

Advanced Cardiac Life Support

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**NATIONAL
RESUSCITATION
COUNCIL**

Singapore Guidelines 2006

ACLS subcommittee

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Role of ACLS in CPR

- Last link in chain of survival
 - Early access- early CPR, early defibrillation - early ACLS
- However critical role in hospital resuscitation
- ACLS is the most important treatment for potential lethal rhythms ie SVTs and VTs

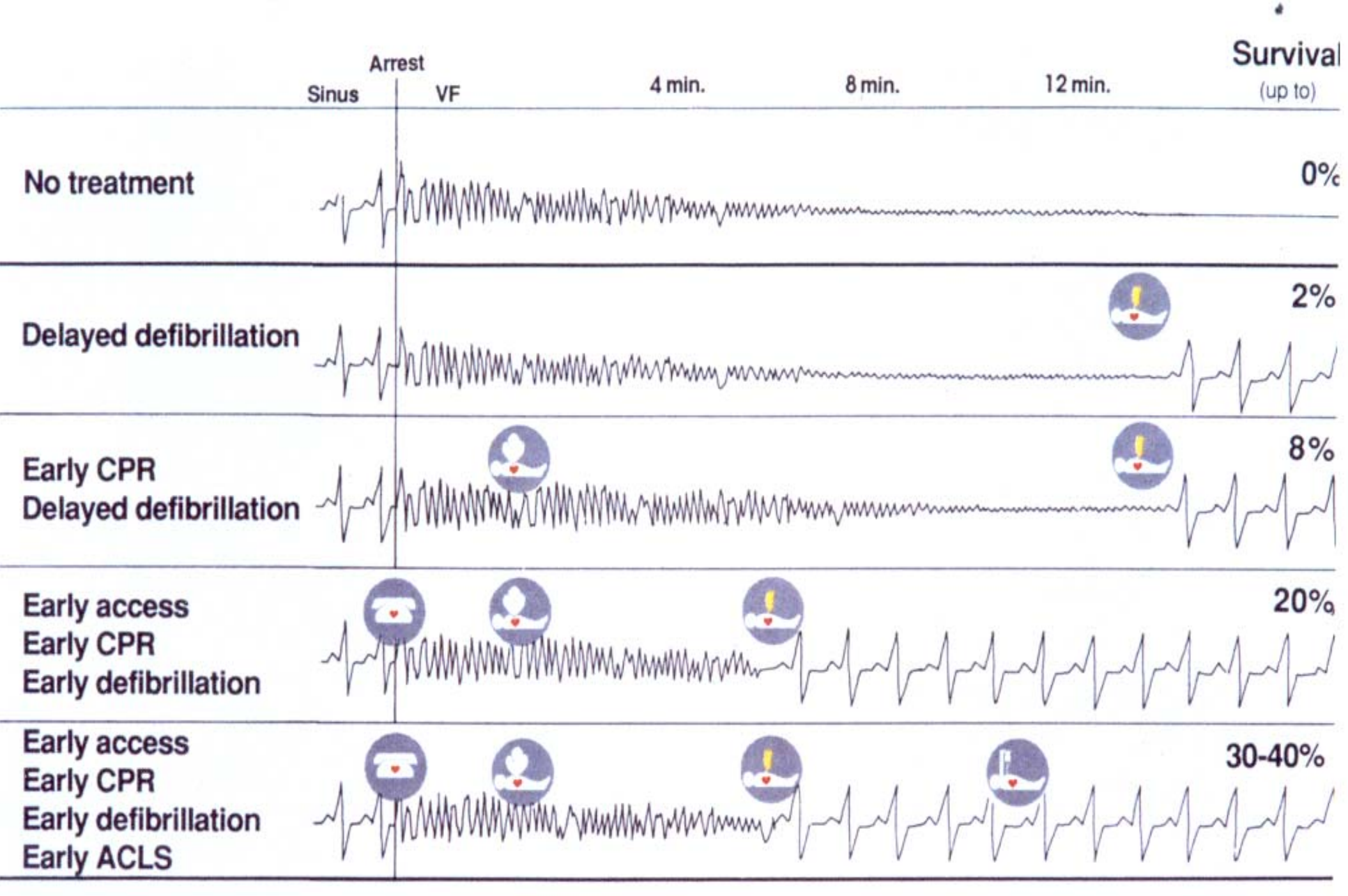


Early Access

Early CPR

Early Defibrillation

Early ACLS



Early Recognition of potential cardiac arrest patient

- Early identification of high risk patients and the immediate arrival of a Medical Emergency Team (MET) (also known as Code Blue Team, Rapid Response Team) to care for the patient may help prevent cardiac arrest

ACLS Drugs

- Vasopressors
 - Adrenaline / Epinephrine
 - Vasopressin
- Antiarrhythmic drugs
 - Adenosine, amiodarone, lignocaine, verapamil
- Atropine
- Magnesium
- Sodium bicarbonate

Vasopressors

- Despite the lack of human data, it is reasonable to continue to use vasopressors on a routine basis

Adrenaline

- 1mg iv push, given after failed 1st shock
- Repeated again if failed 2nd shock
- Repeat later if necessary

Adrenaline vs Vasopressin

- A meta-analysis of 5 randomized trials showed no statistically significant differences between vasopressin and epinephrine for ROSC, death within 24 hrs or death before hospital discharge.
- There is thus insufficient evidence to support or refute the use of vasopressin as an alternative to or in combination with epinephrine in any cardiac arrest rhythm.

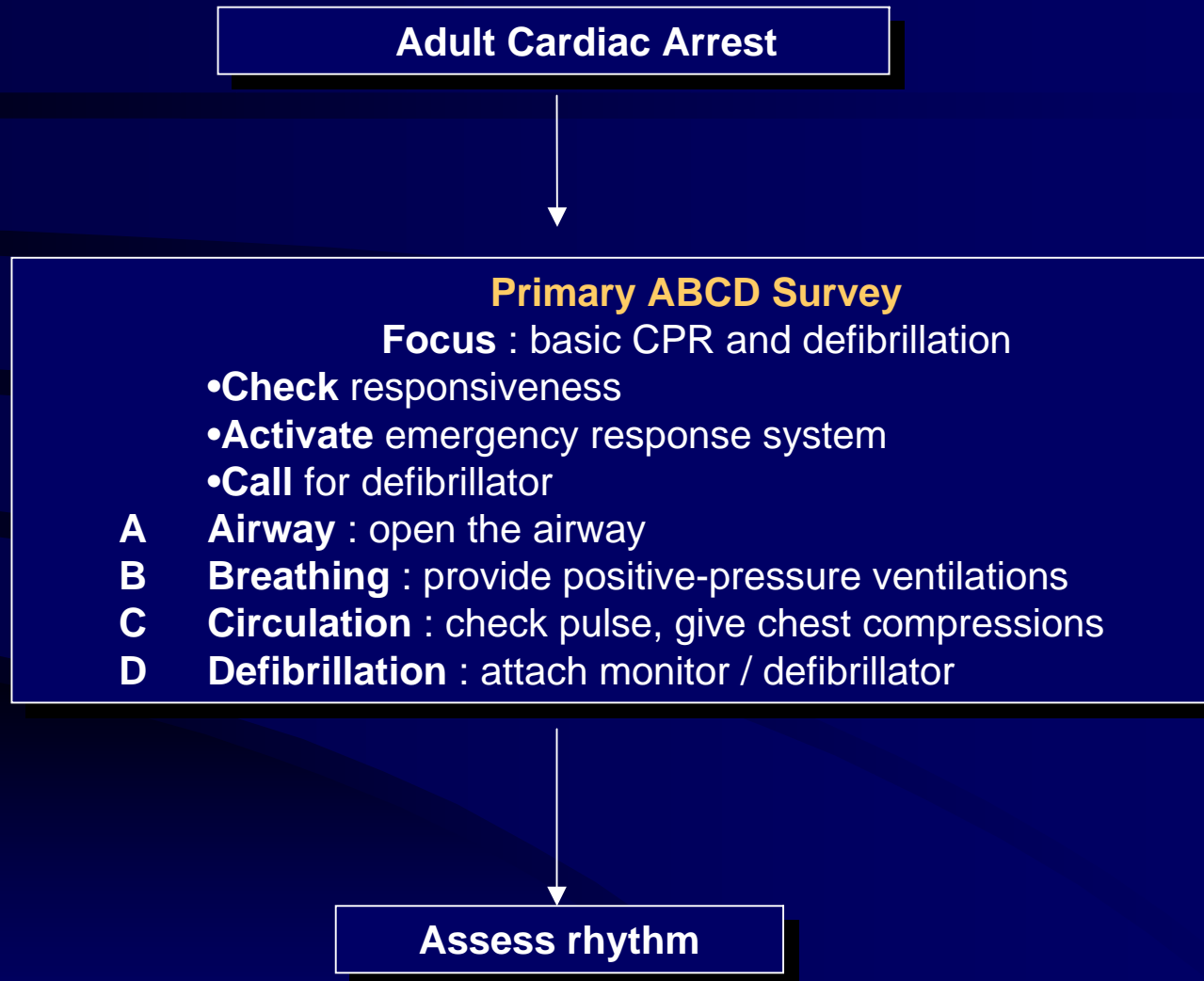
Aung K, Htay T. Vasopressin for cardiac arrest: a systematic review and meta-analysis. Arch Intern Med 2005;17-24

