary with manufacturer
- Check local equipment
- If unsure, deliver highest available energy
- DO NOT DELAY SHOCK
- Energy levels for defibrillators on this course…



Early recognition prevents:

- Cardiac arrests and deaths
- Admissions to ICU
- Inappropriate resuscitation attempts

Adult Advanced Life Support



During CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Correct reversible causes

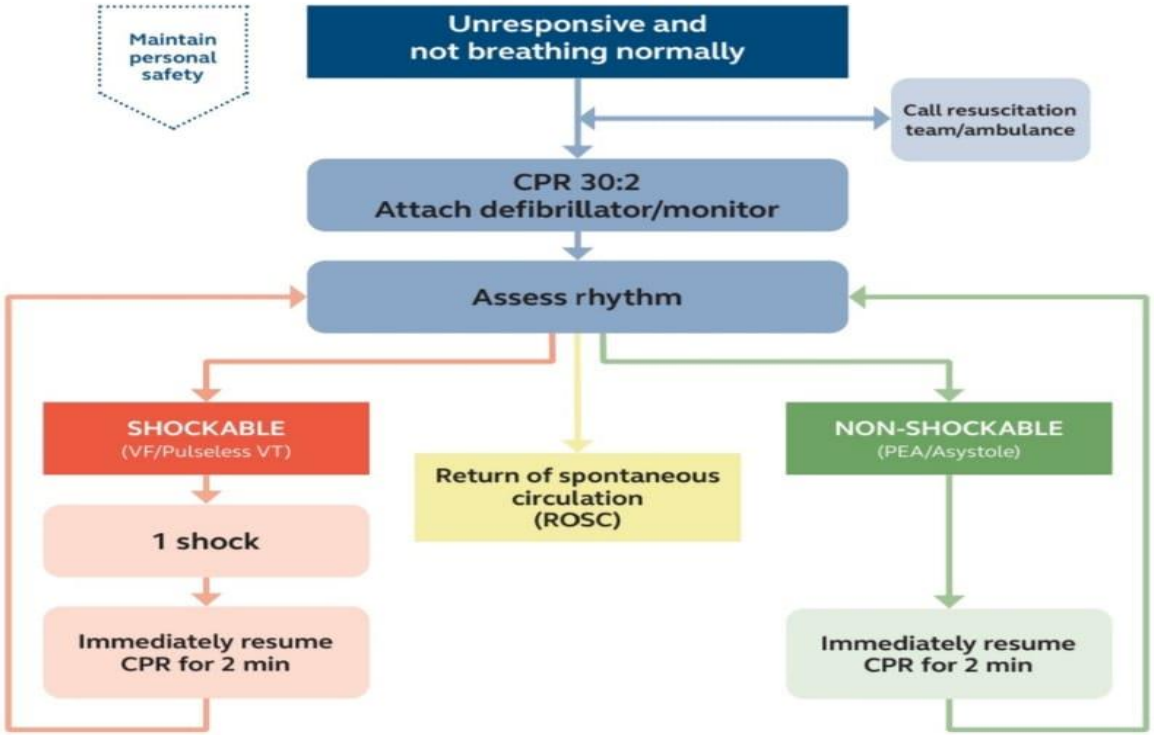
Reversible Causes

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

Resuscitation Council UK

GUIDELINES 2021

Adult advanced life support



Give high-quality chest compressions, and:

- Give oxygen
- Use waveform capnography
- Continuous compressions if advanced airway
- Minimise interruptions to compressions
- Intravenous or intraosseous access
- Give adrenaline every 3–5 min
- Give amiodarone after 3 shocks
- Identify and treat reversible causes

Identify and treat reversible causes

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

Consider ultrasound imaging to identify reversible causes

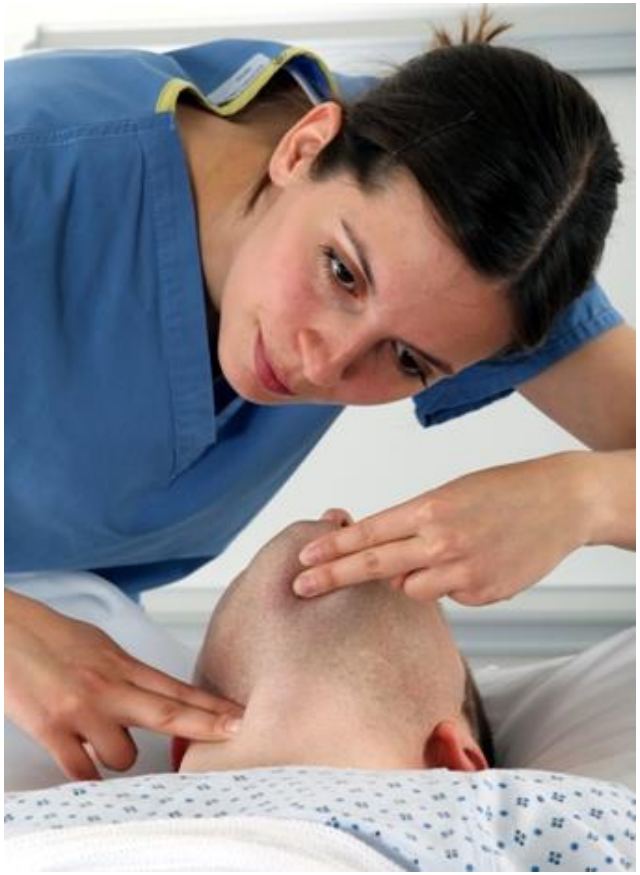
Consider

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

After ROSC

- Use an ABCDE approach
- Aim for SpO_2 of 94–98% and normal $PaCO_2$
- 12-lead ECG
- Identify and treat cause
- Targeted temperature management

Unresponsive?
Not breathing or
only occasional gasps



To confirm cardiac arrest…

- Patient response
- Open airway
- Check for normal breathing
  - Caution agonal breathing
- Check circulation
- Monitoring

Cardiac arrest confirmed

Unresponsive?
Not breathing or
only occasional gasps

Call
resuscitation team

Cardiac arrest confirmed

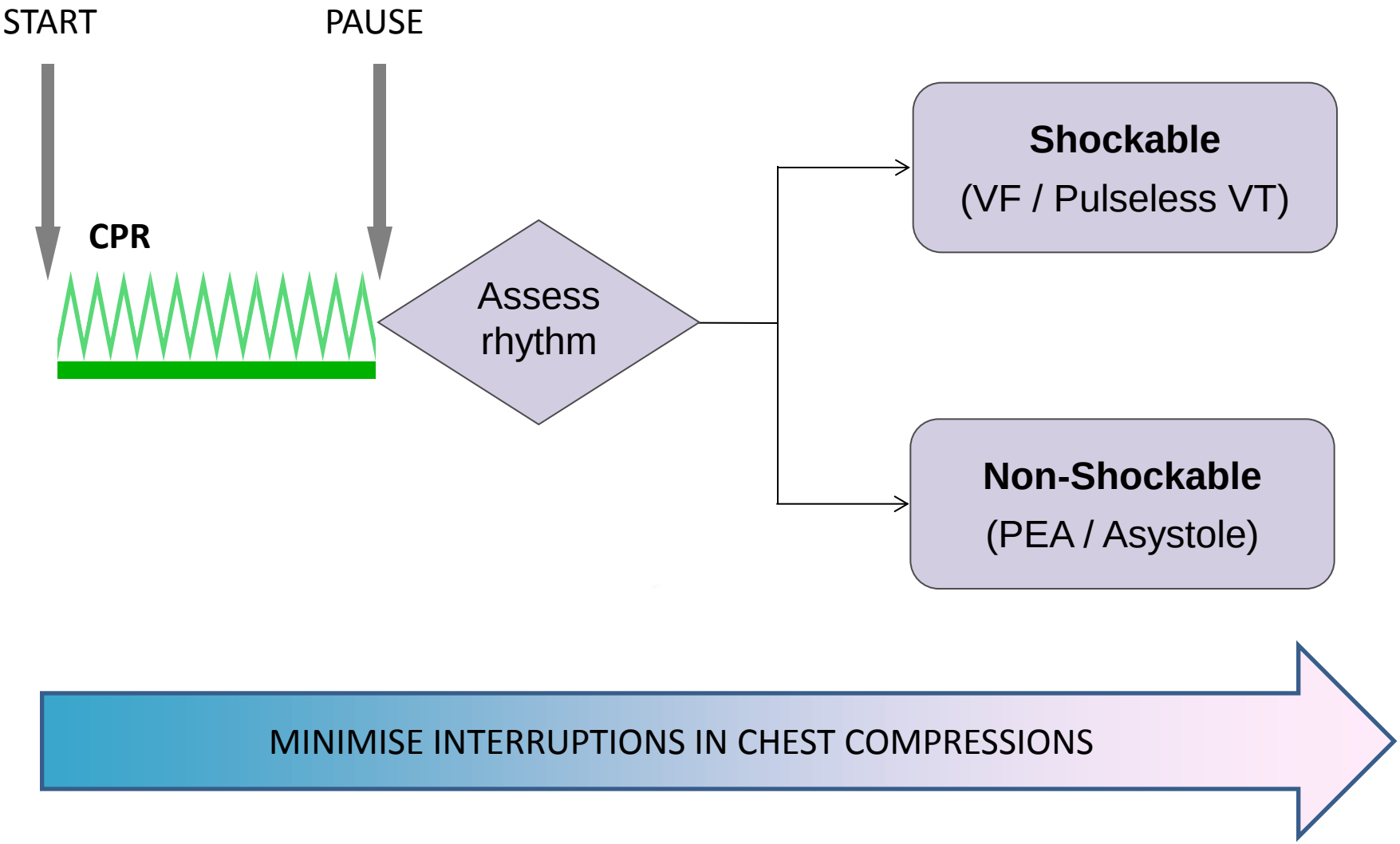
Unresponsive?
Not breathing or
only occasional gasps

Call
resuscitation team

CPR 30:2
Attach defibrillator / monitor
Minimise interruptions

Chest compression

- 30:2
- Compressions
  - Centre of chest
  - 5-6 cm depth
  - 2 per second (100-120 min^{-1})
- Maintain high quality compressions with minimal interruptions
- Continuous compressions once airway secured
- Switch CPR provider every 2 min cycle to avoid fatigue


START
PAUSE
CPR
Assess rhythm
Shockable
(VF / Pulseless VT)
Non-Shockable
(PEA / Asystole)
MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

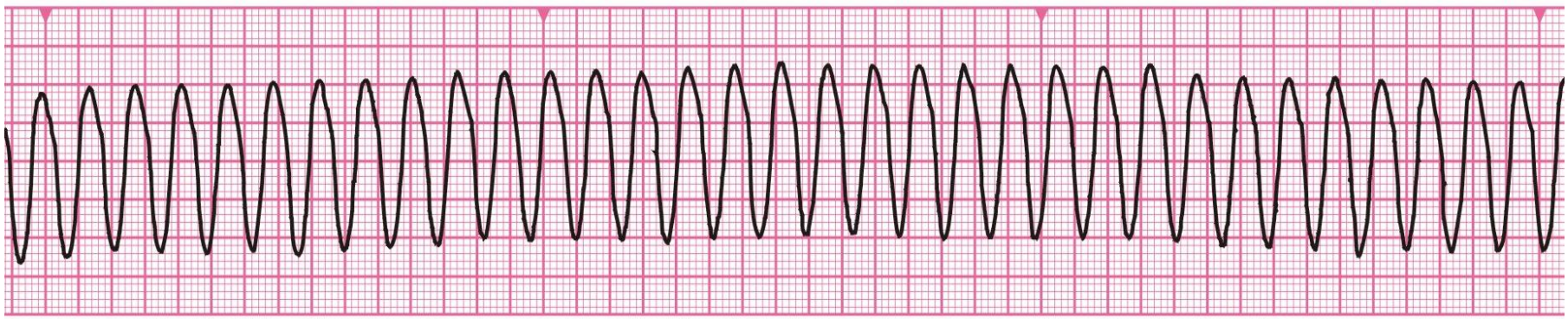
Shockable

(VF)

