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TACHYARYTHMIA

Defibrilation&Drugs

by

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Anesthesia ,ICU ,Pain

Emergency medicine & Critical Cases

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objectives

- Recognition of broad complex tachycardia and narrow complex tachycardias
- Principles of treatment
- Indications for electrical and chemical cardioversion
- Safe synchronised cardioversion

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Normal Impulse Conduction

Sinoatrial node

↓

AV node

↓

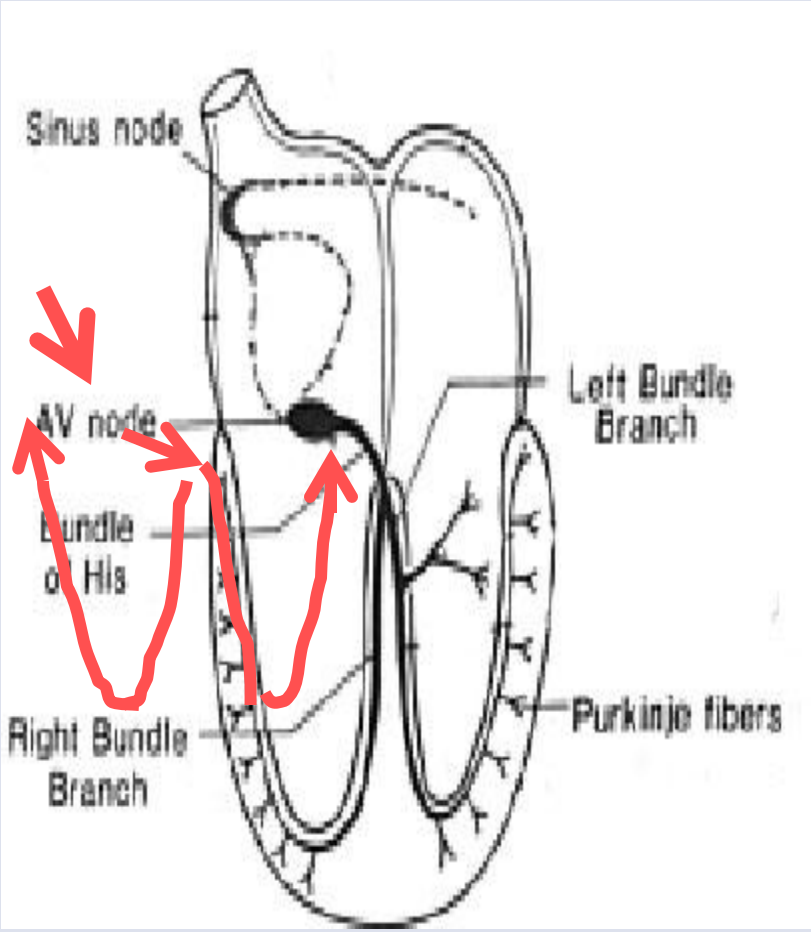
Bundle of His

↓

Bundle Branches

↓

Purkinje fibers



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Impulse Conduction & the ECG

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↓

AV node

↓

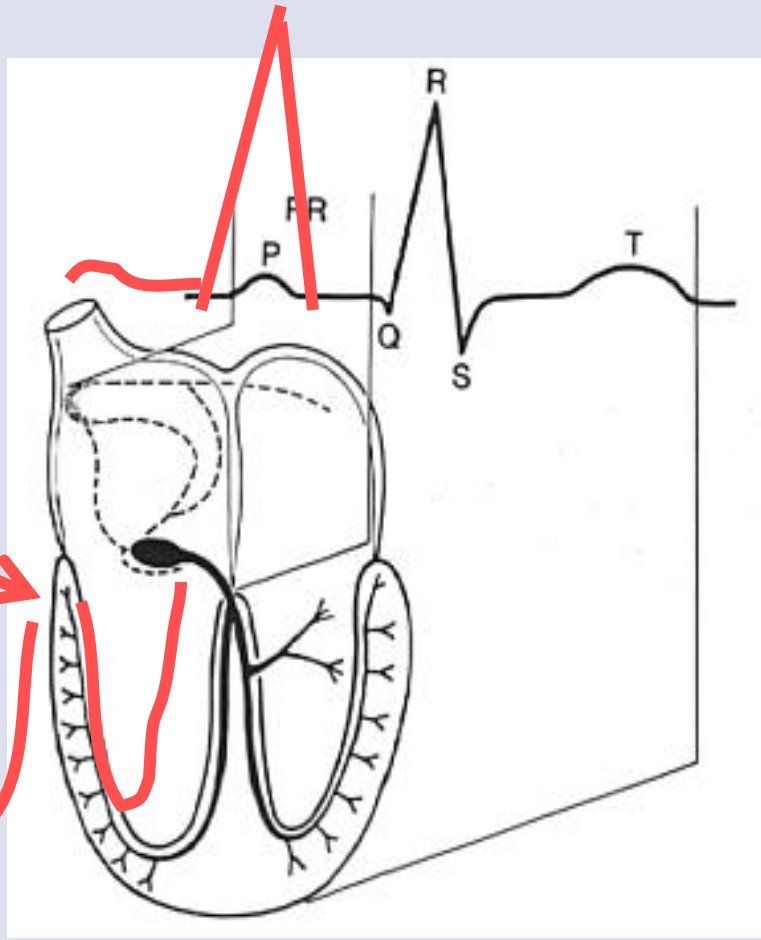
Bundle of His

↓

Bundle Branches

↓

Purkinje fibers



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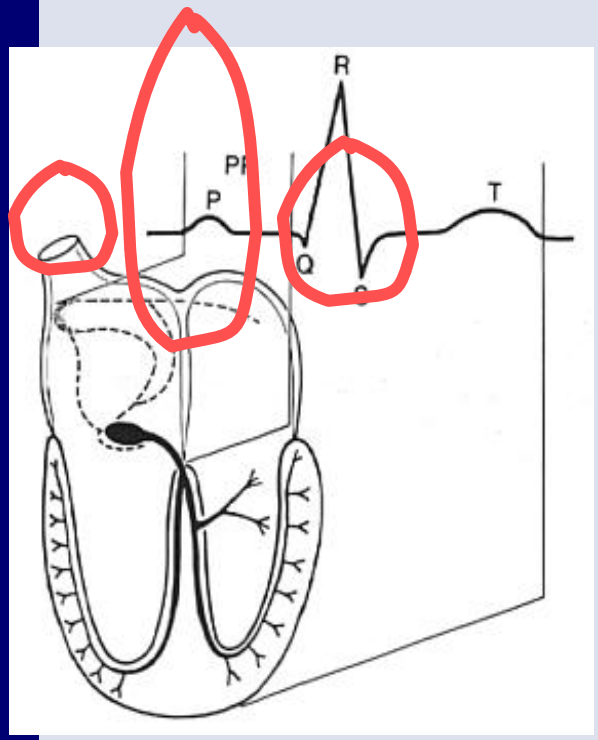
The “PQRST”