2005 International Consensus Conference. Circulation 2005;112:III-29

Universal algorithm for ACLS

- Assess responsiveness
 - If unresponsive,
 - out-of-hospital activate EMS (995)
 - in-hospital call for resus trolley + defib
- **A** - assess airway and breathing
 - open airway, look, listen and feel
- **B** - if not breathing
 - out-of-hospital give 2 breaths
 - in-hospital ventilate with bag valve mask, intubate
- **C** - Assess Circulation, **Immediate Chest compression**
- **D** - Defibrillation / Drugs

Figure 1 : Universal/International ACLS Algorithm



Chest compressions during CPR

- The 2005 guidelines recommend giving 30 chest compressions for every 2 breaths instead of the traditional 15 compressions for 2 breaths. This is based on studies showing that circulating blood increases with each chest compression in a series and must be built back up after interruptions.
- Checks to heart rhythm, inserting airway devices, and administration of drugs should be done **without delaying compressions.**

Simultaneous recording of aortic diastolic (red) and right atrial (yellow) pressures during CPR in which 2 ventilations are delivered within 4-second time period

Hemodynamic Response to "ideal" Chest Compressions
With Only 4 Seconds for Ventilations

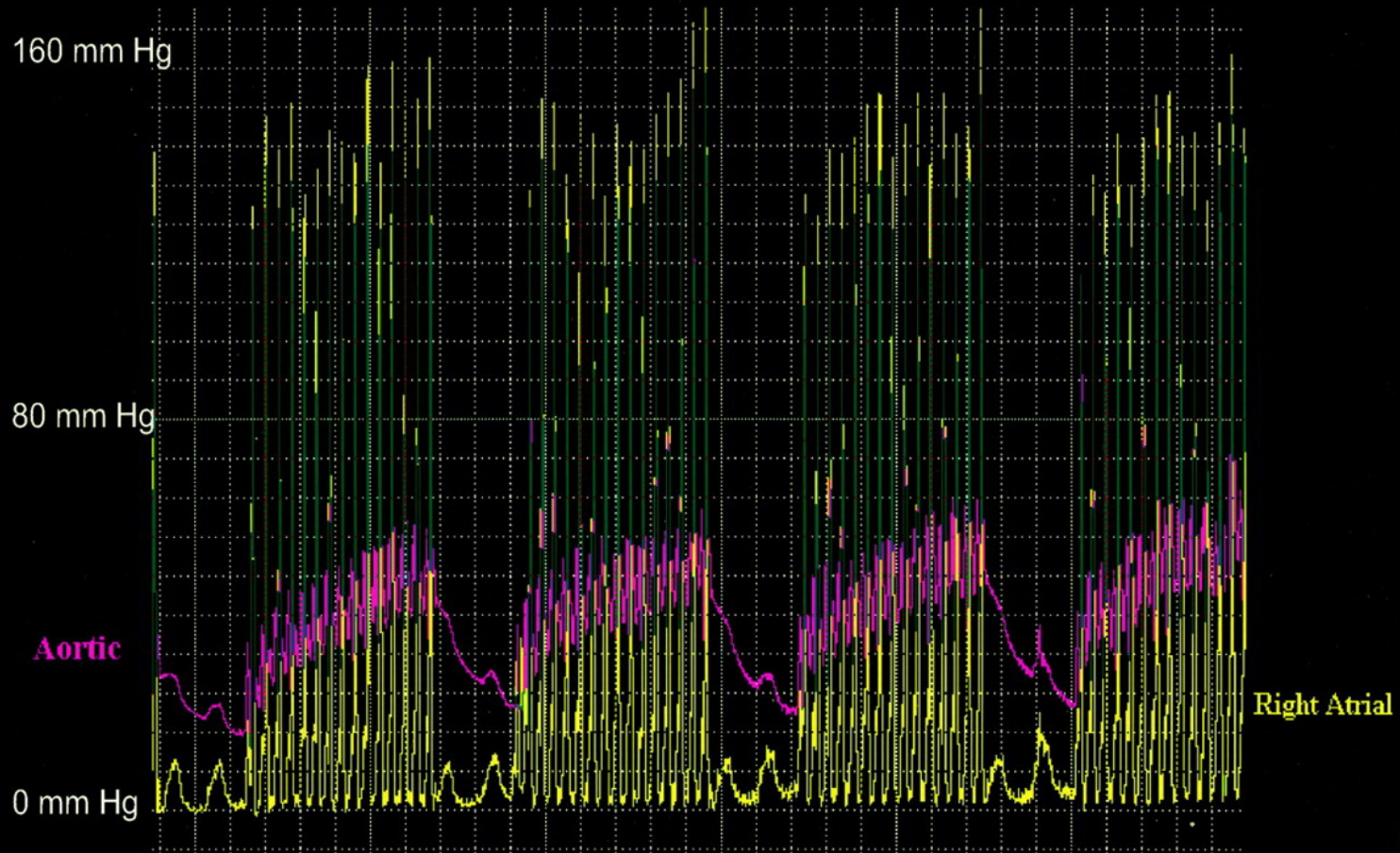
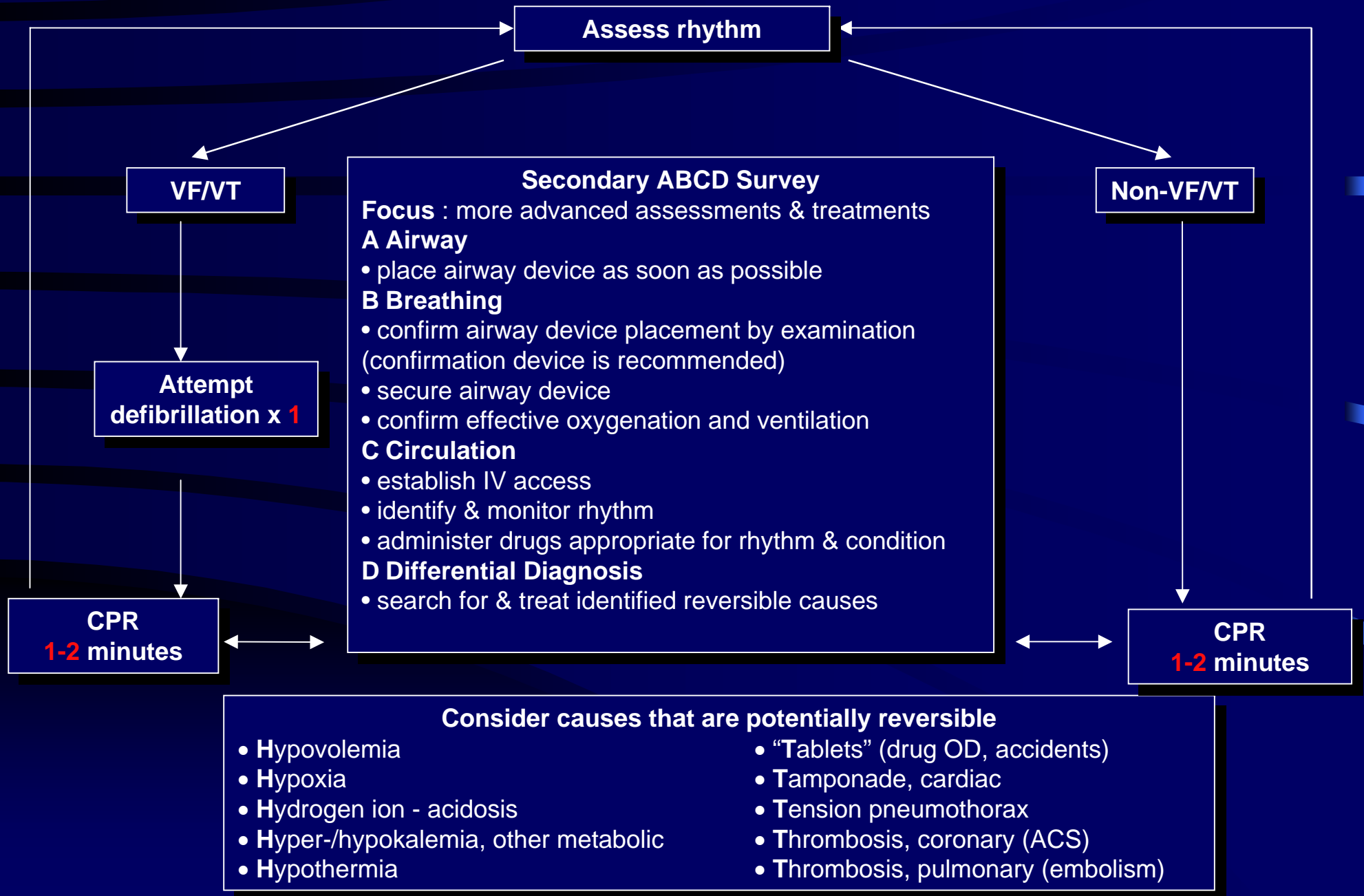
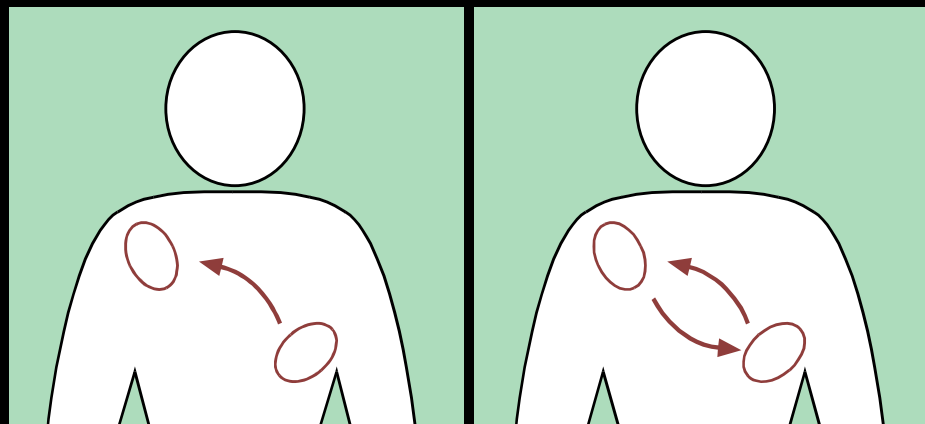