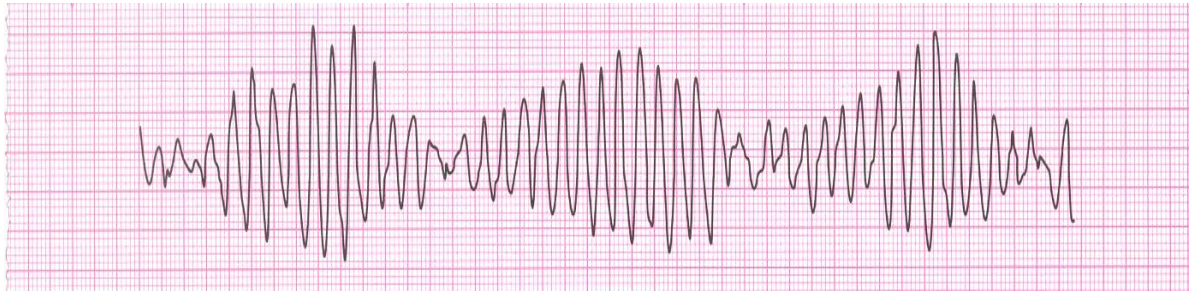
- Bizarre irregular waveform
- No recognisable QRS complexes
- Random frequency and amplitude
- Uncoordinated electrical activity
- Coarse/fine
- Exclude artefact
  - Movement
  - Electrical interference

Shockable

(VT)



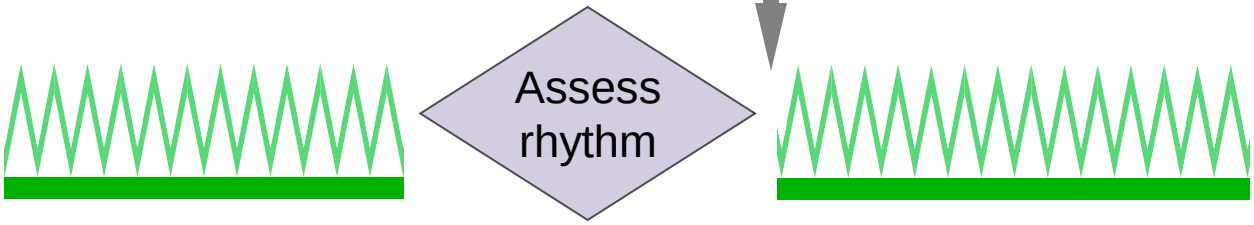
- Monomorphic VT
  - Broad complex rhythm
  - Rapid rate
  - Constant QRS mc
- Polymorphic VT
  - Torsade de pointes



Shockable

(VF / VT)

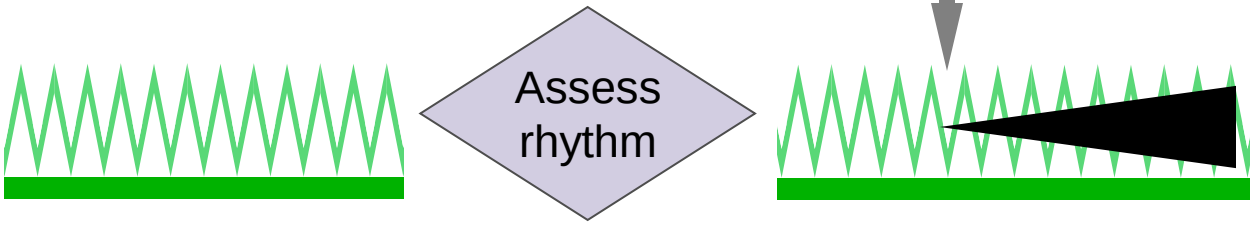
RESTART
CPR



Shockable

(VF / VT)

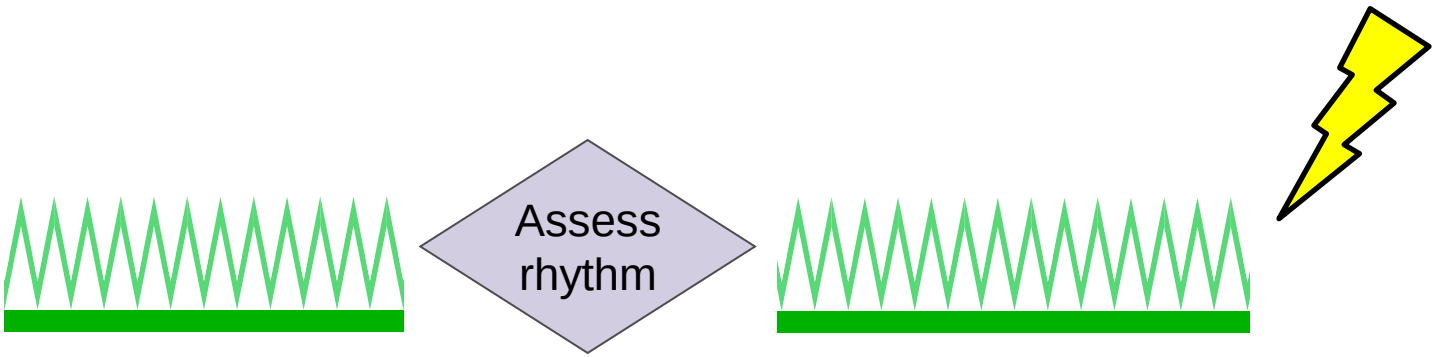
CHARGE
DEFIBRILLATOR



Shockable

(VF / VT)

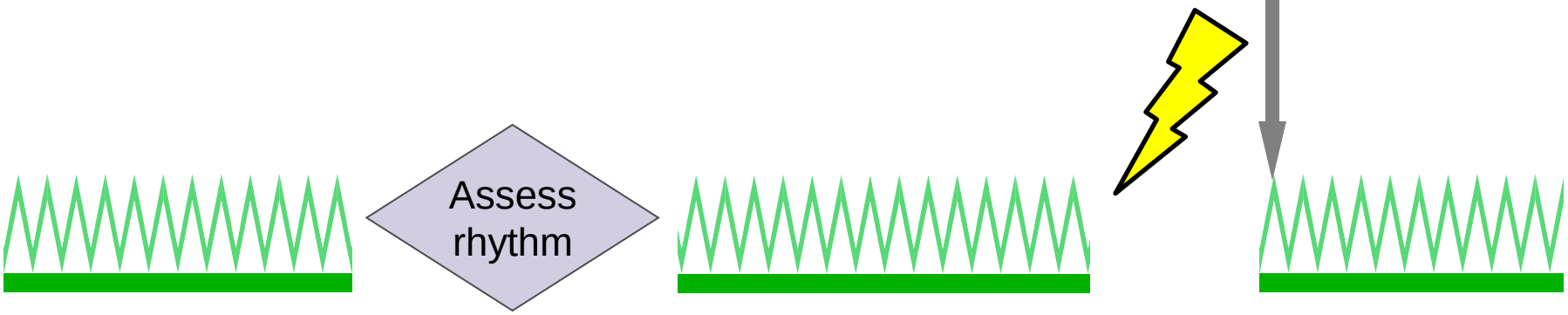
DELIVER SHOCK



Shockable

(VF / VT)

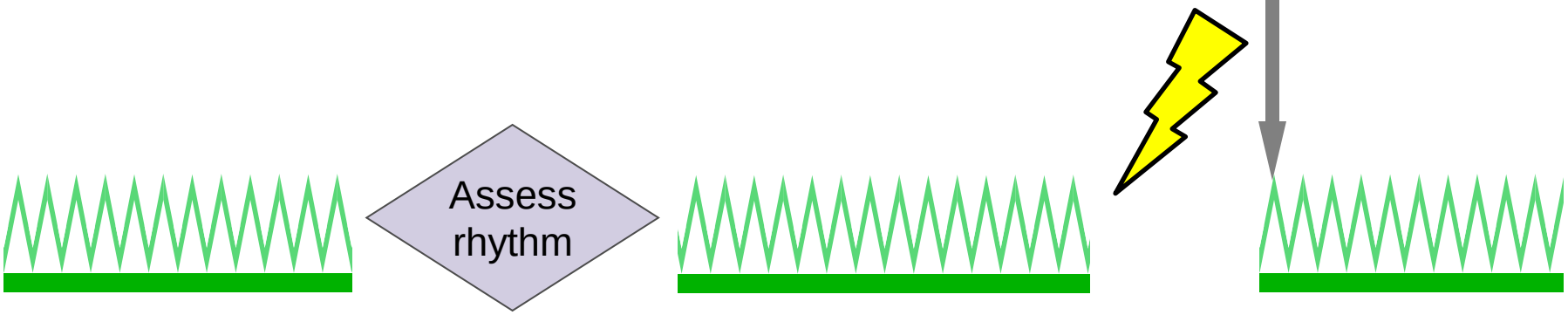
IMMEDIATELY
RESTART CPR



Shockable

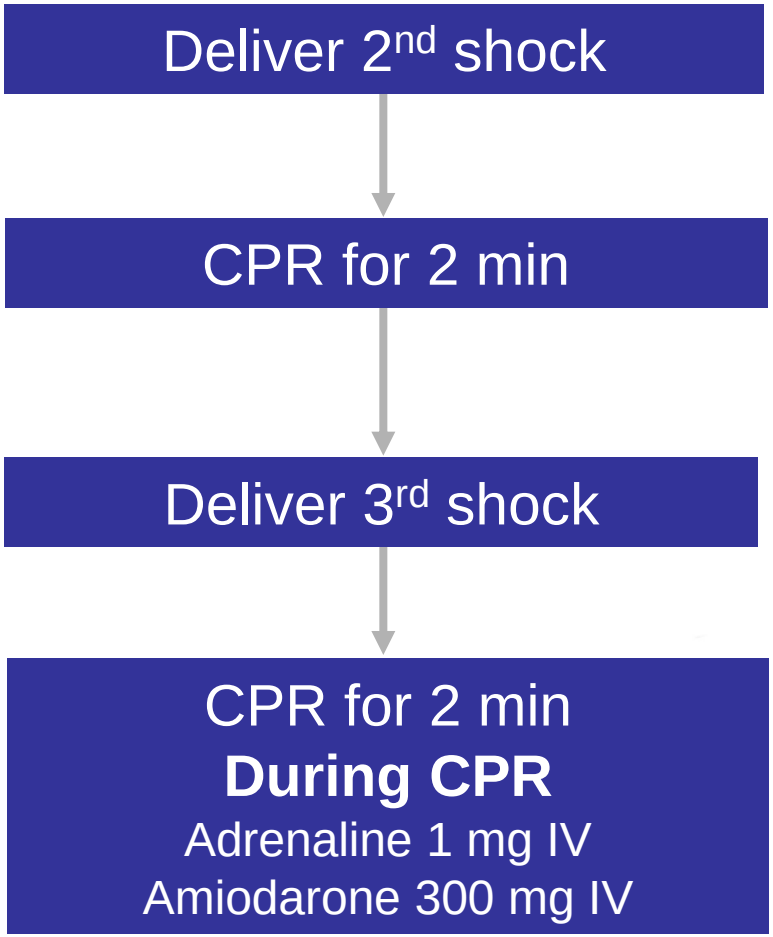
(VF / VT)

IMMEDIATELY
RESTART CPR

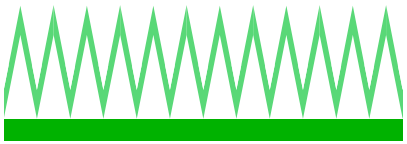


MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

If VF / VT persists



- 2nd and subsequent shocks
  - 150 – 360 J biphasic
  - 360 J monophasic
- Give adrenaline and amiodarone after 3rd shock during CPR



Assess rhythm

Shockable
(VF / Pulseless VT)

Non-Shockable
(PEA / Asystole)

MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS

Non-Shockable

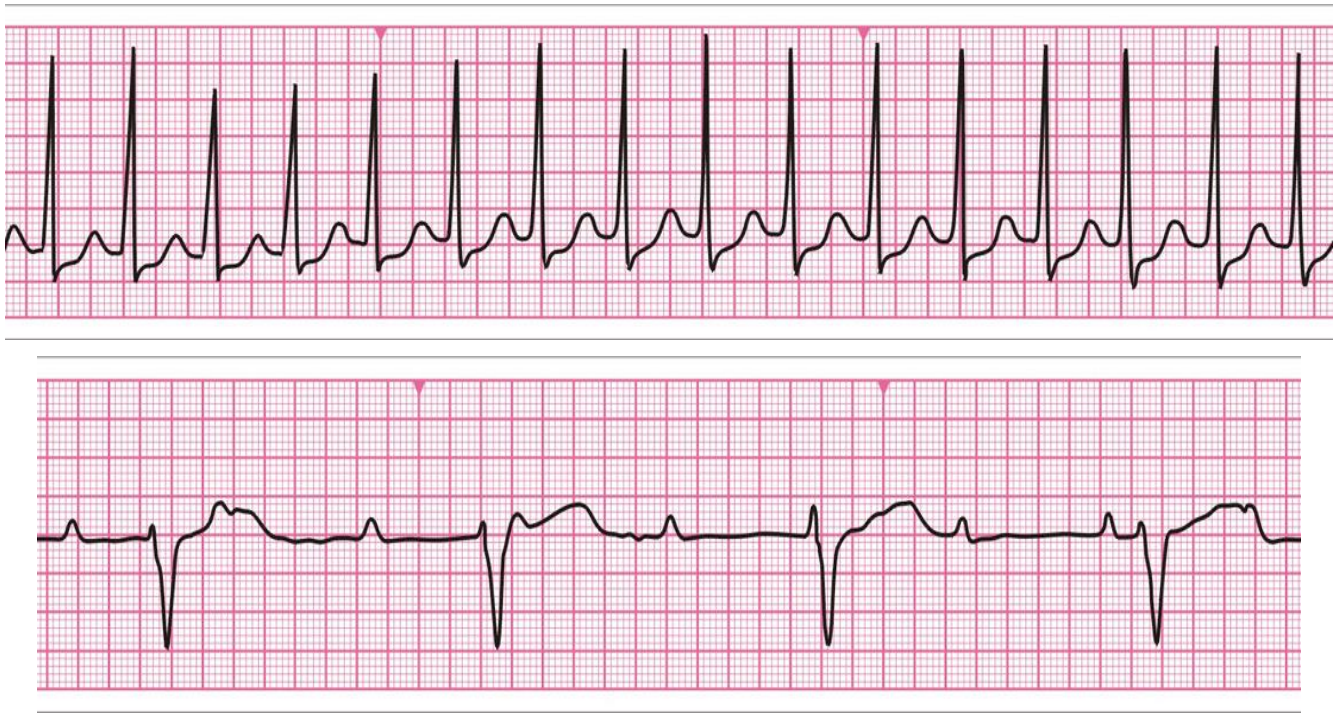
(Asystole)

- Absent ventricular (QRS) activity
- Atrial activity (P waves) may persist
- Rarely a straight line trace

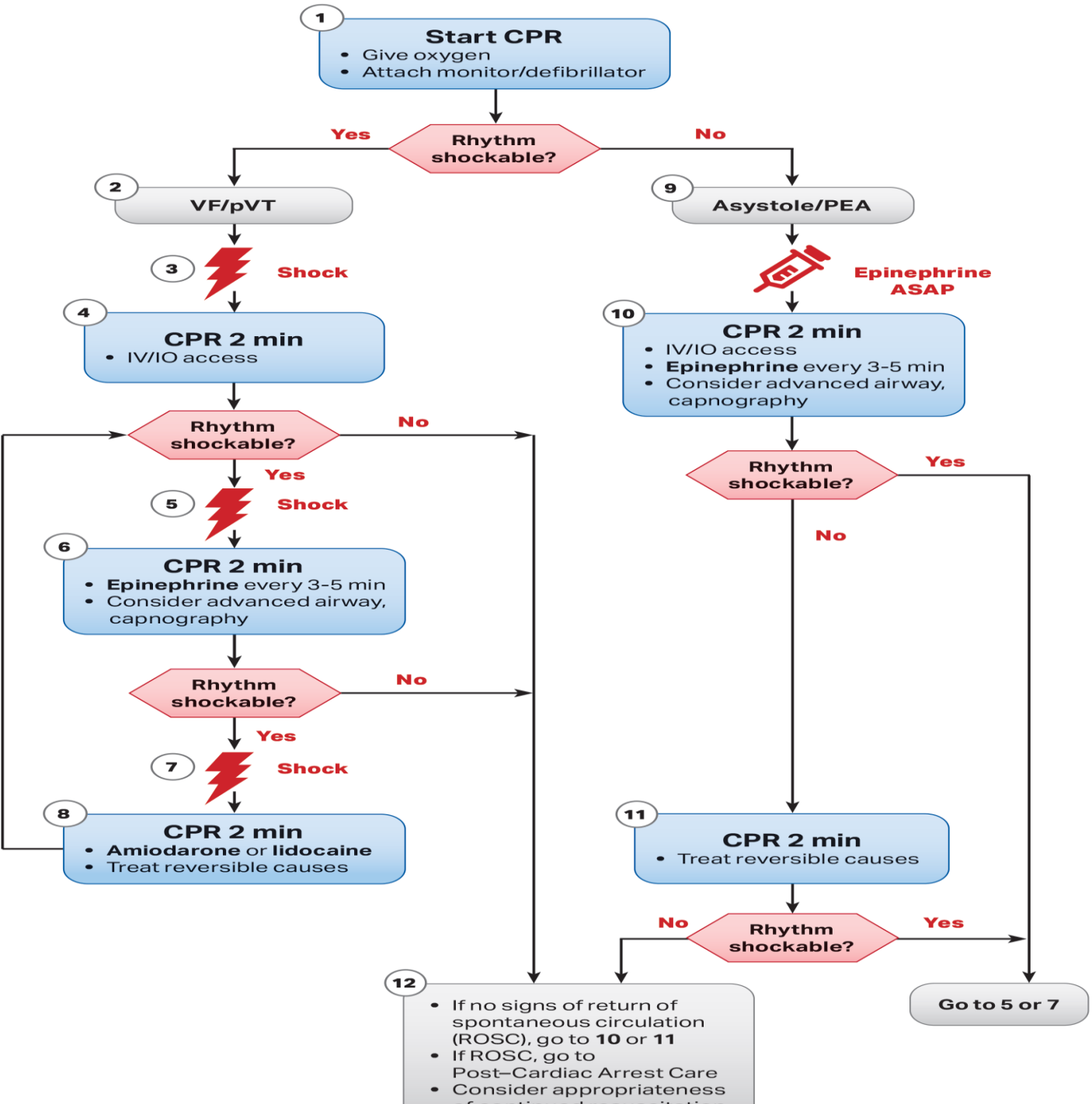
- Adrenaline 1 mg IV then every 3-5 min

Non-Shockable

(PEA)



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



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} is low or decreasing, reassess CPR quality.

Shock Energy for Defibrillation

- **Biphasic**: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic**: 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
  or
  Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

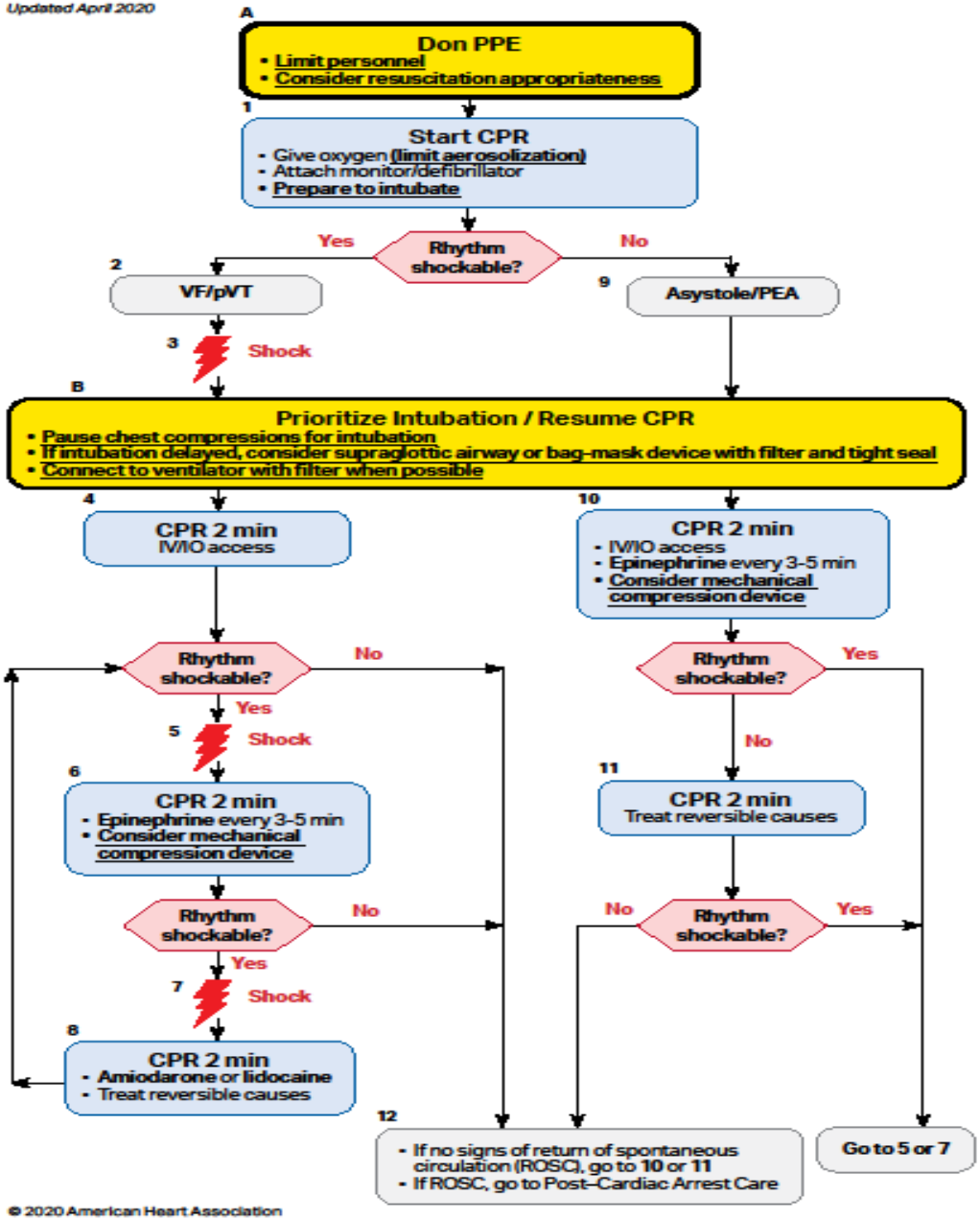
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

ACLS Cardiac Arrest Algorithm for Suspected or Confirmed COVID-19 Patients

Updated April 2020



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100–120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120–200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Advanced Airway

- **Minimize closed-circuit disconnection**
- **Use intubator with highest likelihood of first pass success**
- **Consider video laryngoscopy**
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Drug Therapy

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Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **Hypovolemia**
- **Hypoxia**
- **Hydrogen ion (acidosis)**
- **Hypo-/hyperkalemia**
- **Hypothermia**
- **Tension pneumothorax**
- **Tamponade, cardiac**
- **Toxins**
- **Thrombosis, pulmonary**
- **Thrombosis, coronary**

Treatment of shockable rhythms (VF/VT)

- **Confirm cardiac arrest – check for signs of life and normal breathing, and if trained to do so check for breathing and a pulse simultaneously.**
- **Call resuscitation team.**
- **Perform uninterrupted chest compressions while applying self-adhesive defibrillation/monitoring pads – one below the right clavicle and the other in the V6 position in the midaxillary line.**
- **Plan actions before pausing CPR for rhythm analysis and communicate these to the team.**
- **Stop chest compressions; confirm VF/pVT from the ECG. This pause in chest compressions should be brief and no longer than 5 seconds.**
- **Resume chest compressions immediately; warn all rescuers other than the individual performing the chest compressions to "stand clear" and remove any oxygen delivery device as appropriate.**