- P wave - Atrial depolarization
- QRS - Ventricular depolarization
- T wave - Ventricular repolarization

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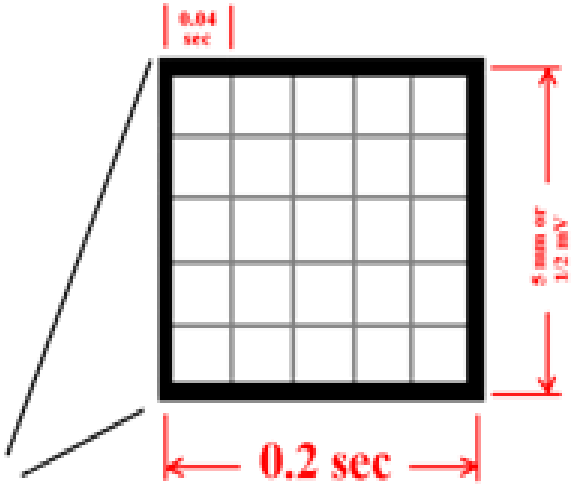
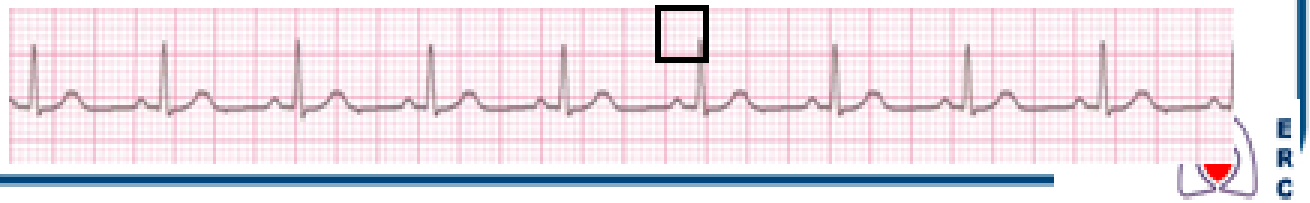
The ECG Paper

- Horizontally
  - One small box - 0.04 s
  - One large box - 0.20 s
- Vertically
  - One large box - 0.5 mV





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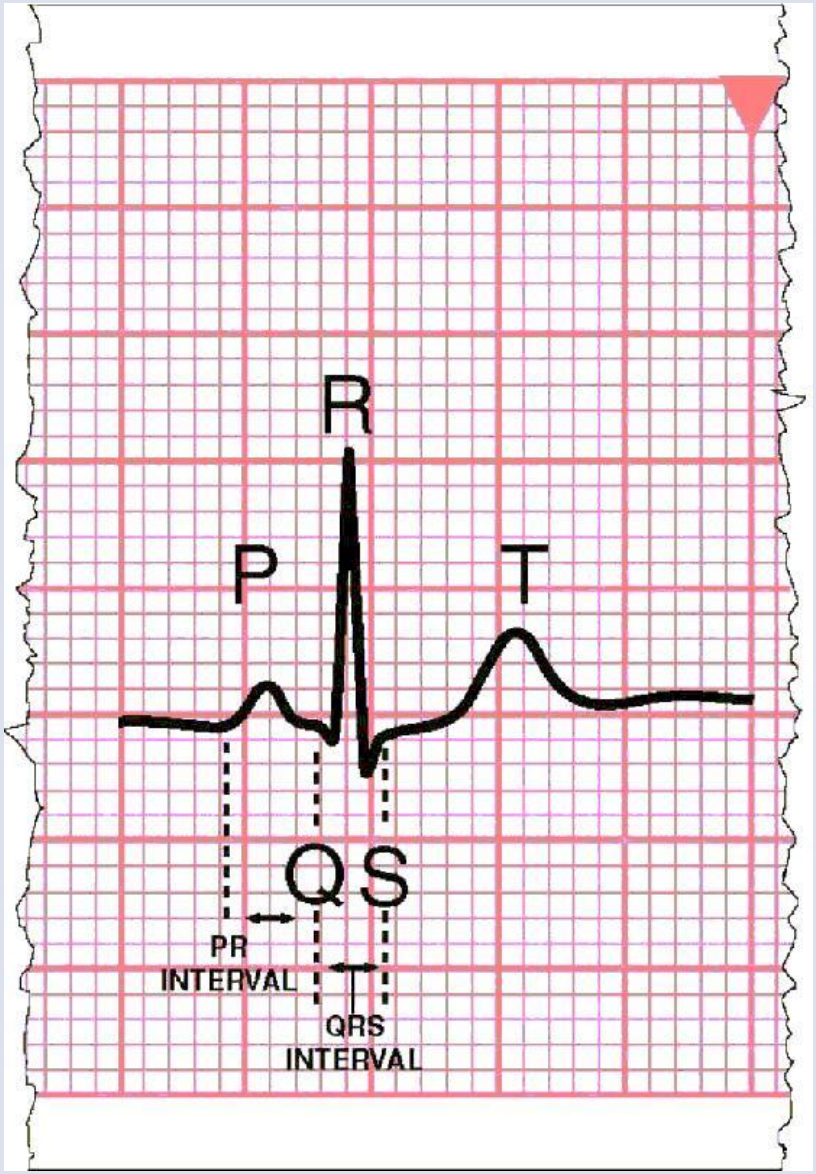