Figure 1 : Universal ACLS Algorithm



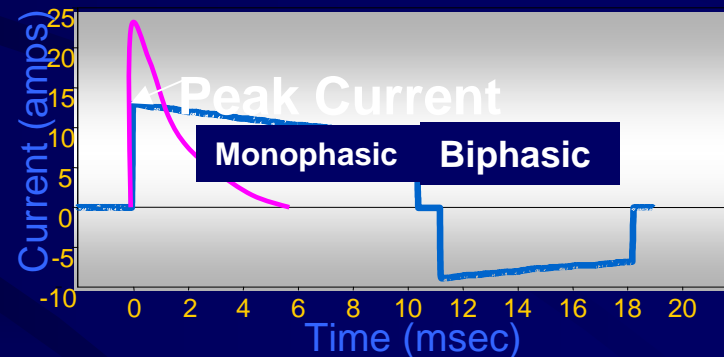
Defibrillation

- One shock strategy with monophasic 360 J or biphasic 150-360 J followed immediately by CPR preferred to the traditional 3 (stack) shocks
- In prolonged arrest (> 4-5 mins), 1-2 minutes of CPR before defibrillation may be better



Monophasic Current

Biphasic Current



CASE 1:

RESPIRATORY ARREST WITH A PULSE

Airway intubation

- Prolonged attempts at tracheal intubation are harmful: the cessation of chest compressions during this time will compromise coronary and cerebral perfusion.

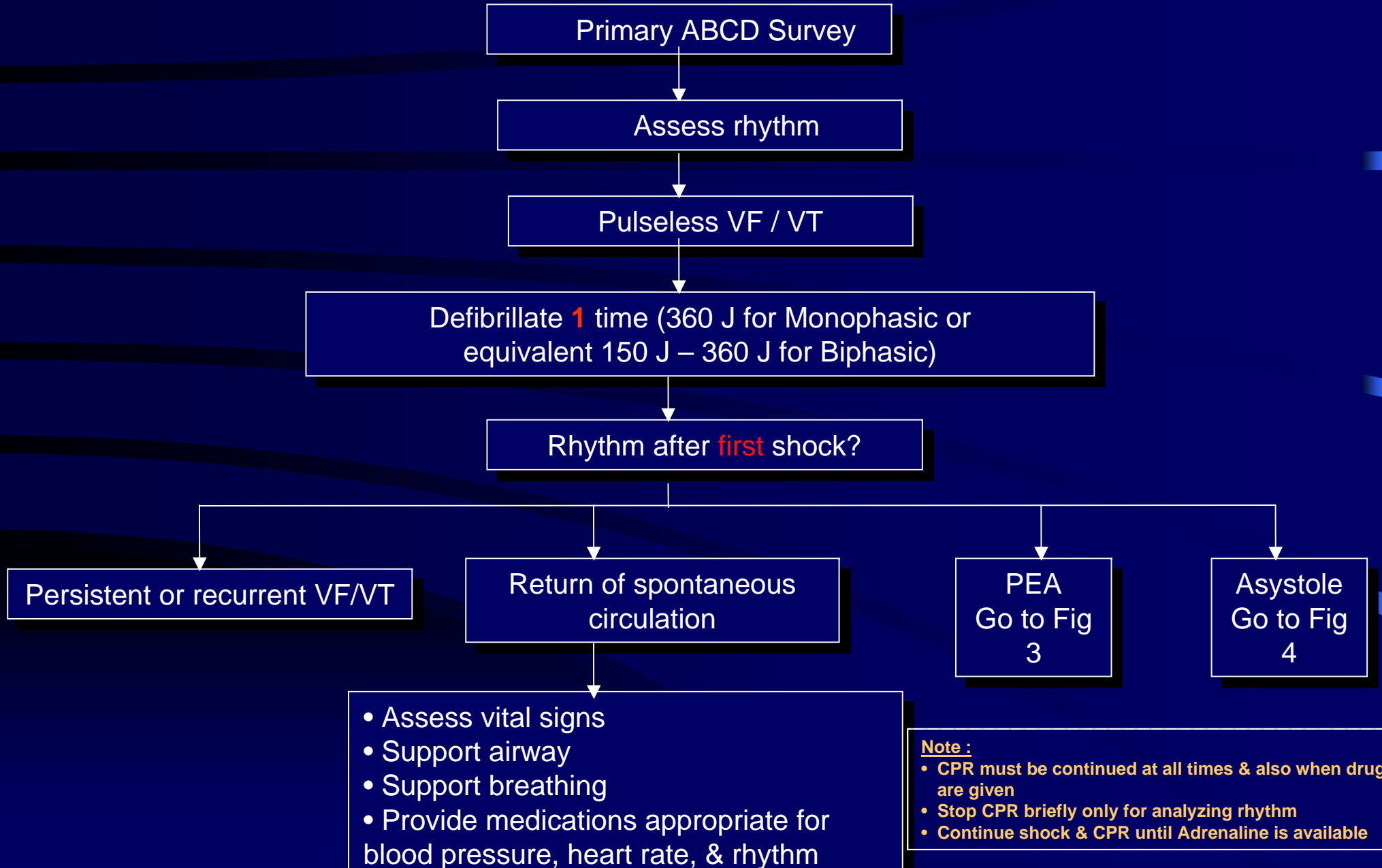
Confirmation of advanced Airway Placement

- Clinical assessment
 - Bilateral breath sounds
 - Normal epigastric auscultation
 - Symmetric expansion of chest
 - Palpation of the cuff in the neck
 - Condensation in the tube during expiration
- Chest X-ray
- Optional techniques
 - Exhaled CO₂ detectors
 - Esophageal detector devices