Treatment of shockable rhythms (VF/VT) Continue

- **The designated person selects the appropriate energy on the defibrillator and presses the charge button. Choose an energy setting of at least 150 J for the first shock, the same or a higher energy for subsequent shocks, or follow the manufacturer's guidance for the particular defibrillator. If unsure of the correct energy level for a defibrillator choose the highest available energy.**
- **Ensure that the rescuer giving the compressions is the only person touching the patient.**
- **Once the defibrillator is charged and the safety check is complete, tell the rescuer doing the chest compressions to "stand clear"; when clear, give the shock.**
- **After shock delivery immediately restart CPR using a ratio of 30:2, starting with chest compressions. Do not pause to reassess the rhythm or feel for a pulse. The total pause in chest compressions should be brief and no longer than 5 seconds.**
- **Continue CPR for 2 min; the team leader prepares the team for the next pause in CPR.**
- **Pause briefly to check the monitor.**
- **If VF/pVT, repeat steps 6–12 above and deliver a second shock.**

Treatment of shockable rhythms (VF/VT) Continue

- **If VF/pVT persists, repeat steps 6–8 above and deliver a third shock. Resume chest compressions immediately. Give adrenaline 1 mg IV and amiodarone 300 mg IV while performing a further 2 min CPR. Withhold adrenaline if there are signs of return of spontaneous circulation (ROSC) during CPR.**
- **Repeat this 2 min CPR – rhythm/pulse check – defibrillation sequence if VF/pVT persists.**
- **Give further adrenaline 1 mg IV after alternate shocks (i.e. approximately every 3–5 min).**
- **If organised electrical activity compatible with a cardiac output is seen during a rhythm check, seek evidence of ROSC (check for signs of life, a central pulse and end-tidal CO_2 if available).**
  - **If there is ROSC, start post-resuscitation care.**
  - **If there are no signs of ROSC, continue CPR and switch to the non-shockable algorithm.**
- **If asystole is seen, continue CPR and switch to the non shockable algorithm.**

Treatment of shockable rhythms (VF/VT) Continue

- **The designated person selects the appropriate energy on the defibrillator and presses the charge button. Choose an energy setting of at least 150 J for the first shock, the same or a higher energy for subsequent shocks, or follow the manufacturer's guidance for the particular defibrillator. If unsure of the correct energy level for a defibrillator choose the highest available energy.**
- **Ensure that the rescuer giving the compressions is the only person touching the patient.**
- **Once the defibrillator is charged and the safety check is complete, tell the rescuer doing the chest compressions to "stand clear"; when clear, give the shock.**
- **After shock delivery immediately restart CPR using a ratio of 30:2, starting with chest compressions. Do not pause to reassess the rhythm or feel for a pulse. The total pause in chest compressions should be brief and no longer than 5 seconds.**
- **Continue CPR for 2 min; the team leader prepares the team for the next pause in CPR.**
- **Pause briefly to check the monitor.**
- **If VF/pVT, repeat steps 6–12 above and deliver a second shock.**

Treatment of PEA and asystole

- **Start CPR 30:2**
- **Give adrenaline 1 mg IV as soon as intravascular access is achieved**
- **Continue CPR 30:2 until the airway is secured – then continue chest compressions without pausing during ventilation**
- **Recheck the rhythm after 2 min:**
- **a. If electrical activity compatible with a pulse is seen, check for a pulse and/or signs of life**
    - **i. If a pulse and/or signs of life are present, start post resuscitation care**
    - **ii. If no pulse and/or no signs of life are present (PEA OR asystole):**
- **Continue CPR**
- **Recheck the rhythm after 2 min and proceed accordingly**
- **Give further adrenaline 1 mg IV every 3–5 min (during alternate 2-min loops of CPR)**
- **b. If VF/pVT at rhythm check, change to shockable side of algorithm.**

During CPR

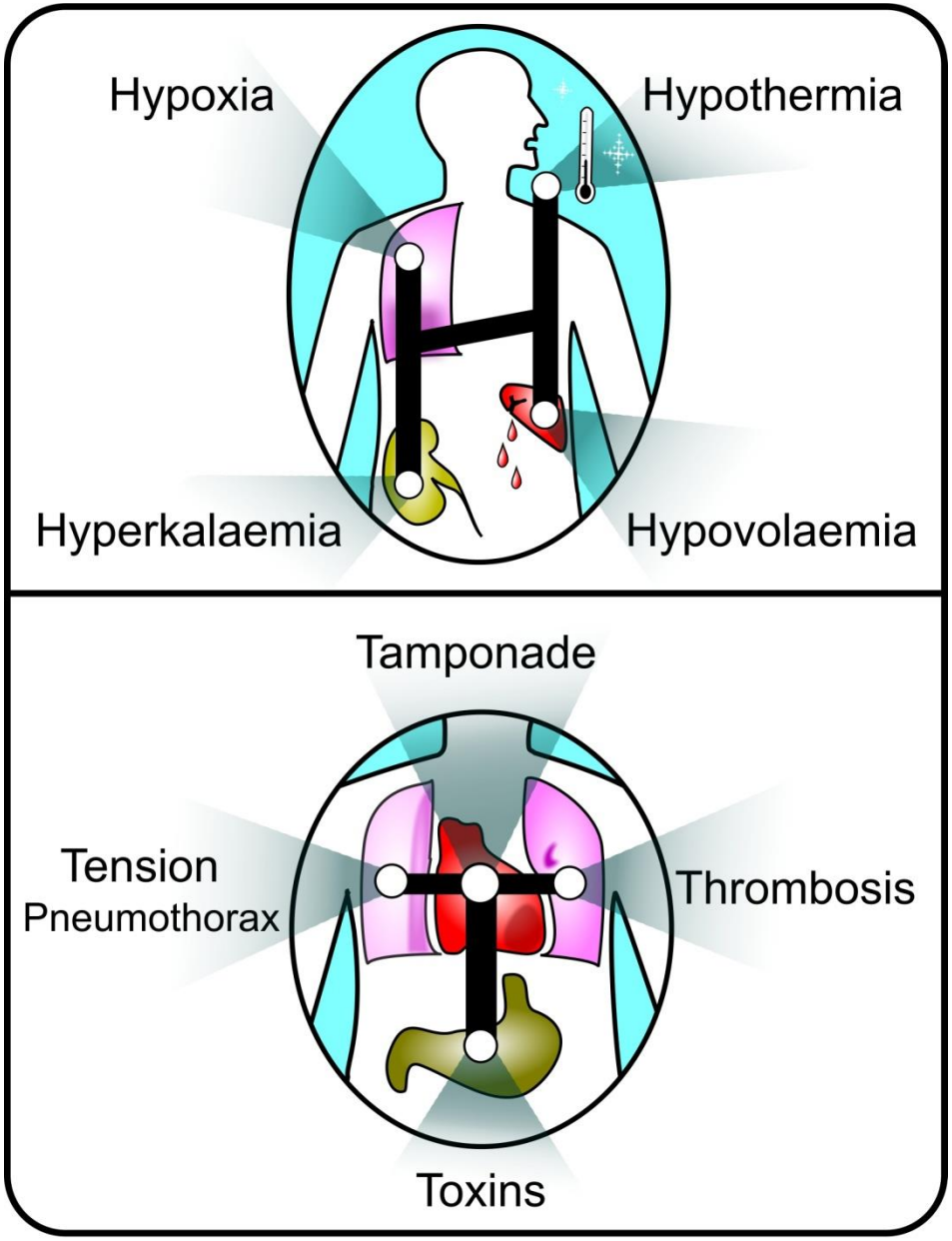
- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Correct reversible causes

Airway and ventilation

- Secure airway:
  - Supraglottic airway device e.g. LMA, i-gel
  - Tracheal tube
- Do not attempt intubation unless trained and competent to do so
- Once airway secured, if possible, do not interrupt chest compressions for ventilation
- Avoid hyperventilation
- Capnography

Vascular access

- Peripheral versus central veins
- Intraosseous


Hypoxia
Hypothermia
Hyperkalaemia
Hypovolaemia
Tamponade
Tension
Pneumothorax
Thrombosis
Toxins

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

Hypo/hyperkalaemia and metabolic disorders

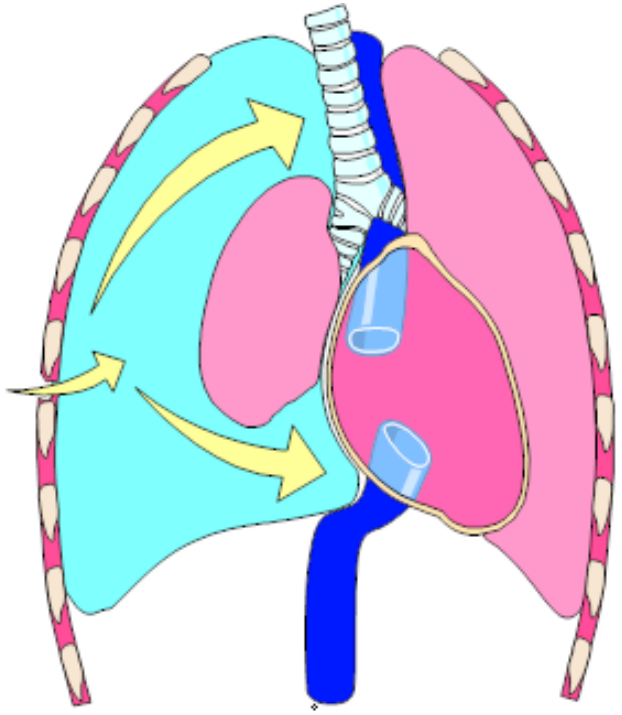
- Near patient testing for K^+ and glucose
- Check latest laboratory results
- Hyperkalaemia
  - Calcium chloride
  - Insulin/dextrose
- Hypokalaemia/ Hypomagnesaemia
  - Electrolyte supplementation