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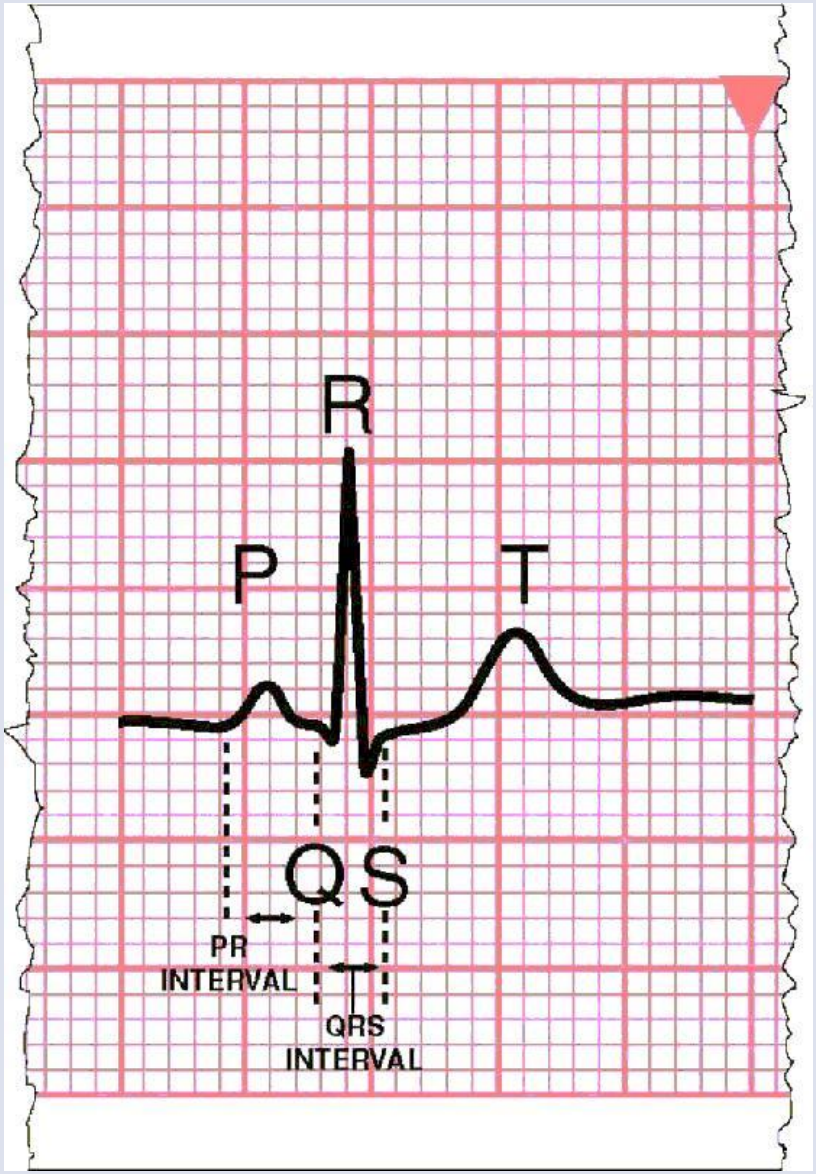

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Normal sinus rhythm

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- normal sinus rhythm
  - each P wave is followed by a QRS
  - P waves normal for the subject
  - P wave rate 60 - 100 bpm with <10% variation
  - rate <60 = sinus bradycardia
  - rate >100 = sinus tachycardia
  - variation >10% = sinus arrhythmia
- normal QRS axis
- normal P waves
  - height < 2.5 mm in lead II
  - width < 0.11 s in lead II
  - for abnormal P waves see right atrial hypertrophy, left atrial hypertrophy, atrial premature beat, hyperkalaemia

- normal PR interval
  - 0.12 to 0.20 s (3 - 5 small squares)
  - for short PR segment consider Wolff-Parkinson-White syndrome or Lown-Ganong-Levine syndrome (other causes - Duchenne muscular dystrophy, type II glycogen storage disease (Pompe's), HOCM)
  - for long PR interval see first degree heart block and 'trifasicular' block
- normal QRS complex
  - < 0.12 s duration (3 small squares)
  - for abnormally wide QRS consider right or left bundle branch block, ventricular rhythm, hyperkalaemia, etc.
  - no pathological Q waves
- no evidence of left or right ventricular hypertrophy

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- normal QT interval
  - Calculate the corrected QT interval (QTc) by dividing the QT interval by the square root of the preceeding R - R interval. Normal = 0.42 s.
    - Causes of long QT interval
    - myocardial infarction, myocarditis, diffuse myocardial disease
    - hypocalcaemia, hypothyrodism
    - subarachnoid haemorrhage, intracerebral haemorrhage
    - drugs (e.g. sotalol, amiodarone)
    - hereditary
      - Romano Ward syndrome (autosomal dominant)
      - Jervill + Lange Nielson syndrome (autosomal recessive) associated with sensorineural deafness

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- normal ST segment
  - no elevation or depression
    - causes of elevation include acute MI (e.g. anterior, inferior), left bundle branch block, normal variants (e.g. athletic heart, Edeiken pattern, high-take off), acute pericarditis
    - causes of depression include myocardial ischaemia, digoxin effect, ventricular hypertrophy, acute posterior MI, pulmonary embolus, left bundle branch block

- normal T wave
  - causes of tall T waves include hyperkalaemia, hyperacute myocardial infarction and left bundle branch block
  - causes of small, flattened or inverted T waves are numerous and include ischaemia, age, race, hyperventilation, anxiety, drinking iced water, LVH, drugs (e.g. digoxin), pericarditis, PE, intraventricular conduction delay (e.g. RBBB)and electrolyte disturbance.
- normal U wave