CASE 2:

WITNESSED VF CARDIAC ARREST

Figure 2 : Ventricular Fibrillation/Pulseless VT Algorithm

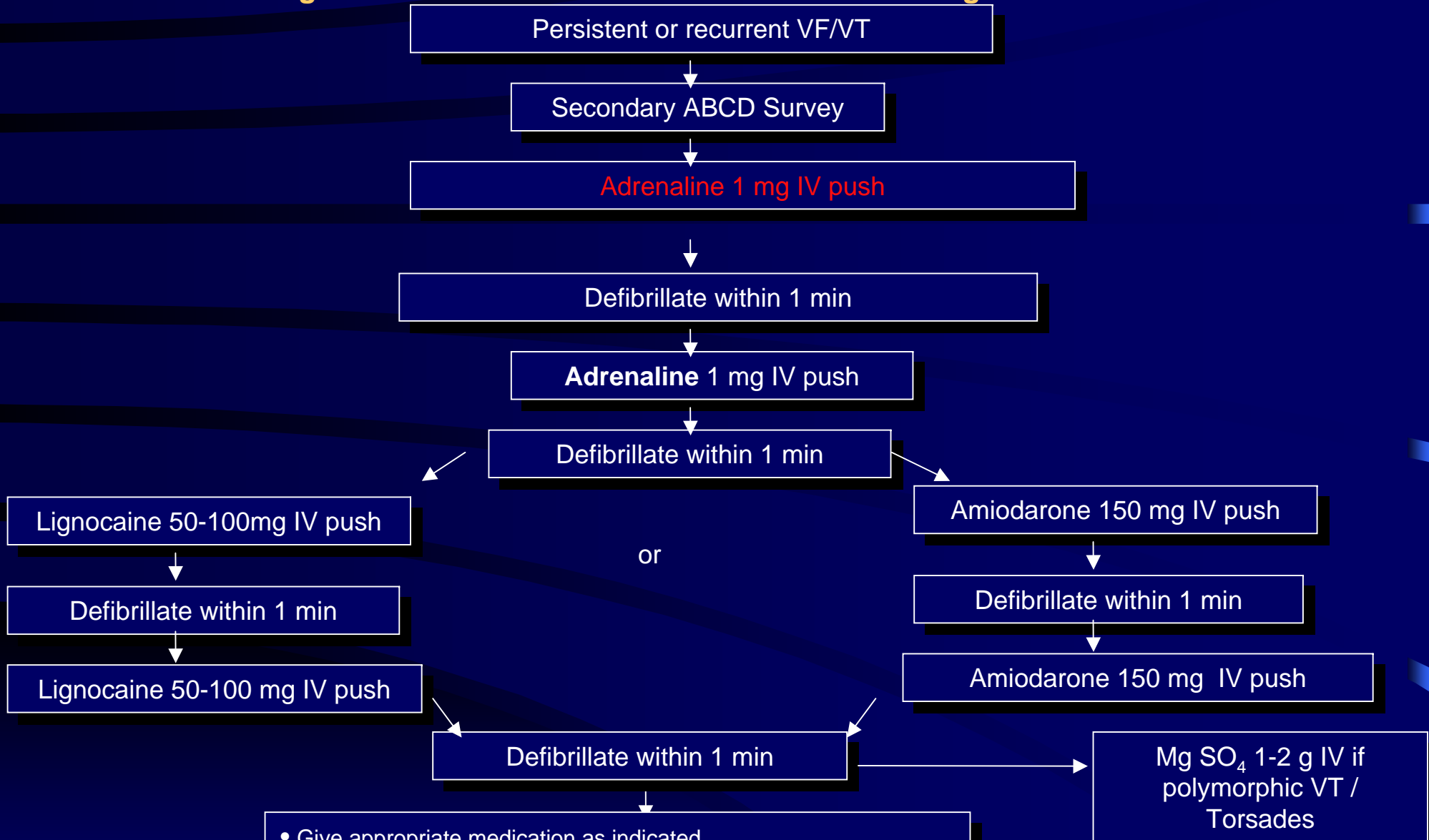


CASE 3:

MEGA VF

REFRACTORY VF/PULSELESS VT

Figure 2 : Ventricular Fibrillation/Pulseless VT Algorithm



- Give appropriate medication as indicated
- Defibrillate 360 J monophasic or 150-360 J biphasic within 1 min after each dose of medication
- Pattern should be drug-shock, drug shock
- Consider Buffers

Note :

- CPR must be continued at all times & also when drugs are given
- Stop CPR briefly only for analyzing rhythm

Antiarrhythmic drugs

- Antiarrhythmic drugs can be used after failure of 2 shocks to convert hemodynamically unstable VT or VF
- Amiodarone can now be considered as first line for shock-refractory VF and VT
- There is limited evidence for the use of lignocaine but can be considered as an alternative
- Only 1 antiarrhythmic drug should be attempted

Amiodarone

- In 2 blinded randomized controlled clinical trials in adults (level of evidence 1), Amiodarone 300 mg (5 mg/kg) to pts with refractory VF/pulseless VT in the out-of-hospital setting improved survival to hospital admission when compared with placebo or lignocaine (1.5 mg/kg)

Kudenchuk P et al. Amiodarone for resuscitation after out-of-hospital cardiac arrest due to ventricular fibrillation. N Engl J Med. 1999;871-878

Dorian P et al. Amiodarone as compared with lidocaine for shock-resistant ventricular fibrillation. N Engl J Med 2002;884-90

ARREST Trial

Amiodarone in out-of-hospital resuscitation of refractory sustained ventricular tachyarrhythmias

randomized, double-blind, placebo-controlled trial involving 504 pts
Pts received at least 3 unsuccessful shocks before study entry
Iv amiodarone 300 mg given

significant improvement in the proportion of pts surviving to the emergency department following out-of-hospital cardiac arrest in amiodarone-treated pts.

27% more admitted alive to hospital

26% more successful resuscitation in VF subset

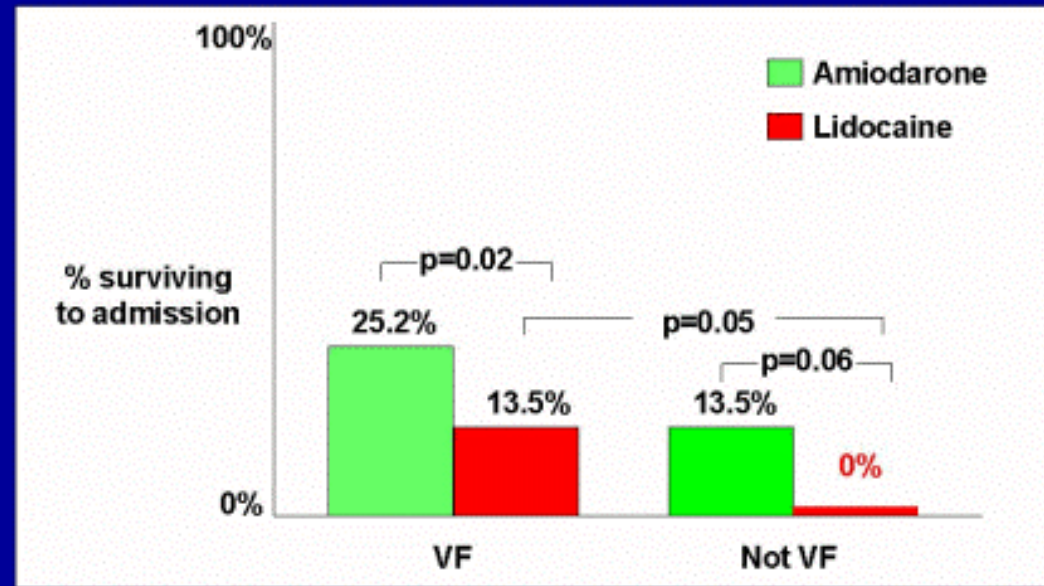
56% more successful resuscitations in pts treated with iv amiodarone when electrical defibrillation could temporarily restore but not maintain a pulse

However the effect on survival to hospital discharge was inconclusive, as there was no significant difference.

ALIVE Trial

- 347 pts (mean age, 67±14 yrs)
- amiodarone, 22.8 % 180 pts survived to hospital admission, as compared with 12.0 % of 167 pts treated with lidocaine (P=0.009; odds ratio, 2.17; 95 percent CI, 1.21 to 3.83).