Hypothermia

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

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



Tamponade, cardiac

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

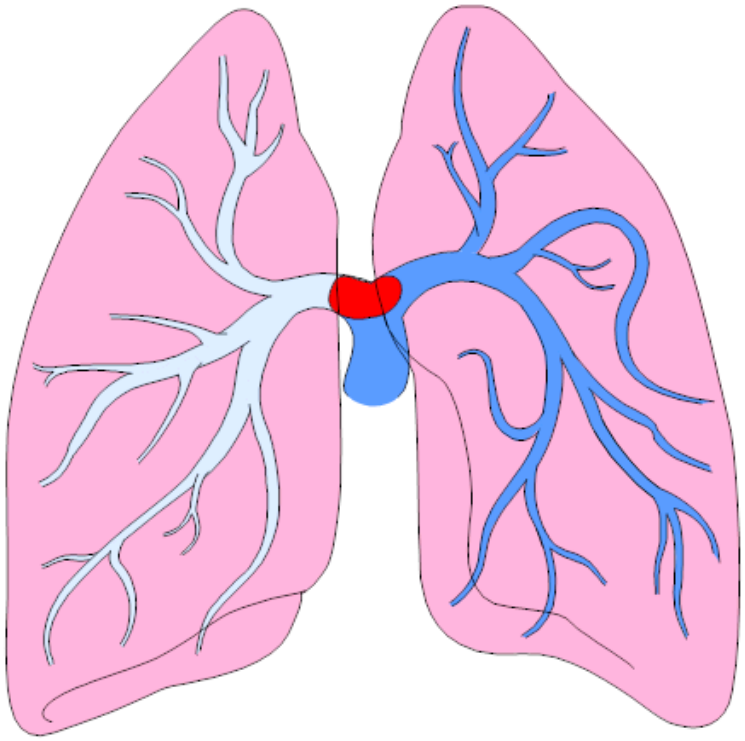
Toxins

- Rare unless evidence of deliberate overdose
- Review drug chart

Thrombosis

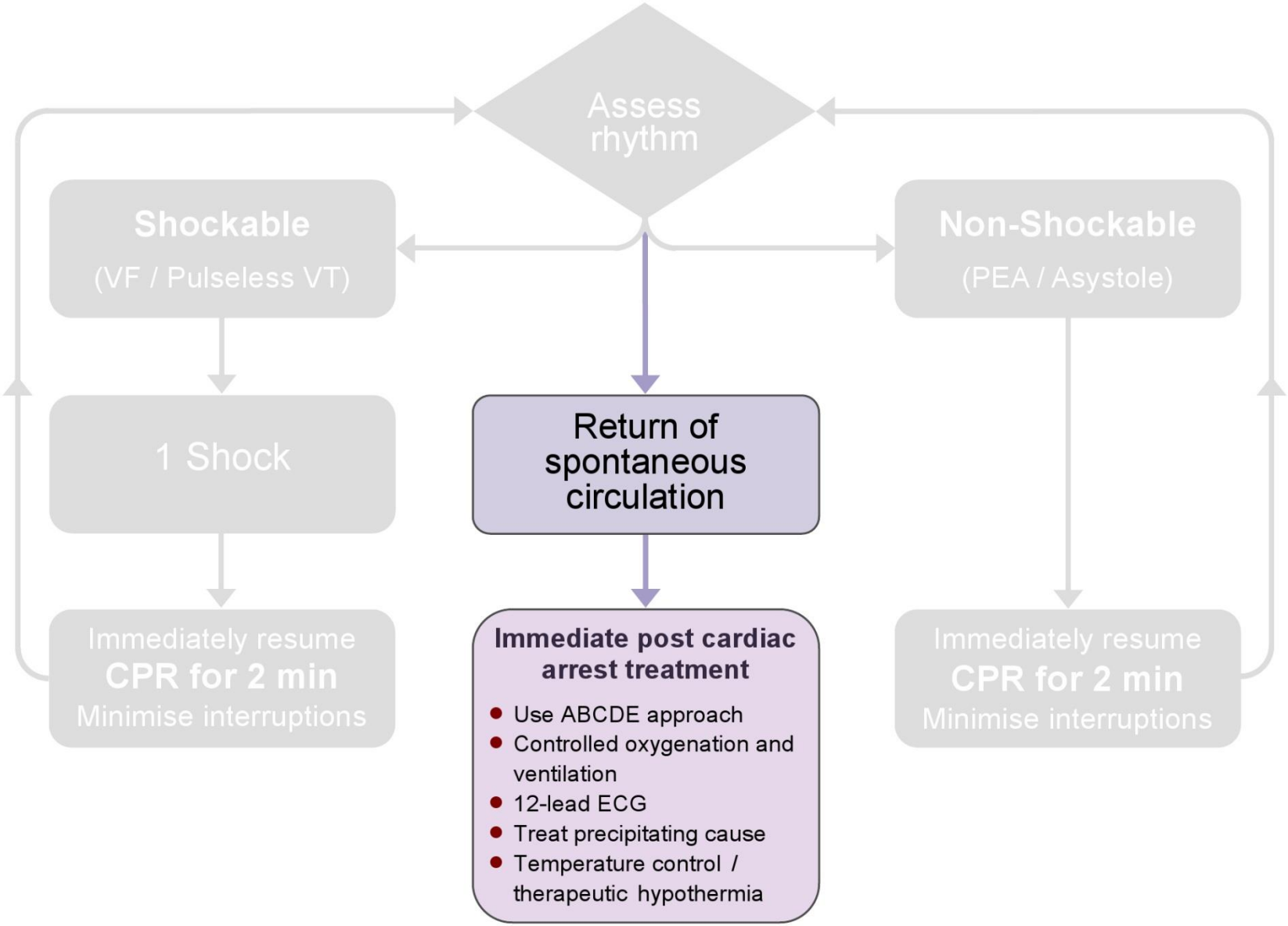
- If high clinical probability for PE consider fibrinolytic therapy

- If fibrinolytic therapy given continue CPR for up to 60-90 min before discontinuing resuscitation



Ultrasound

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


Assess rhythm
Shockable
(VF / Pulseless VT)
Non-Shockable
(PEA / Asystole)
1 Shock
Return of spontaneous circulation
Immediately resume
CPR for 2 min
Minimise interruptions
Immediate post cardiac arrest treatment
Use ABCDE approach
Controlled oxygenation and ventilation
12-lead ECG
Treat precipitating cause
Temperature control / therapeutic hypothermia
Immediately resume
CPR for 2 min
Minimise interruptions

Resuscitation Council UK

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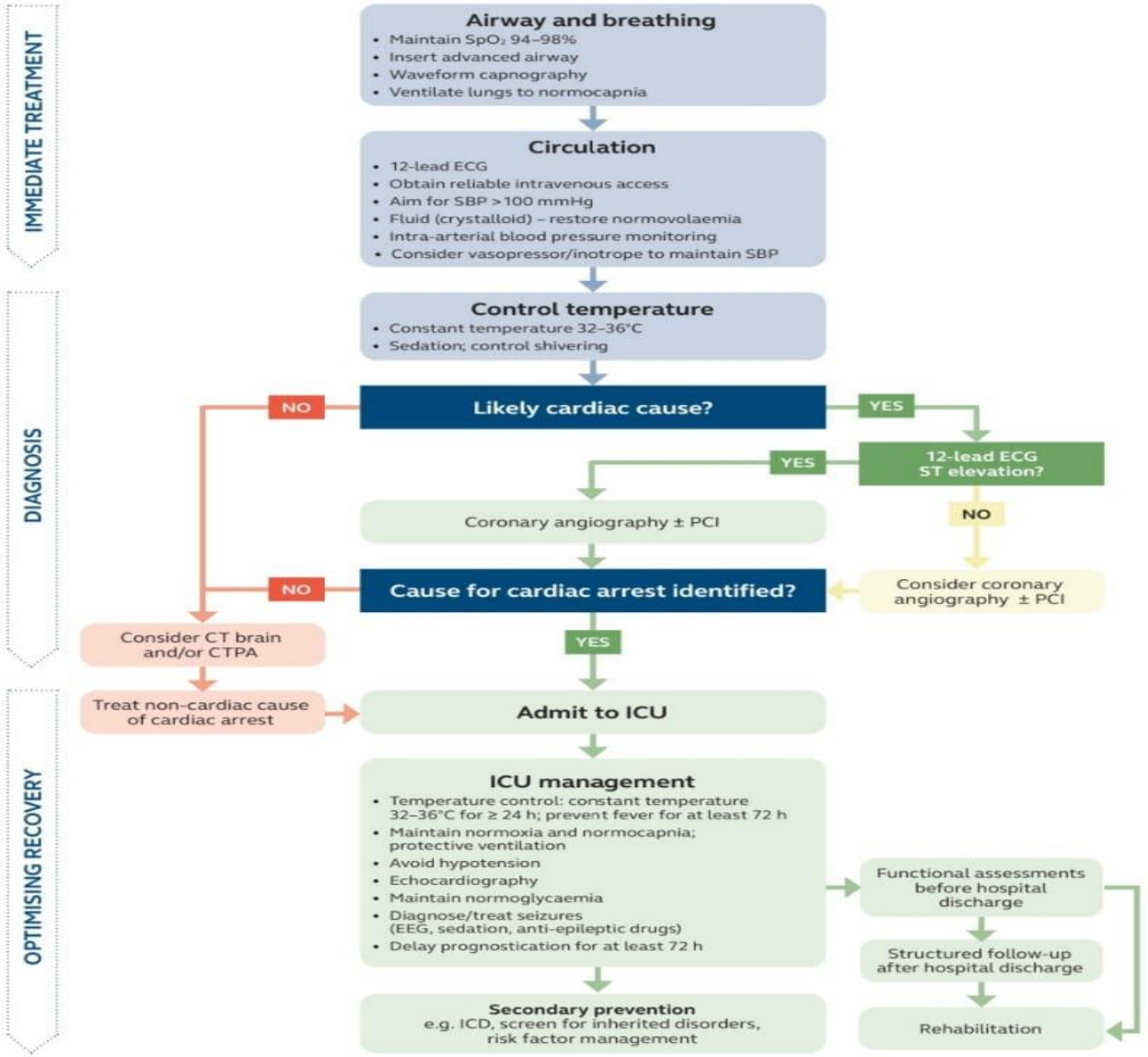
Adult post resuscitation care



Council (UK)

Any questions?

Summary

- The ALS algorithm
- Importance of high quality chest compressions
- Treatment of shockable and non-shockable rhythms
- Administration of drugs during cardiac arrest
- Potentially reversible causes of cardiac arrest
- Role of resuscitation team