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Rate calculation

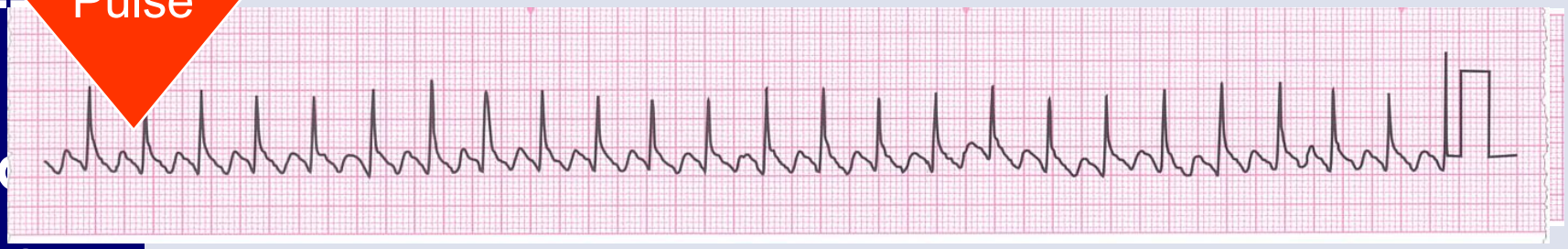
Normal rate 60 : 100 b/min

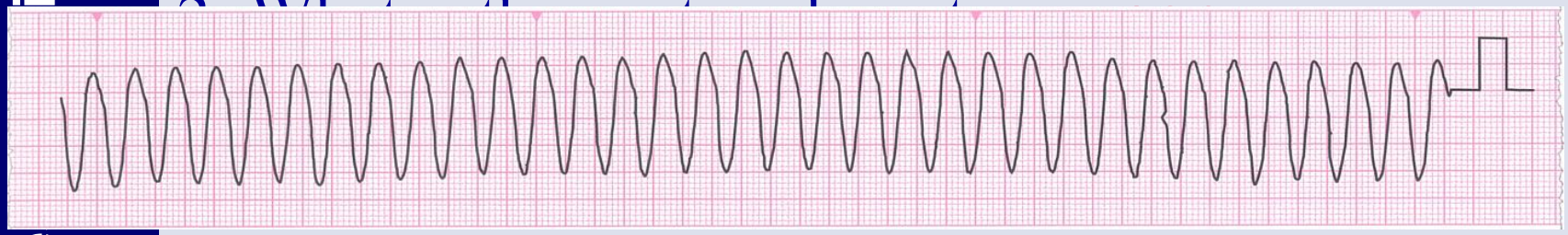
If regular 300/n.of large squares between R.....R