ALIVE: Results by Subgroups Survival by Initial Rhythm



Paul Dorian, et al. NEJM 2002

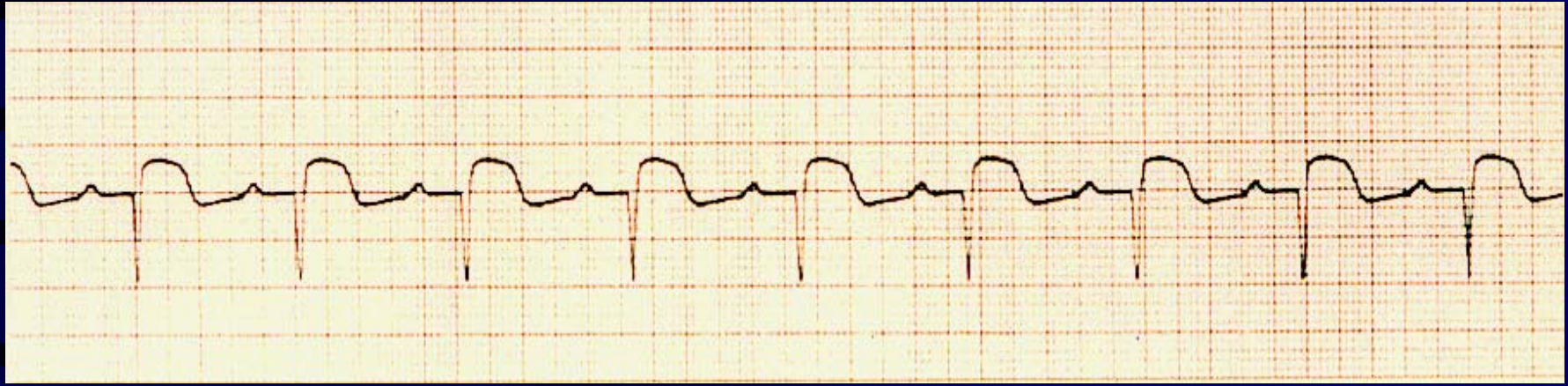
Amiodarone as Compared with Lidocaine for Shock-Resistant Ventricular Fibrillation

Magnesium

- Magnesium should be given for hypomagnesemia and Torsades de pointes, but there is insufficient data to recommend for or against its routine use in cardiac arrest.

Pulseless Electrical Activity

- Any rhythm or electrical activity that fails to generate a palpable pulse
- Includes :
 - EMD
 - Pseudo – EMD
 - Idioventricular Rhythms
 - Ventricular Escape Rhythms
 - Brady - Asystolic Rhythms
 - Postdefibrillation Idioventricular Rhythms



Narrow QRS PEA

Important to exclude:

Hypovolemia

Acute pulmonary embolism

Cardiac Tamponade

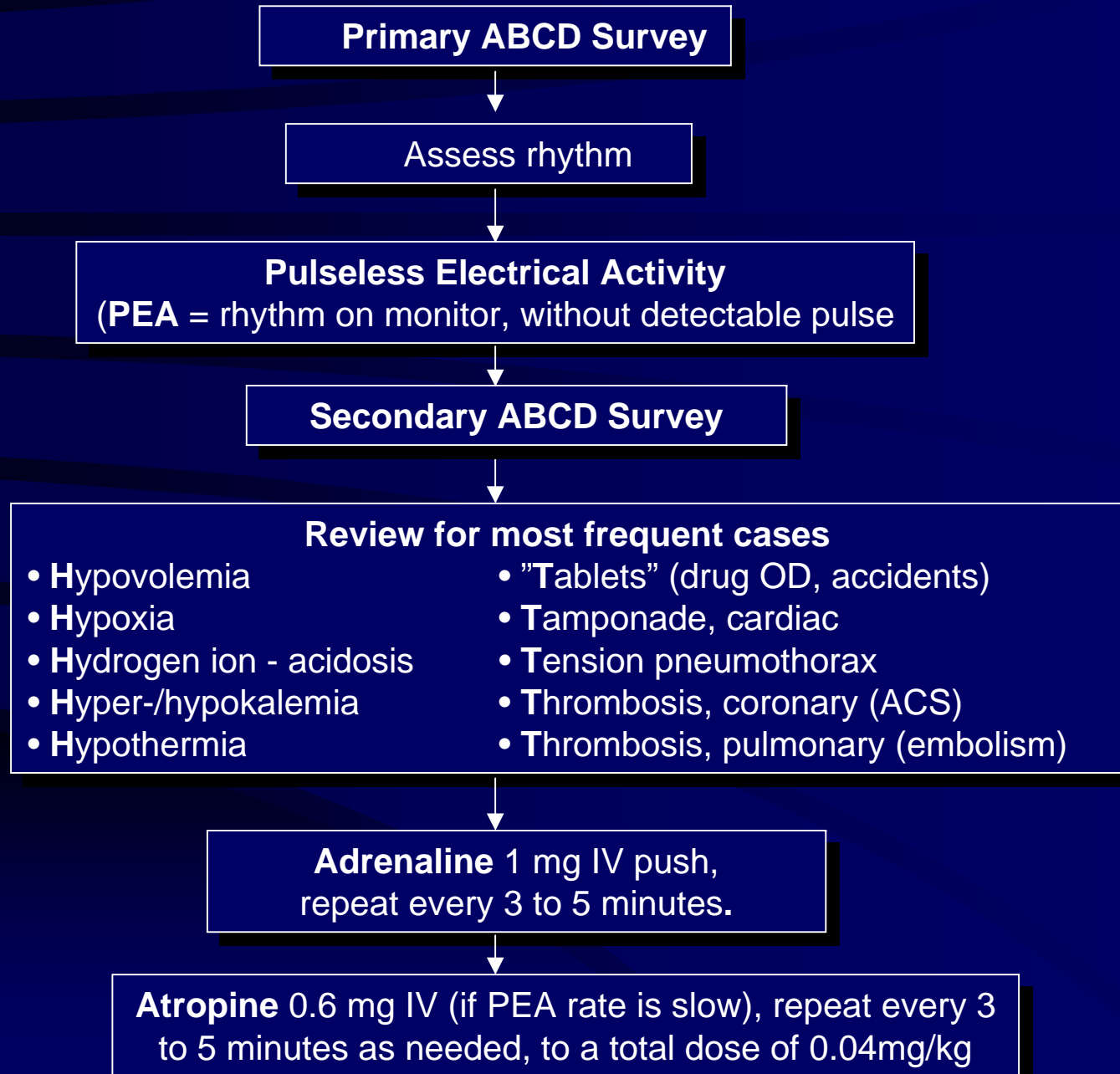


Some rhythms have **Broader QRS Complex**

..... less likely to be associated with Hypovolemia, usually poor survival rate if due to massive AMI or dying myocardium

May be due to specific rhythm disturbances (eg: severe hyper K^+ , hypothermia, hypoxia, acidosis, drug overdose)