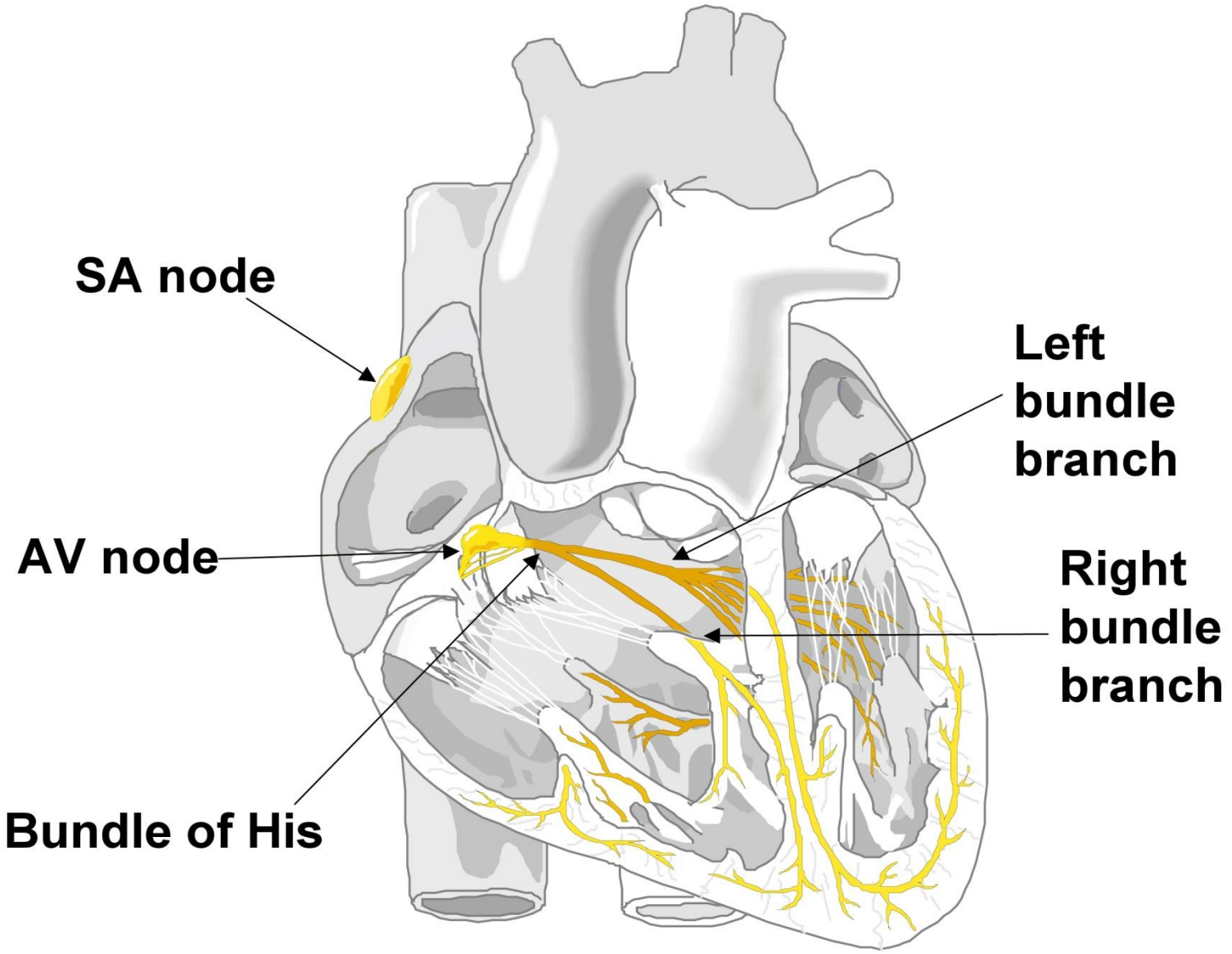
Advanced Life Support Course
Slide set

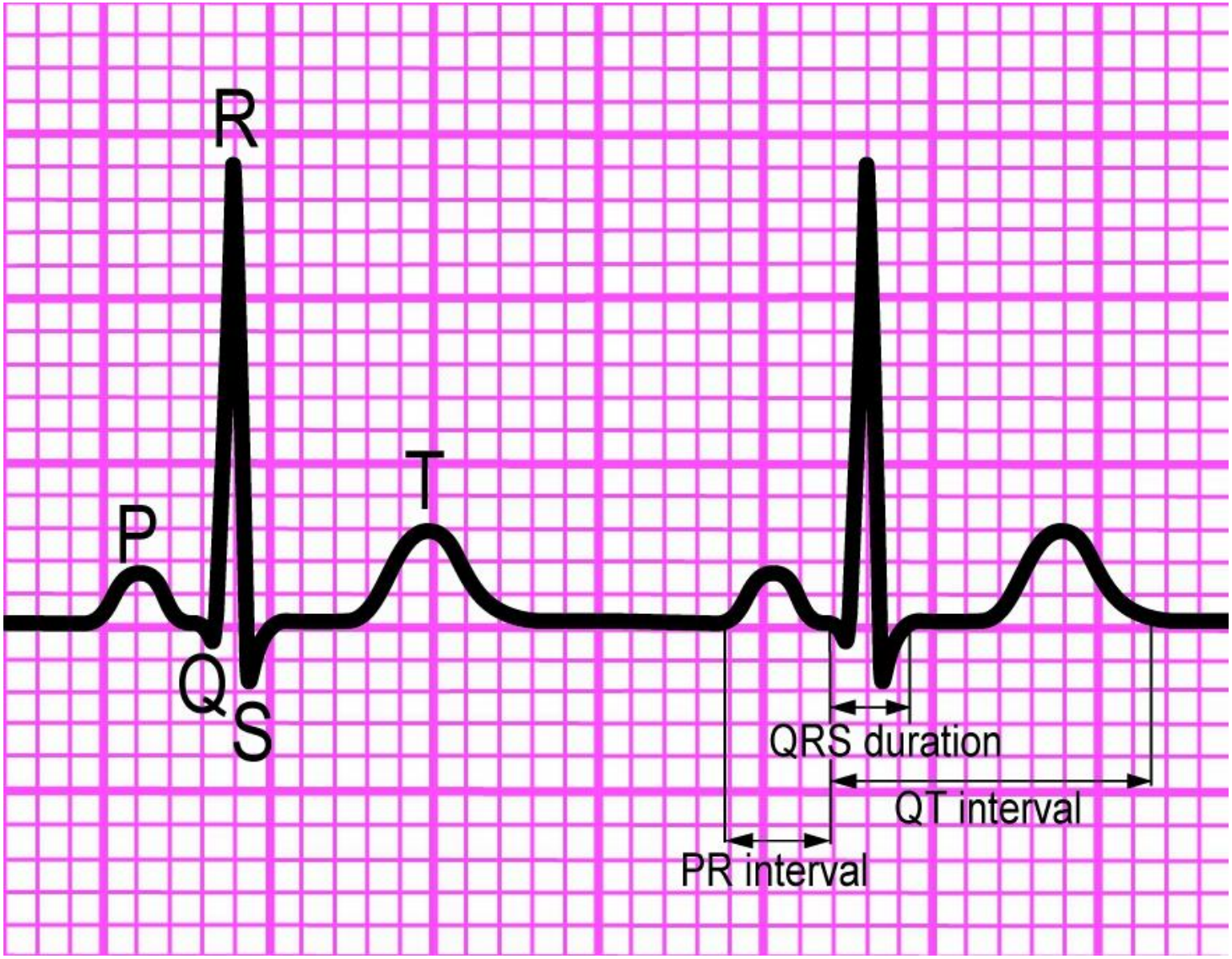
Tachycardia, Cardioversion and Drugs

Learning outcomes

At the end of this workshop you should:

- Be able to recognise types of tachycardia, defined by regularity and QRS width
- Understand the principles of treatment
- Know the indications for electrical and chemical cardioversion
- Know how to perform synchronised cardioversion


SA node
Left bundle branch
AV node
Right bundle branch
Bundle of His


R
T
P
Q
S
QRS duration
QT interval
PR interval

How to read a rhythm strip

1. Is there any electrical activity?

How to read a rhythm strip

1. Is there any electrical activity?
2. What is the ventricular (QRS) rate?
3. Is the QRS rhythm regular or irregular?
4. Is the QRS width normal (narrow) or broad?

How to read a rhythm strip

1. Is there any electrical activity?

2. What is the ventricular (QRS) rate?

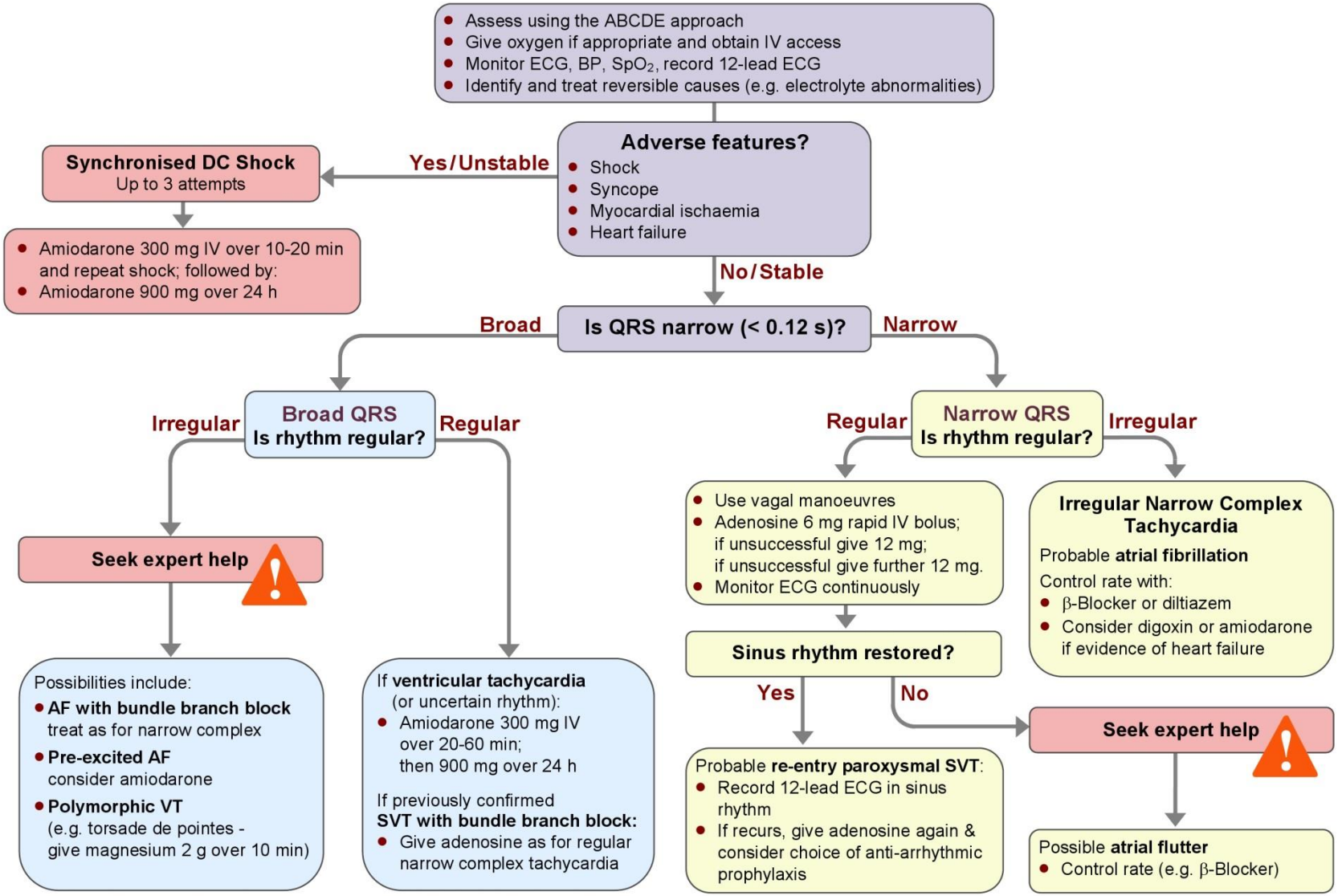
3. Is the QRS rhythm regular or irregular?

4. Is the QRS width normal (narrow) or broad?

5. Is atrial activity present?
   (If so, what is it: P waves? Other atrial activity?)

6. How is atrial activity related to ventricular activity?

Tachycardia algorithm (with pulse)



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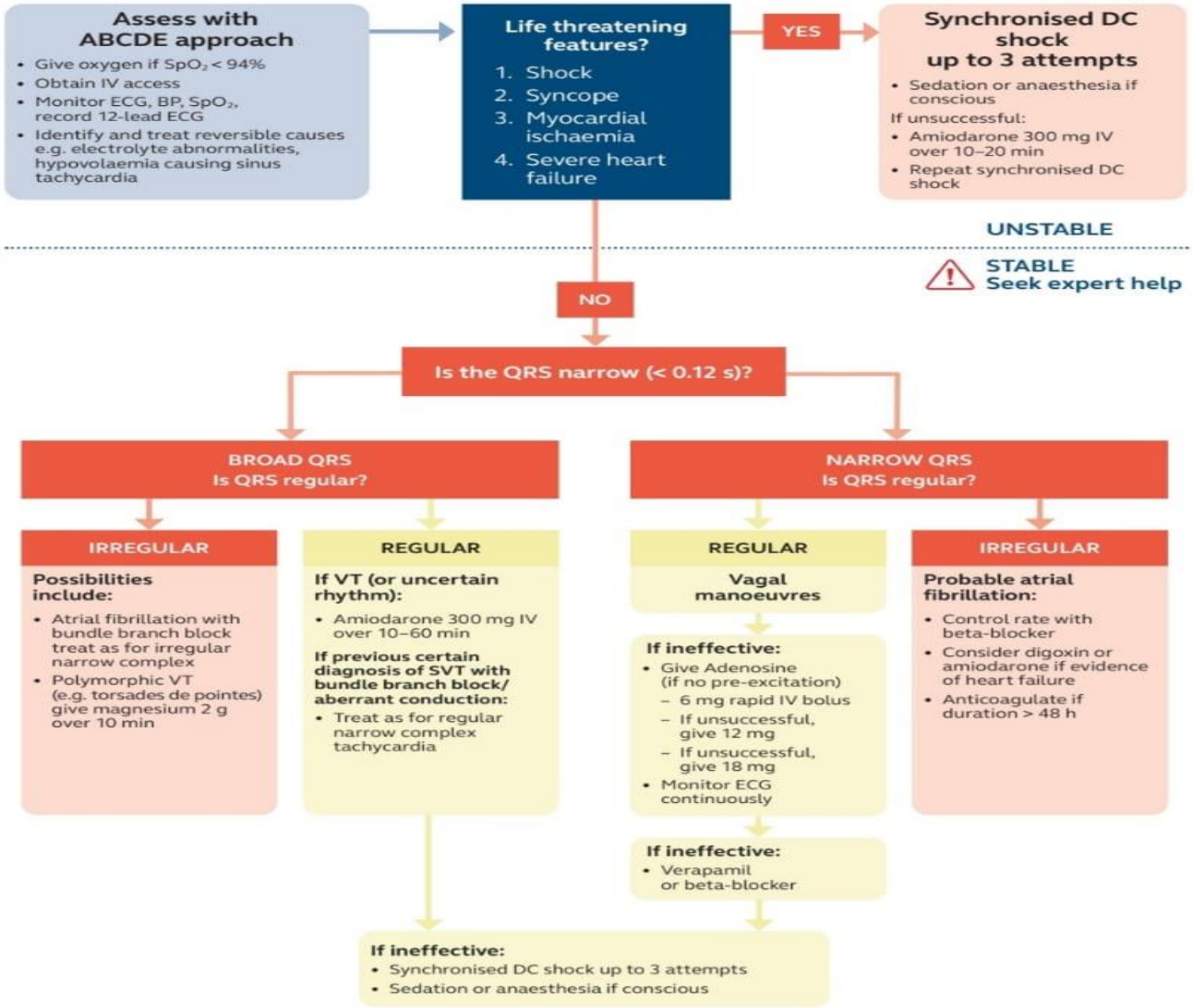
GUIDELINES 2021

Adult tachycardia



Tachycardia algorithm

- Assess using the ABCDE approach
- Give oxygen if appropriate and obtain IV access
- Monitor ECG, BP, SpO_2, record 12 lead ECG
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

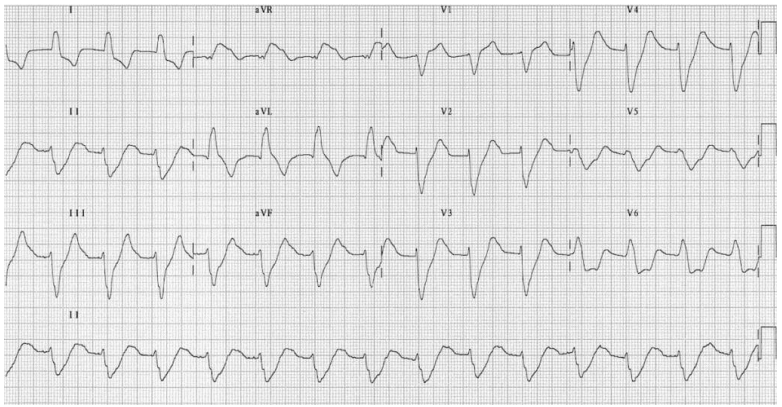
Adverse features?