If irregular n.of R in 15 large squares x 10

How to read a rhythm strip

Pulse





4- Is the QRS complex width normal or prolonged

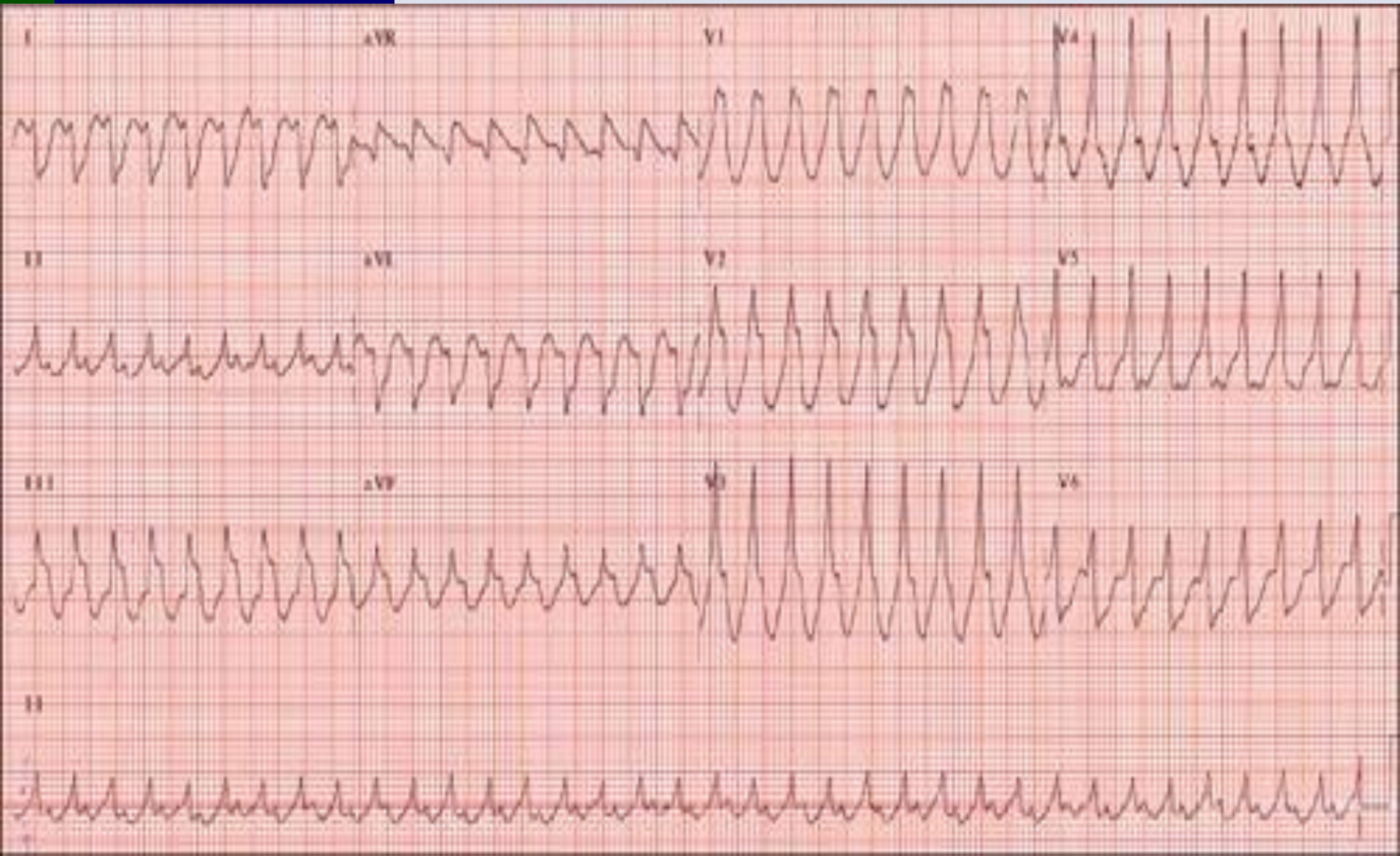
5- Is atrial activity present

6- How is atrial activity related to ventricular activity

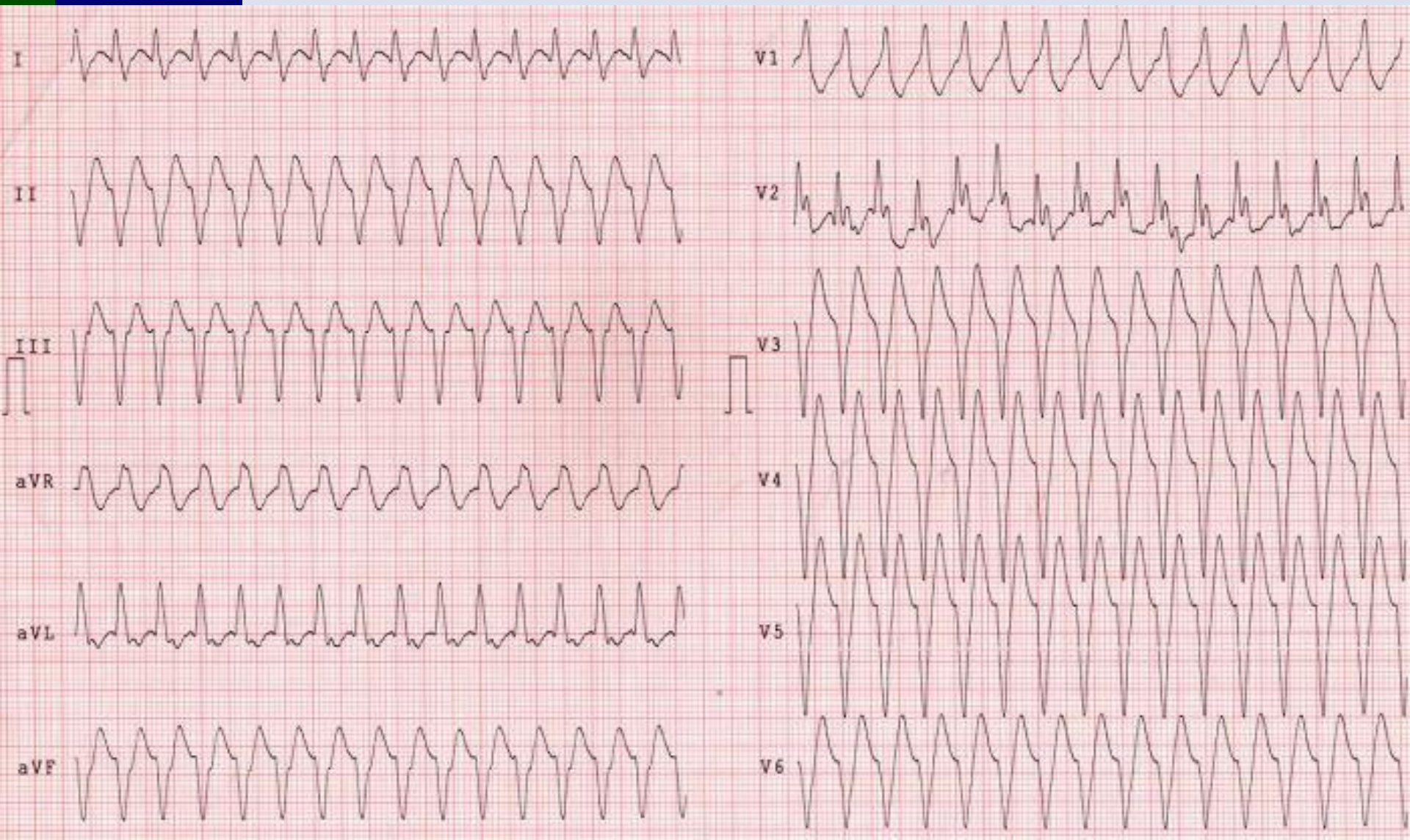
European Re

SVT

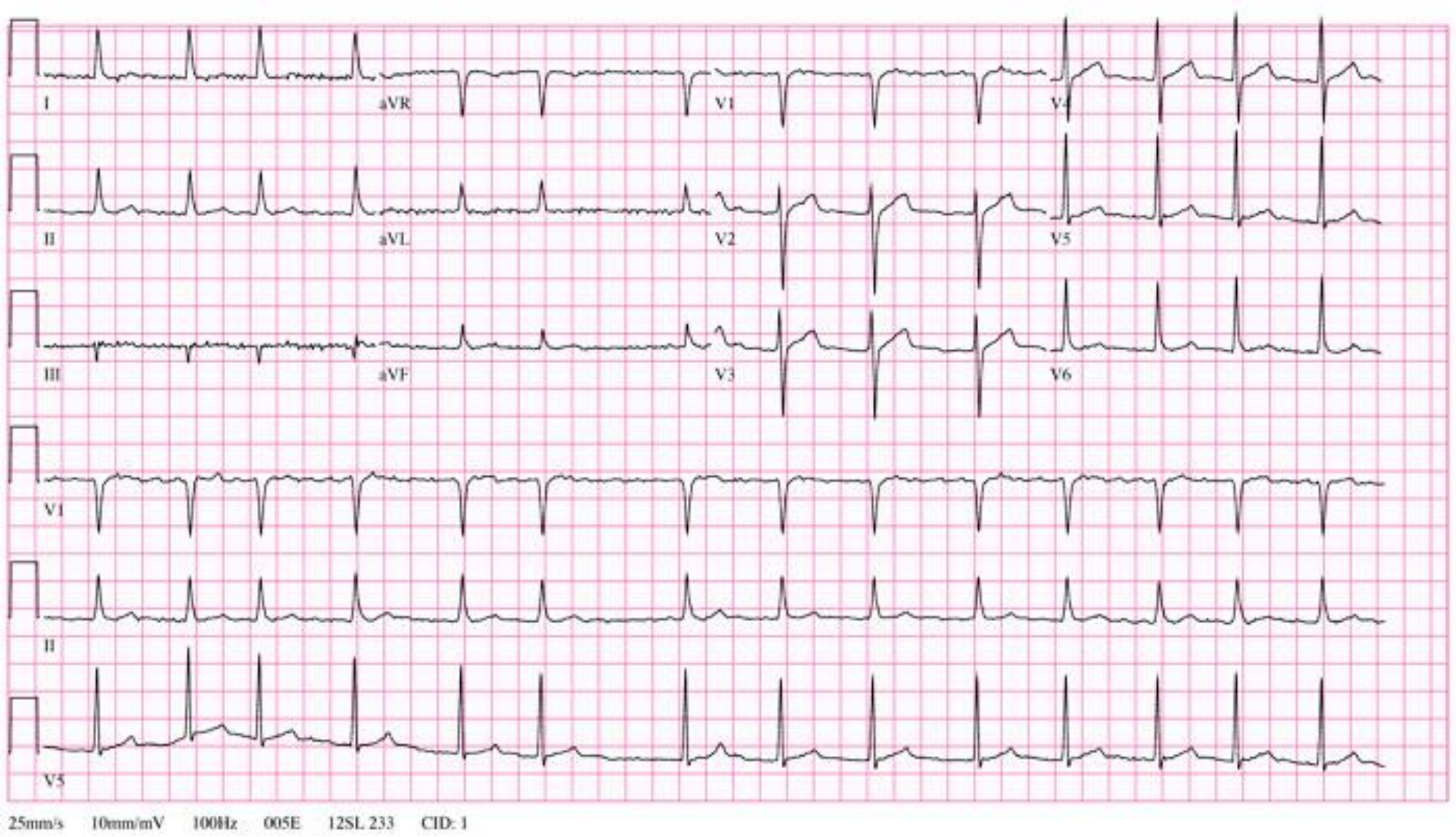
Vtac



Ventricular fibrillation



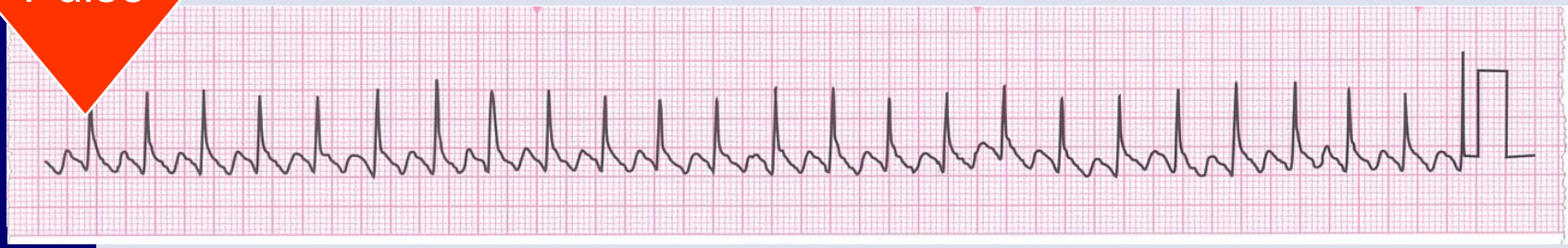
Atrial fibrillation

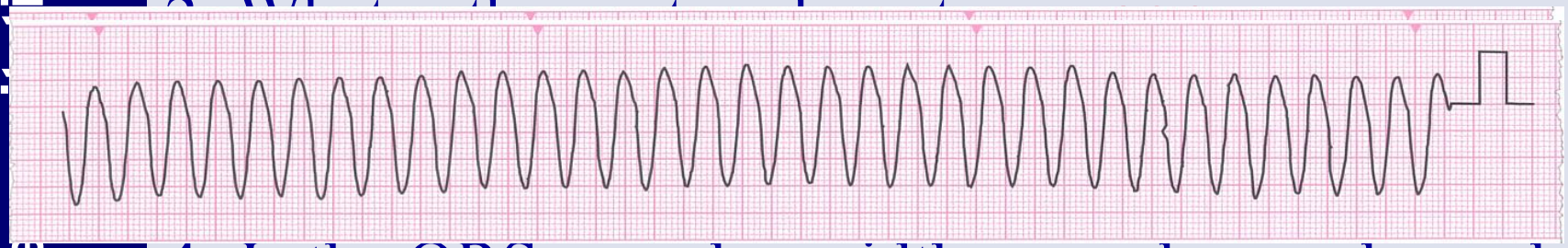


Atrial flutter