Figure 3 : Pulseless Electrical Activity Algorithm



Specific Therapies for PEA

Hypovolemia

Hypoxia

Hypothermia

Hyperkalemia

Hydrogen ion -Acidosis

Tamponade

Tension Pneumothorax

Thrombosis- AMI

Thromboembolism

Tablets -Overdose

Volume Infusion

Ventilation

Rewarming

CACL₂, Insulin-Glucose, NAHCO₃, Dialysis

NAHCO₃

Pericardiocentesis

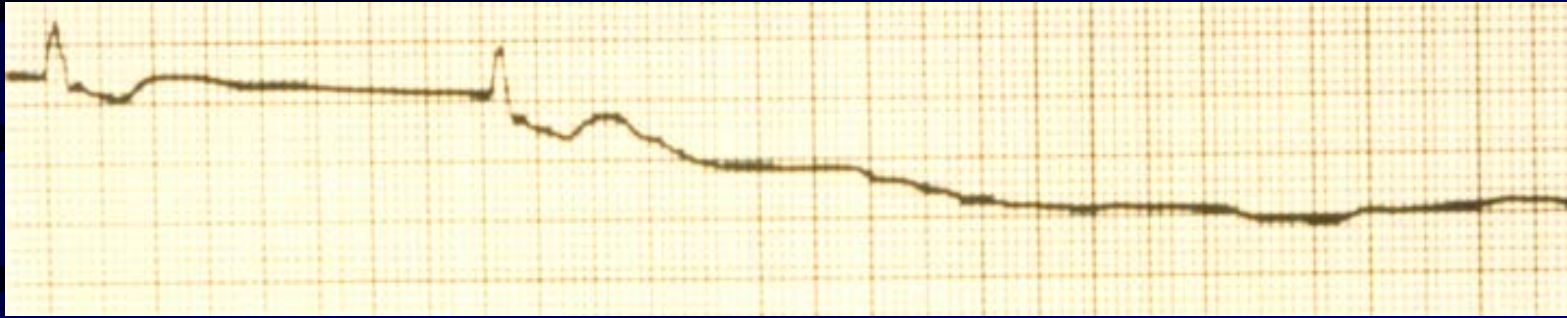
Needle Decompression

Rx Cardiogenic Shock

Embolectomy

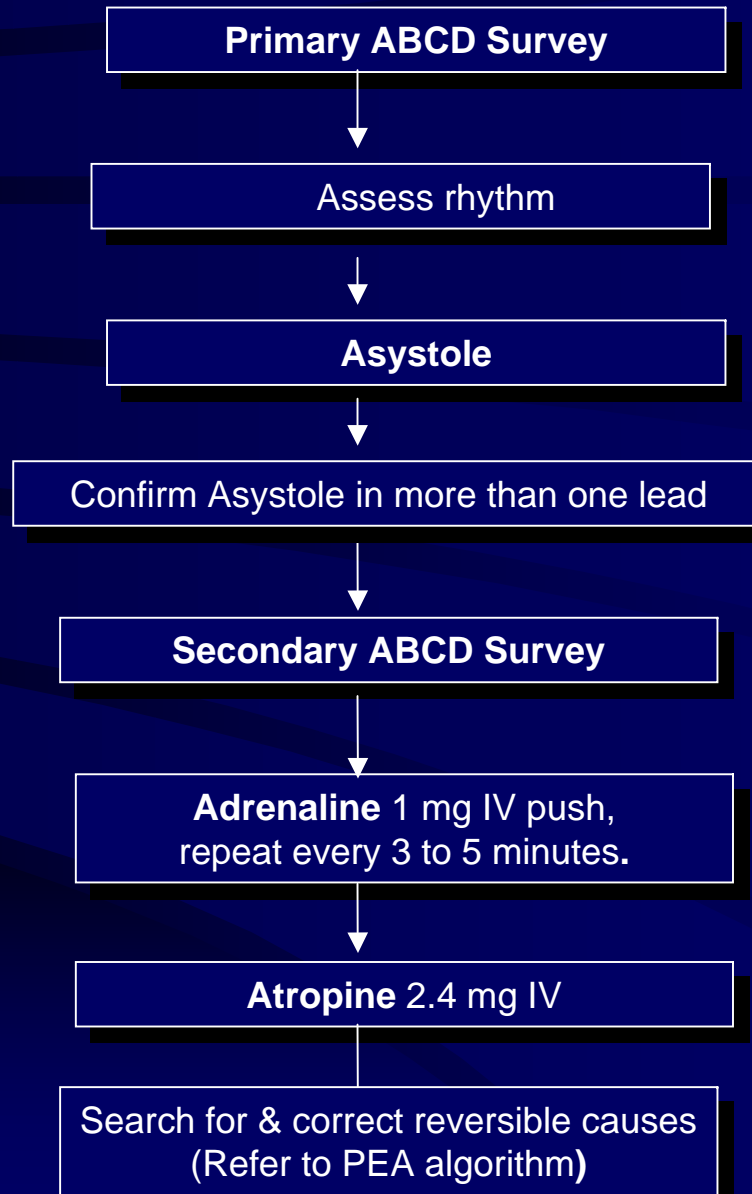
Lavage, Activated Charcoal, Specific RX

“Flat line” - possible causes :



- Power Off
- Leads not attached
- Lead selection
- Fine VF (rare)
- Asystole

Figure 4 : Asystole: The Silent Heart Algorithm



Sodium Bicarbonate (1mEq/kg)

- Role has been de-emphasized
- Adequate ventilation and CPR should correct the metabolic acidosis of arrest
- Side effects
 - ↑ Na
 - Hyperosmolality
 - Metabolic alkalosis
 - Unfavourable shift of O₂-Hb dissociation curve
- Indications
 - Pre-existing metabolic acidosis,
 - ↑ K
 - Tricyclic Antidepressant or phenobarbitone overdose
 - Prolonged arrest > 10 min (Class IIb)
- Contraindicated in hypoxic lactic acidosis

Figure 5 : Bradycardia Algorithm

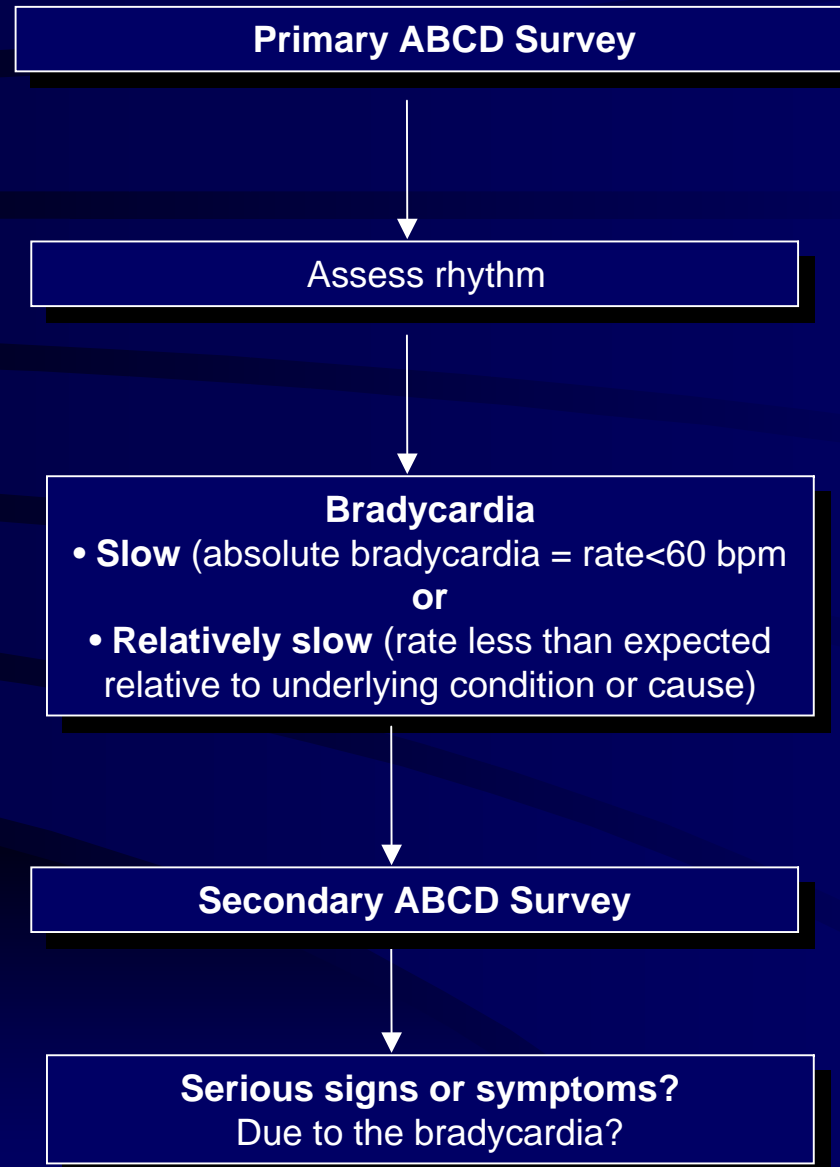
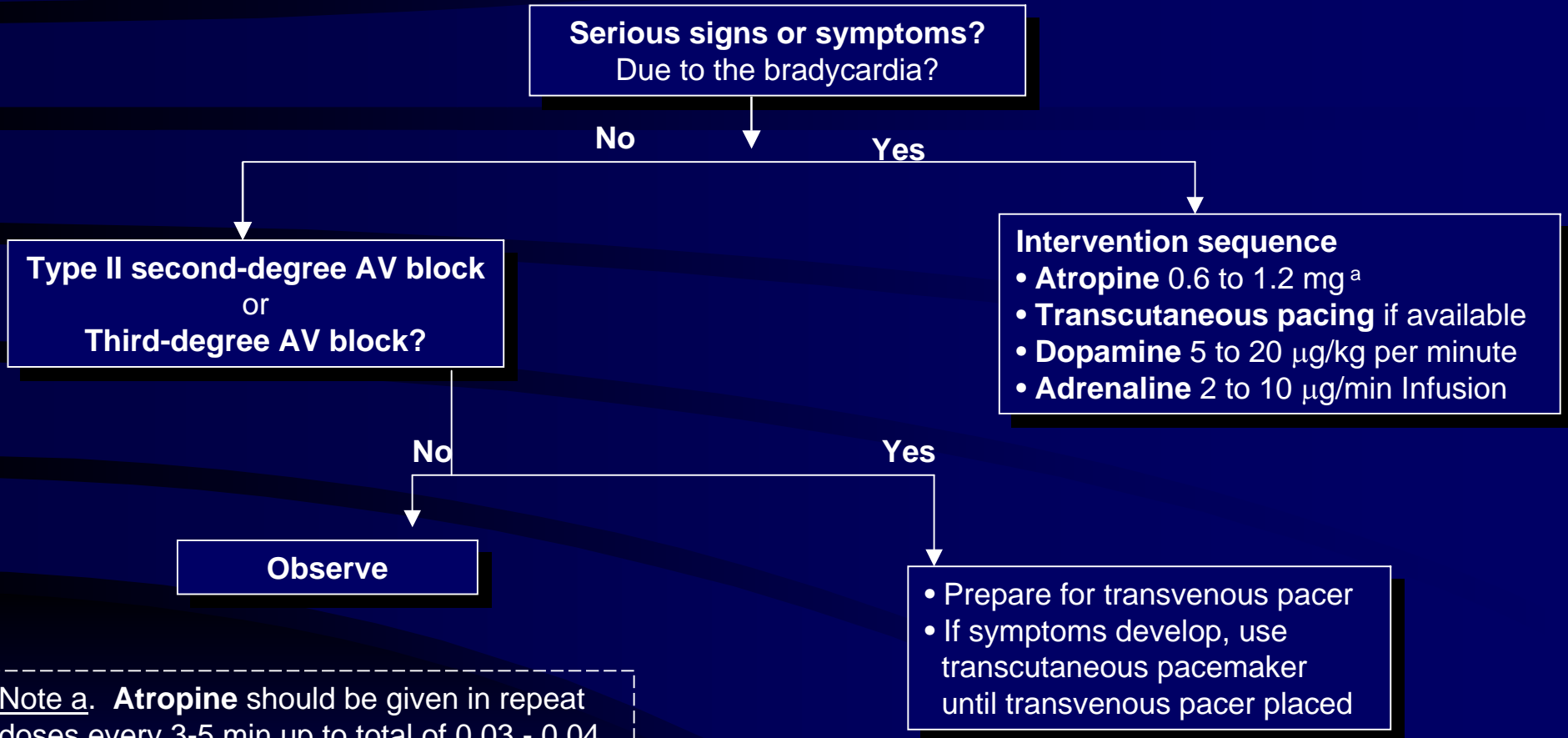