- Shock
- Syncope
- Myocardial ischaemia
- Heart failure

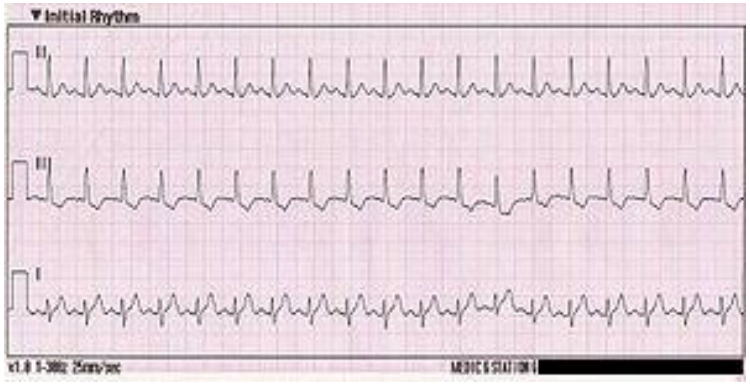
Yes/Unstable

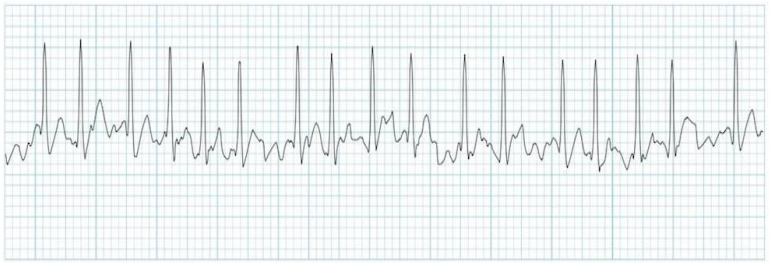
Synchronised DC Shock
Up to 3 attempts

- Amiodarone 300 mg IV over 10-20 min and repeat shock; followed by:
- Amiodarone 900 mg over 24 h



Stable narrow-complex tachycardia





Is QRS narrow (< 0.12 s)?

Narrow

Narrow QRS
Is rhythm regular?

Regular

- Use vagal manoeuvres
- Adenosine 6 mg rapid IV bolus; if unsuccessful give 12 mg; if unsuccessful give further 12 mg.
- Monitor ECG continuously

Sinus rhythm restored?

Yes

Probable **re-entry paroxysmal SVT**:
- Record 12-lead ECG in sinus rhythm
- If recurs, give adenosine again & consider choice of anti-arrhythmic prophylaxis

No

Seek expert help

Possible **atrial flutter**
- Control rate (e.g. β-Blocker)

Irregular

Irregular Narrow Complex Tachycardia

Probable **atrial fibrillation**

Control rate with:
- β-Blocker or diltiazem
- Consider digoxin or amiodarone if evidence of heart failure

Stable broad-complex tachycardia

Is QRS narrow (< 0.12 s)?

Broad

Broad QRS
Is rhythm regular?

Irregular

Regular

Seek expert help

Possibilities include:

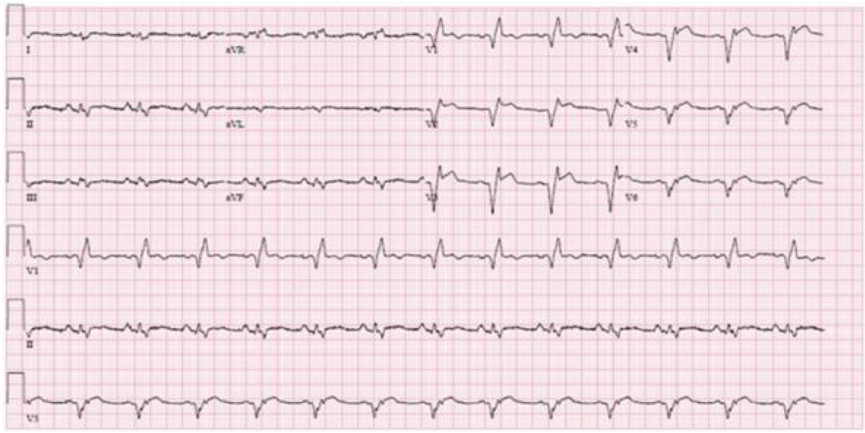
- **AF with bundle branch block**
  treat as for narrow complex
- **Pre-excited AF**
  consider amiodarone
- **Polymorphic VT**
  (e.g. torsade de pointes -
  give magnesium 2 g over 10 min)

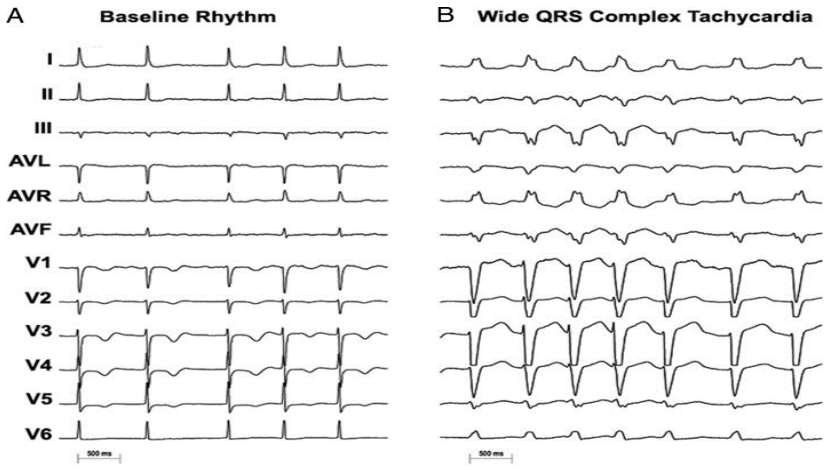
If **ventricular tachycardia**
(or uncertain rhythm):

- Amiodarone 300 mg IV
  over 20-60 min;
  then 900 mg over 24 h

If previously confirmed
SVT with bundle branch block:

- Give adenosine as for regular
  narrow complex tachycardia





Case study 1

Clinical setting and history

- 65-year-old woman
- In monitored bed 3 days after anterior myocardial infarction
- Complains to nurse of feeling unwell

Clinical course

- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 26 min^{-1}
  - C : Looks pale, HR 180 min^{-1}, BP 70/42 mmHg, CRT 3 s

  Initial rhythm?
  - D : Alert, glucose 5.6 mmol l^{-1}
  - E : Nil of note

What action will you take?

Case study 2

Clinical setting and history

- 48-year-old woman admitted to ED
- History of palpitation over past 12 h

Clinical course

- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 16 min^{-1}
  - C : P 180 min^{-1}, BP 110/90 mmHg, CRT < 2 s

  Initial rhythm?
  - D : Alert, glucose 5.5 mmol l^{-1}
  - E : Nil of note

What action will you take?

Case study 2 (continued)

Clinical course

- No response to vagal manoeuvres
- Vital signs unchanged

What action will you take now?

Case study 2 (continued)

Adenosine

Indications

- Narrow-complex tachycardia
- Regular broad-complex tachycardia of uncertain nature
- Broad-complex tachycardia only if previously confirmed SVT with bundle branch block

Contraindications

- Asthma

Dose

- 6 mg bolus by rapid IV injection
- Up to 2 doses of 12 mg if needed

Actions

- Blocks conduction through AV node

Case study 2 (continued)

Amiodarone

Indications

- Broad-complex and narrow-complex tachycardia

Dose

- 300 mg over 20-60 min IV
- 900 mg infusion over 24 h
- Preferably via central venous catheter

Actions

- Lengthens duration of action potential
- Prolongs QT interval
- May cause hypotension

Case study 3

Clinical setting and history

- 76-year-old man
- History of hypertension treated with a diuretic
- In the recovery area after an uncomplicated hernia repair
- Nurses report the sudden onset of tachycardia

Clinical course

- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 18 min^{-1}
  - C : P 170 min^{-1}, BP 100/60 mmHg, CRT < 2 s

  Initial rhythm?
  - D : Alert, glucose 4.0 $mmol\ l^{-1}$
  - E : Nil of note

What action will you take?

Case study 3 (continued)

Clinical course

- Patient is given IV metoprolol
- 30 min later, he complains of chest discomfort
- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 24 min^{-1}
  - C : HR 170 min^{-1}, BP 85/50 mmHg, CRT 4 s

  What is the rhythm?

What action will you take?

Case study 3 (continued)

Clinical course

- Cardioversion restores sinus rhythm
- Patient is transferred back to the day-case unit

What actions may be required as part of discharge planning?

Any questions?

Summary

You should now:

- Be able to recognise types of tachycardia, defined by regularity and QRS width
- Understand the principles of treatment
- Know the indications for electrical and chemical cardioversion
- Know how to perform synchronised cardioversion