How to read a rhythm strip

Pulse





4- Is the QRS complex width normal or prolonged

5- Is atrial activity present

6- How is atrial activity related to ventricular activity

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- Signs of RISK

Is patient stable?

1. Reduced conscious level
2. Chest pain
3. Systolic BP < 90 mmHg 4. Heart failure

(*Rate related symptoms uncommon at less than 150 beats min^{-1}*)

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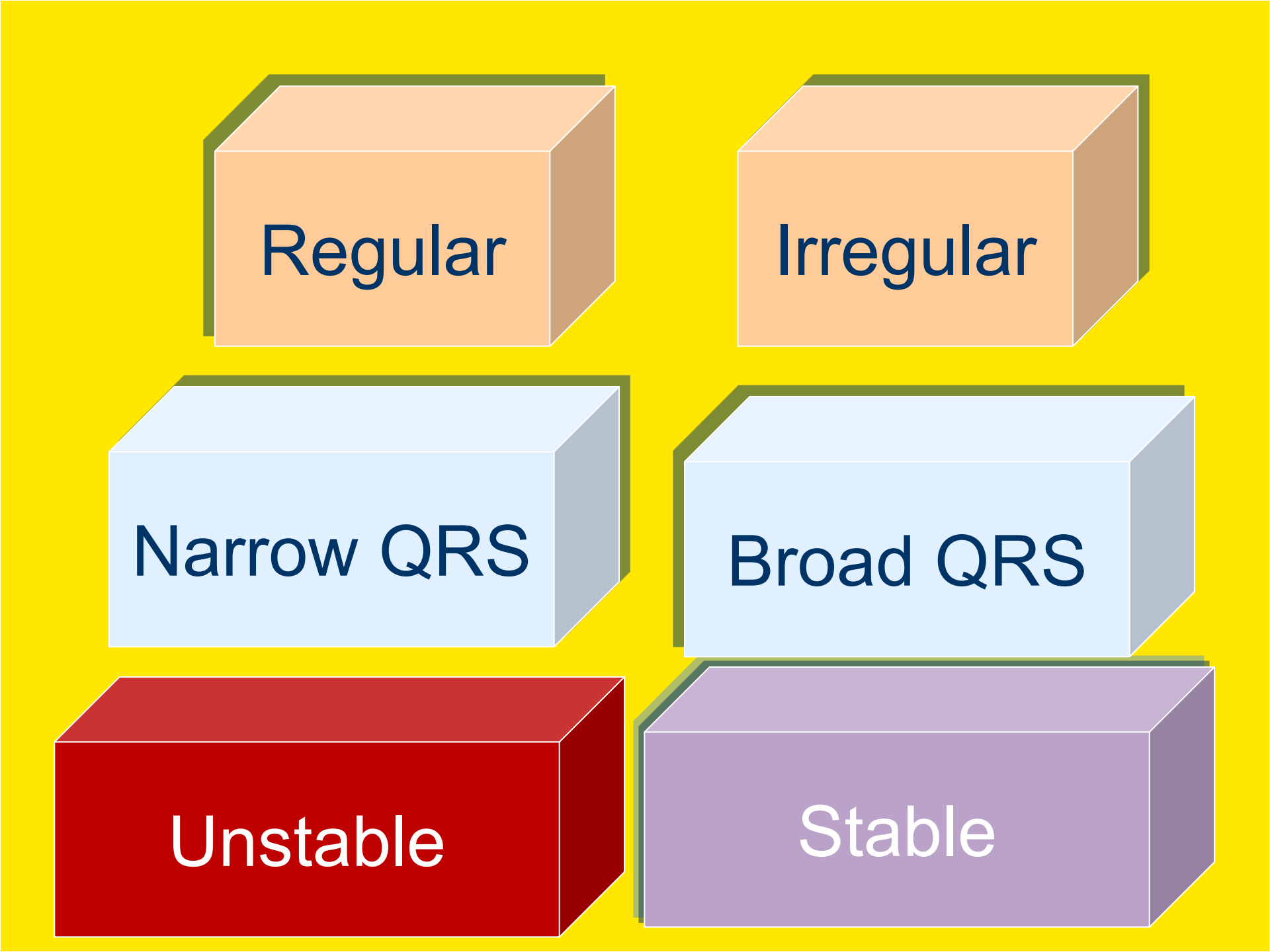
Therapeutic measures