Figure 5 : Bradycardia Algorithm

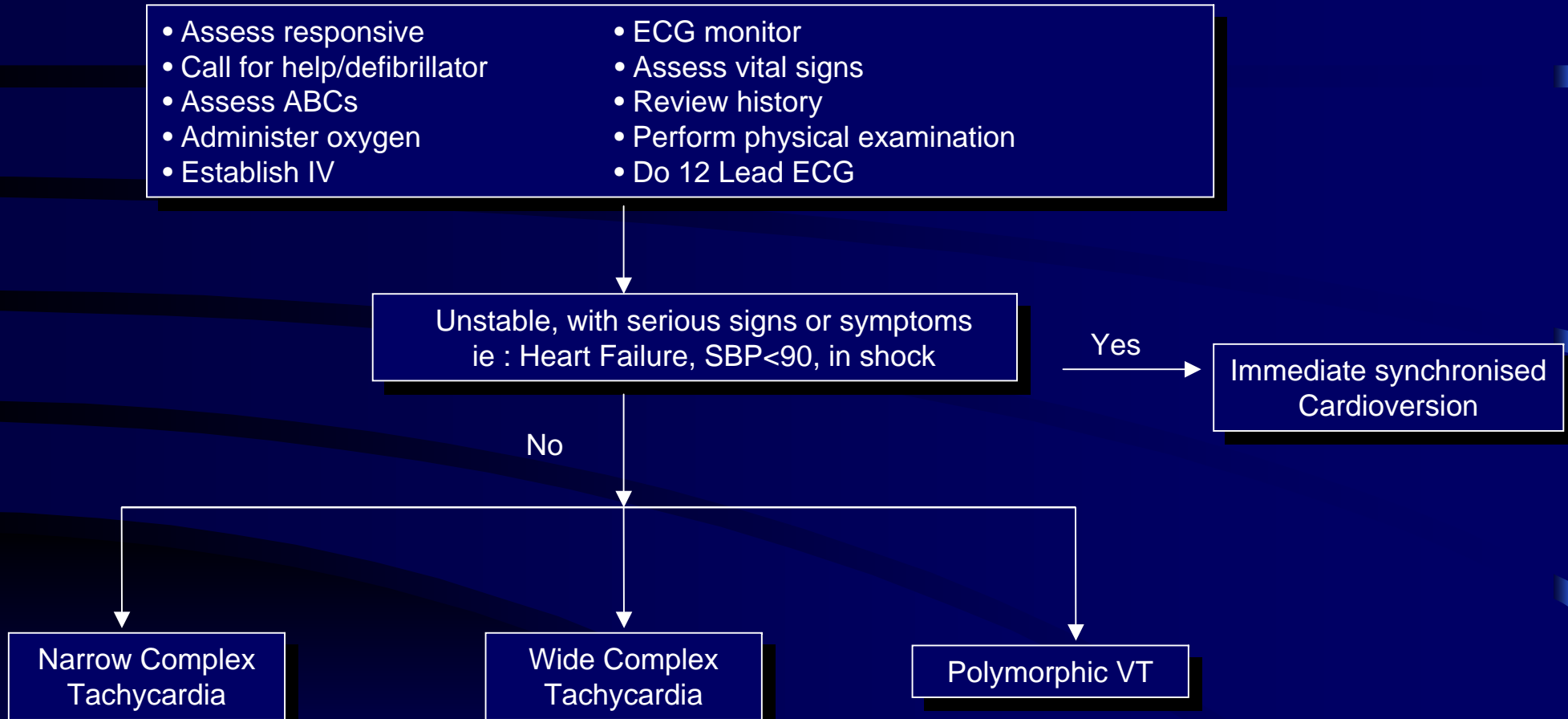


Note a. Atropine should be given in repeat doses every 3-5 min up to total of 0.03 - 0.04 kg. It has been suggested that atropine should be used with caution in AV block at the His-Purkinje level (type II AV block and new third-degree block with wide QRS complexes) (Class IIb).

Atropine

- Asystole – 2.4 mg push given once only
- Bradycardia – 0.6 mg push, up to a maximum of 0.04 mg/kg

Figure 6 : Tachycardia Algorithm



Tachycardia Algorithm

Narrow Complex Tachycardia

Atrial fibrillation
Atrial flutter

Use rate controlled drugs eg: amiodarone,
Diltiazem, Verapamil or Digoxin.
Consider anti-coagulation/aspirin

Paroxysmal supraventricular tachycardia (PSVT)