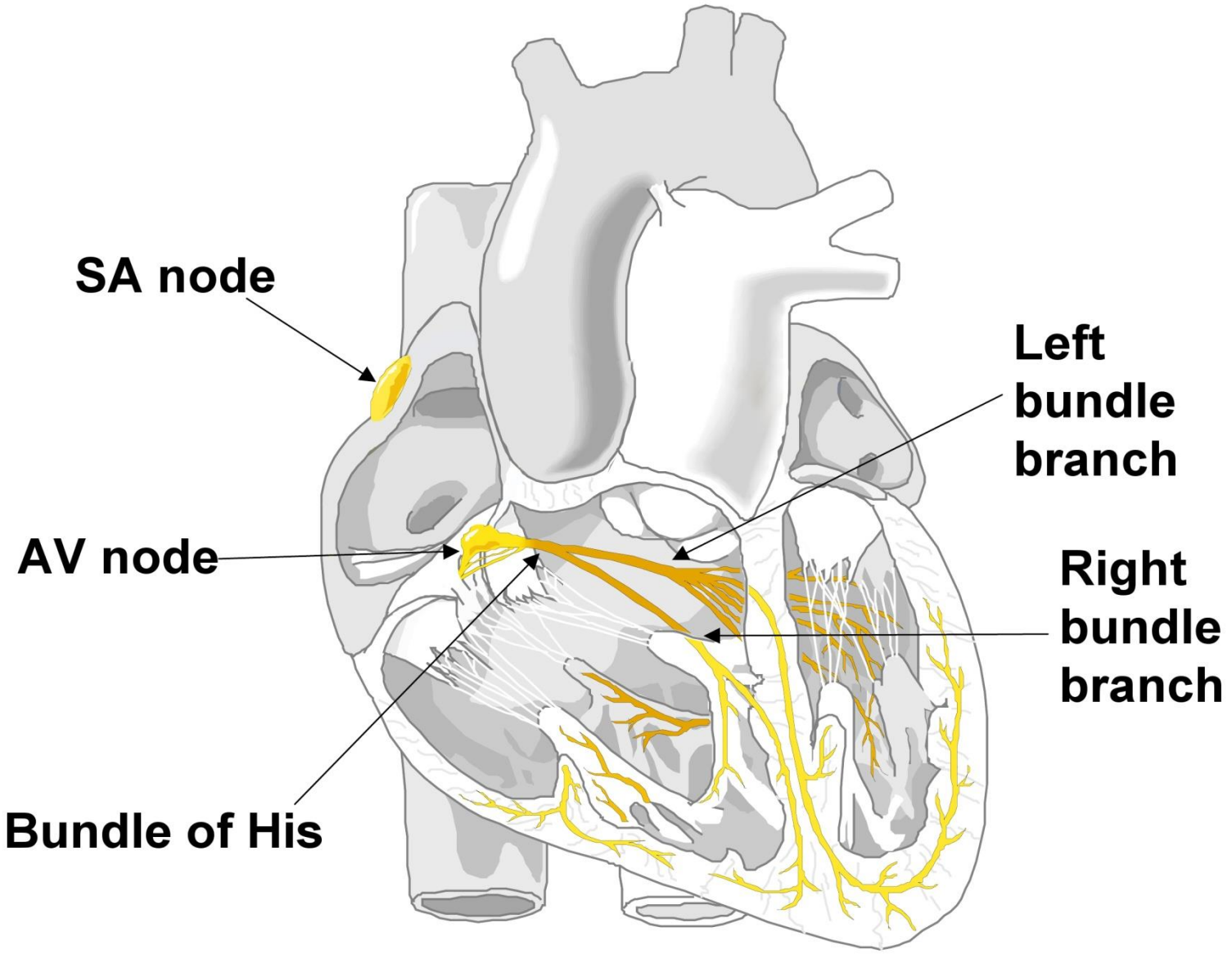
Advanced Life Support Course
Slide set

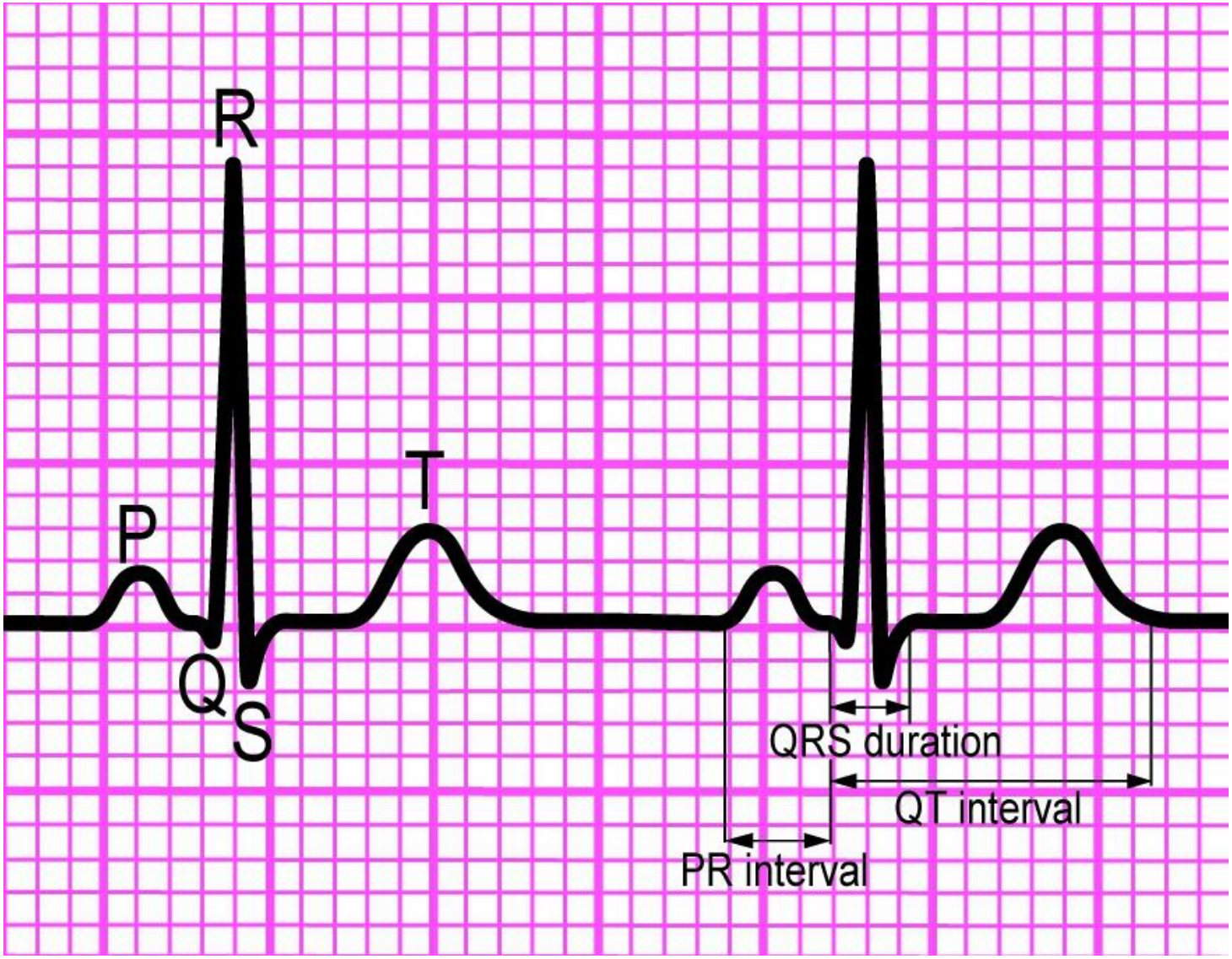
Bradycardia,
Cardiac Pacing and Drugs

Learning outcomes

At the end of this workshop you should:

- Be able to recognise bradycardia and differentiate between the different degrees of heart block
- Understand the principles of treating bradycardia
- Understand the indications for cardiac pacing
- Be aware of the different methods available for cardiac pacing
- Know how to apply non-invasive, transcutaneous electrical pacing safely and effectively


SA node
Left bundle branch
AV node
Right bundle branch
Bundle of His


R
T
P
Q
S
QRS duration
QT interval
PR interval

How to read a rhythm strip

1. Is there any electrical activity?

How to read a rhythm strip

1. Is there any electrical activity?
2. What is the ventricular (QRS) rate?
3. Is the QRS rhythm regular or irregular?
4. Is the QRS width normal (narrow) or broad?

How to read a rhythm strip

1. Is there any electrical activity?

2. What is the ventricular (QRS) rate?

3. Is the QRS rhythm regular or irregular?

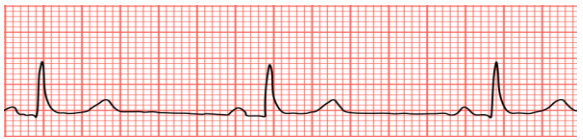
4. Is the QRS width normal (narrow) or broad?

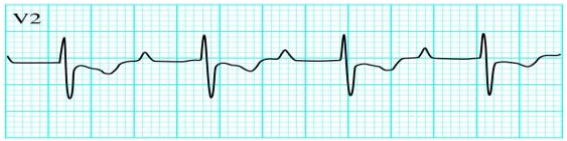
5. Is atrial activity present?
   (If so, what is it: P waves? Other atrial activity?)

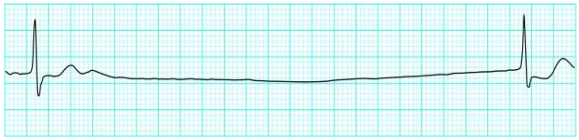
6. How is atrial activity related to ventricular activity?

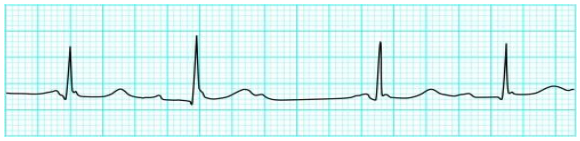
Bradycardia algorithm

Includes rates inappropriately slow for haemodynamic state









- Assess using the ABCDE approach
- Give oxygen if appropriate and obtain IV access
- Monitor ECG, BP, SpO_2, record 12-lead ECG
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Adverse features?
- Shock
- Syncope
- Myocardial ischaemia
- Heart failure

YES

NO

Atropine
500 mcg IV

Satisfactory response?

YES

NO

Interim measures:
- Atropine 500 mcg IV repeat to maximum of 3 mg
- Isoprenaline 5 mcg min^{-1} IV
- Adrenaline 2-10 mcg min^{-1} IV
- Alternative drugs *

OR
- Transcutaneous pacing

Risk of asystole?
- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS
- Ventricular pause > 3 s

YES

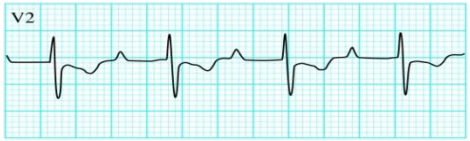
NO

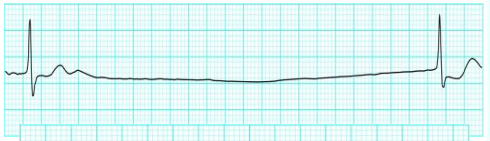
Seek expert help
Arrange transvenous pacing

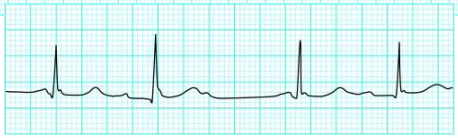
Observe

***Alternatives include:**
- Aminophylline
- Dopamine
- Glucagon (if beta-blocker or calcium channel blocker overdose)
- Glycopyrrolate can be used instead of atropine

Adult bradycardia







Assess with ABCDE approach

↓

Give oxygen if appropriate and obtain IV access

↓

Monitor ECG, BP, SpO_2, record 12-lead ECG

↓

Identify and treat reversible causes e.g. electrolyte abnormalities

↓

Evidence of life threatening signs?

- Shock
- Syncope
- Myocardial ischaemia
- Heart failure

YES

↓

Atropine 500 mcg IV

↓

Satisfactory response?

YES → **Risk of asystole?**

- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS
- Ventricular pause > 3 s

NO

↓

Interim measures:

- Atropine 500 mcg IV repeat to maximum of 3 mg
- Isoprenaline 5 mcg min^{-1} IV
- Adrenaline 2–10 mcg min^{-1} IV
- Alternative drugs*

or

Transcutaneous pacing

↓

Seek expert help

↓

Arrange transvenous pacing

NO

↓

Risk of asystole?

- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS
- Ventricular pause > 3 s

YES → (to Interim measures)

NO → **Observe**

* **Alternatives include:**

- Aminophylline
- Dopamine
- Glucagon (if beta-blocker or calcium channel blocker overdose)
- Glycopyrrolate can be used instead of atropine

Case study

Clinical setting and history

- 60-year-old man referred to admissions unit by GP
- Long-term history of heart disease
- Feeling light-headed and breathless

Clinical course

- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 18 min^{-1}
  - C : Looks pale, P 45 min^{-1}, BP 90/50 mmHg, CRT 3 s

Initial rhythm?

  - D : Alert, glucose 4.5 mmol l^{-1}
  - E : Nil of note

What action will you take?

Case study (continued)

Clinical course

- No response to atropine
- Patient becomes more breathless, cold, clammy and mildly confused
- Change in rhythm
- ABCDE
  - A : Clear
  - B : Spontaneous breathing, rate 24 min^{-1}
    widespread crackles on auscultation
  - C : Looks pale, HR 35 min^{-1}, BP 80/50 mmHg, CRT 4 s
  - D : Responding to verbal stimulation
  - E : Nil of note

What will you do now?

Case study (continued)

- Consider need for expert help
- Prepare for transcutaneous pacing
- Consider percussion pacing as interim measure
- Confirm electrical capture and mechanical response once transcutaneous pacing has started

Case study (continued)

Atropine

Indication

- Symptomatic bradycardia

Contraindication

- Do not give to patients who have had a cardiac transplant

Dose

- 500 mcg IV, repeated every 3 - 5 min to maximum of 3 mg

Actions

- Blocks vagus nerve
- Increases sinus rate
- Increases atrioventricular conduction

Side effects

- Blurred vision, dry mouth, urinary retention
- Confusion

Case study (continued)

Adrenaline

Infusion of 2-10 mcg min^{-1} titrated to response

OR **Isoprenaline** infusion 5 mcg min^{-1} as starting dose

OR **Dopamine** infusion 2-5 mcg kg^{-1} min^{-1}

Any questions?

Summary

You should now:

- Be able to recognise bradycardia and differentiate between the different degrees of heart block
- Understand the principles of treating bradycardia
- Understand the indications for cardiac pacing
- Be aware of the different methods available for cardiac pacing
- Know how to apply non-invasive, transcutaneous electrical pacing safely and effectively

Advanced Life Support Course
Slide set