General Measures

- Support ABCs: give oxygen; cannulate a vein
- Monitor ECG, BP, SpO_2
- Record 12-lead if possible, if not record rhythm strip
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Specific therapeutic measures

- Vagal maneuvers
- Drug therapy
- Electrotherapy


Regular
Irregular
Narrow QRS
Broad QRS
Unstable
Stable

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Instability means

Usually rate >150 b/m

1- chest pain
2- signs of shock
3- short breathing
4- altered mental status
5- Exhaustion (weakness and fatigue
6- syncope and/or DCL

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stability means

Usually rate <150 b/m

Only tachyarrhythmia

without

symptoms and signs of INSTABILITY

Tachycardia Algorithm (with pulse)

- Support ABCs: give oxygen; cannulate a vein
- Monitor ECG, BP, SpO_2
- Record 12-lead if possible, if not record rhythm strip
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Is patient stable?

Signs of instability include:
1. Reduced conscious level
2. Chest pain
3. Systolic BP < 90 mmHg
4. Heart failure

(Rate related symptoms uncommon at less than 150 beats min^{-1})

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

Is QRS narrow (< 0.12 sec)?

Broad QRS
Is QRS regular?

Irregular

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)

Regular

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

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

Normal sinus rhythm restored?

Yes

Probable re-entry PSVT:
- 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 IV or digoxin IV

If onset < 48 h consider:
- Amiodarone 300 mg IV 20-60 min; then 900 mg over 24 h

*Attempted electrical cardioversion is always undertaken under sedation or general anaesthesia

Scenario 1

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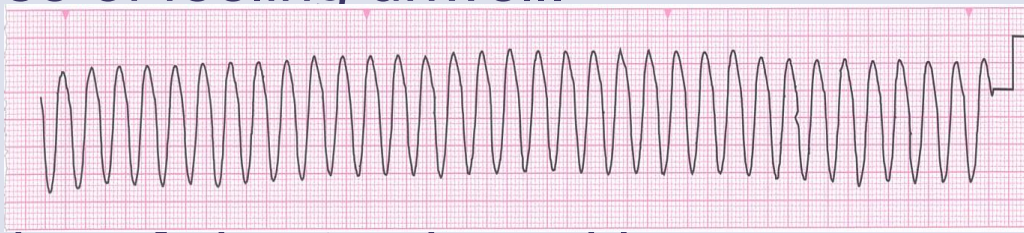
Clinical Setting & History

65 year old woman, in monitored bed 3 days after anterior myocardial infarction. Complains to auxiliary nurse of feeling unwell.

Clinical Course



Patient complains of chest pain and becomes increasingly unwell

Vital signs:

- P 180 min^{-1}
- BP 70/40
- RR 26 min^{-1}

What action will you take?

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Tachycardia Algorithm
(with pulse)

- Support ABCs: give oxygen; cannulate a vein
- Monitor ECG, BP, SpO_2
- Record 12-lead if possible, if not record rhythm strip
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Is patient stable?

Signs of instability include:

1. Reduced conscious level
2. Chest pain
3. Systolic BP < 90 mmHg
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(Rate related symptoms uncommon at less than 150 beats/min)

Unstable

**Synchronised DC Shock*
Up to 3 attempts**

- Amiodarone 300 mg IV over 10-20 min and repeat shock; followed by:
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Stable Narrow Complex Tachycardia

Is QRS narrow (< 0.12 sec)?

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

Normal sinus rhythm restored?

No

Seek expert help

Yes

Probable re-entry PSVT:
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Irregular

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

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Scenario 3

Clinical Setting & History

71 year old man with a history of hypertension is in the recovery area after an uncomplicated hernia repair. Nurses report the sudden onset of tachycardia

Vital signs:

- P 170 min^{-1}
- BP 100/60
- RR rate 18 min^{-1}

What action will you take?

Scenario 3 (continued)

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Clinical Course

Patient is given IV amiodarone. 30 min later patient complains of chest discomfort

Rhythm shows?