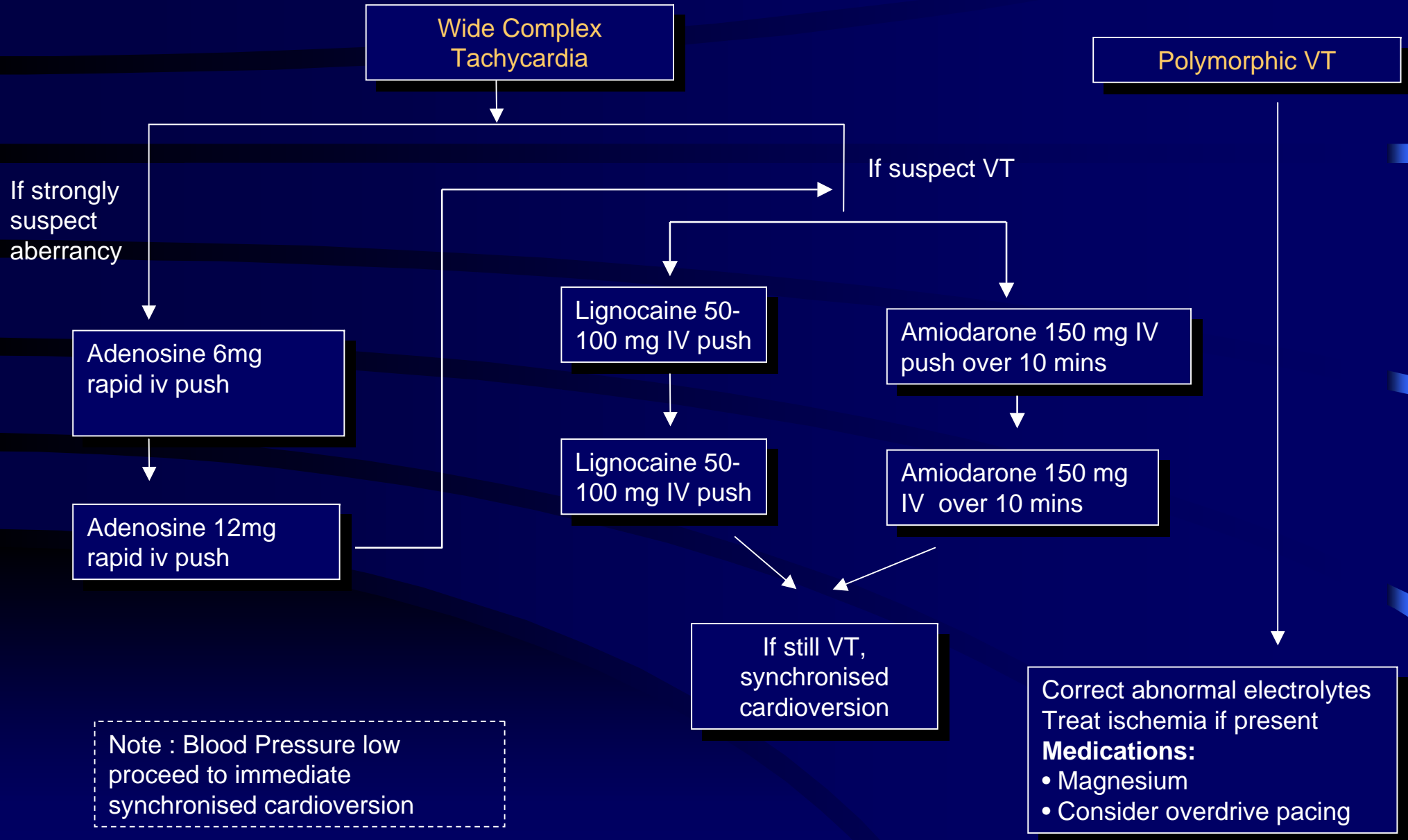
Vagal maneuvers

* Adenosine 6 mg rapid IV push
Adenosine 12mg rapid iv push

* Verapamil 1 mg/min (up
to maximum 20 mg)

* either drug depending on availability and experience

Figure 6 : Tachycardia Algorithm



Torsades De Pointes

Abnormal looking & constantly changing QRS complexes

Gradually shifting electrical axis (twisting of points)

Sinus rhythm shows prolong QT

often starts as a short cycle following a long cycle

Management :

Discontinuation of offending drugs

Magnesium sulfate

Overdrive pacing

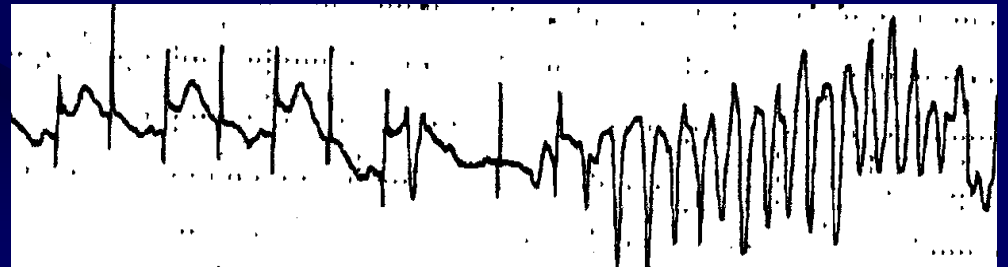
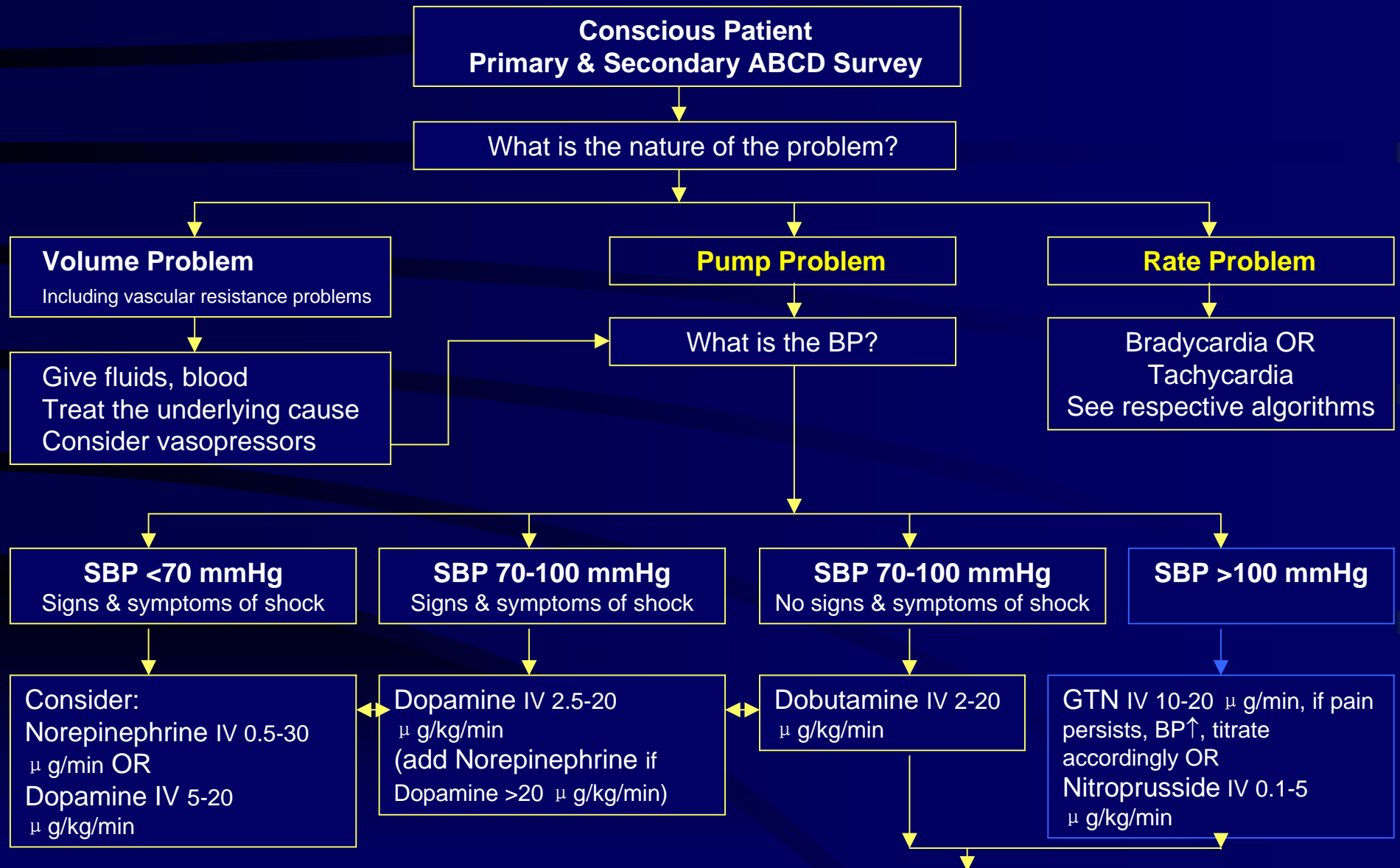


Figure 1: Hypotension, Shock, Pulmonary Edema Algorithm



Validity of ACLS certification

- ACLS refresher training should be provided after 2 years
- Instructors must instruct at least once or twice a year in order to maintain ACLS instructor status