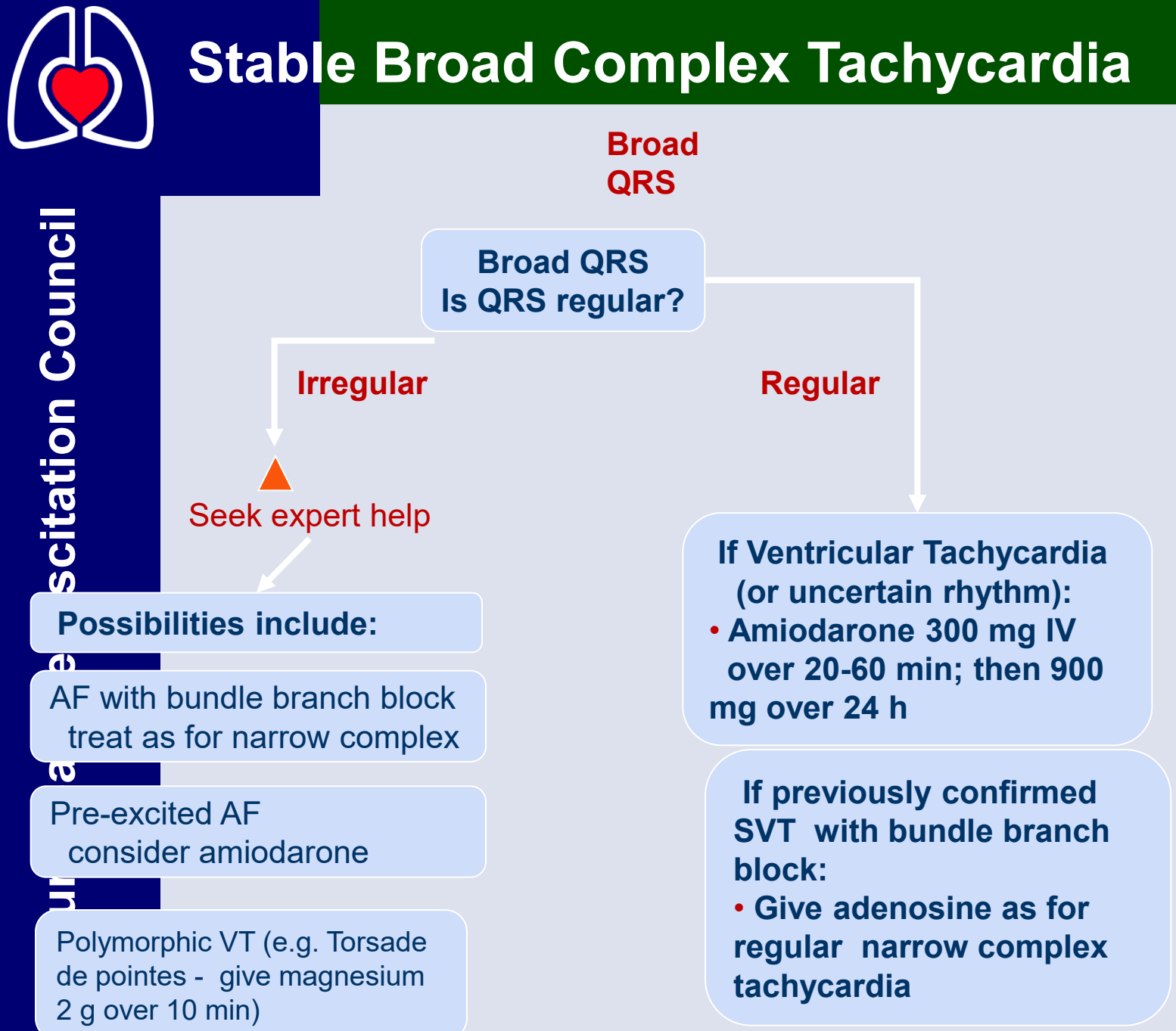
Vital signs:

- P 170 min^{-1}
- BP 85/50

Clinical Course

Cardioversion restores sinus rhythm.
Patient is returned to the day case unit.

Stable Broad Complex Tachycardia



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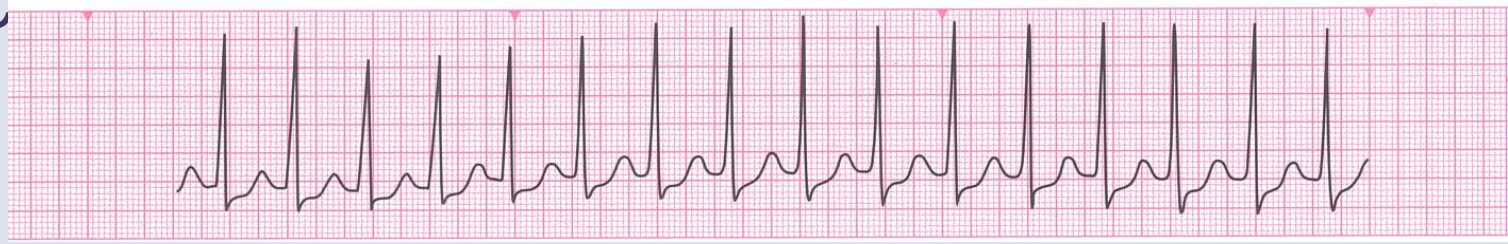
Scenario 2

Clinical Setting & History

48 year old woman admitted to Emergency Dept / ward via GP. History of rapid palpitation over past 12 hours.

Clinical Course



Vital signs:

- P 180 min^{-1}
- BP 110/90
- RR 16 min^{-1}

What action will you take?

Scenario 2 (continued)

Clinical Course

- No response to vagal manoeuvres
- Vital signs unchanged

Tachycardia Algorithm (with pulse)

- Support ABCs: give oxygen; cannulate a vein
- Monitor ECG, BP, SpO_2
- Record 12-lead if possible, if not record rhythm strip
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Is patient stable?

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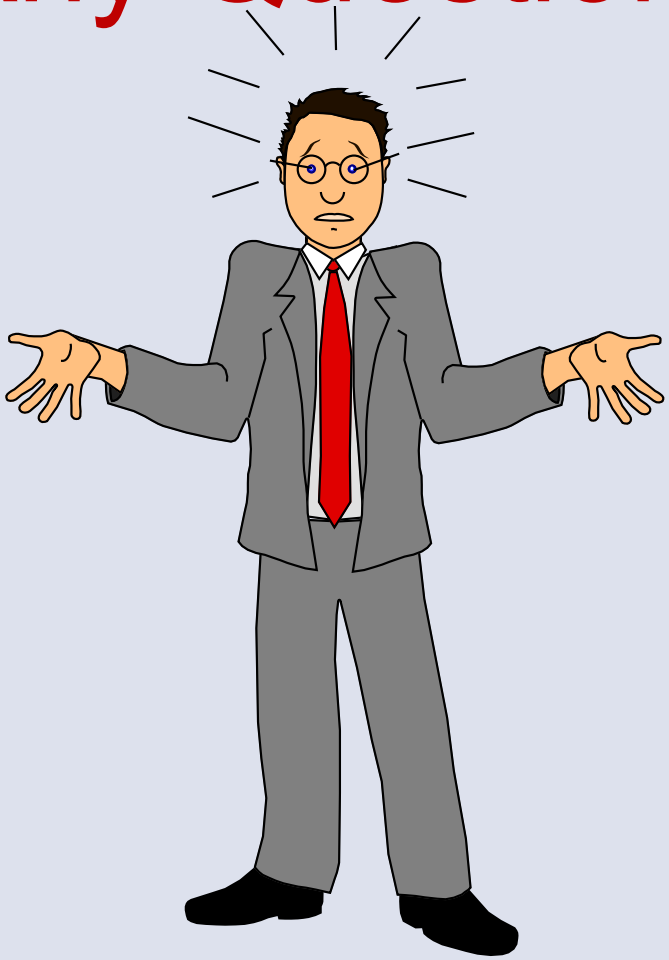
Any Questions ?



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Summary

- Assess the Patient “ stable or not ”
- Assess the Rhythm
- Follow the treatment protocol
- Seek Expert help