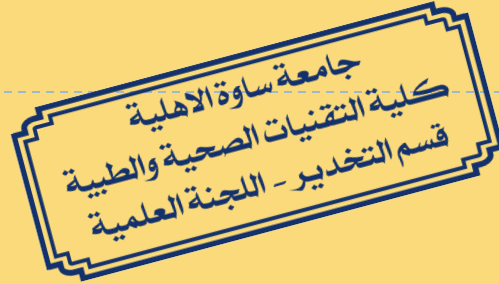


أسس الطب الباطني

CARDIOVASCULAR diseases L2



Sawa University

College of health and medical techniques

Department of

Anesthesia.....2nd..... Stage

جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات التخدير

..... المرحلة الثانية .. الثانية

.....محاضرة رقم 11..

Lecture No. ...11.....

نظري

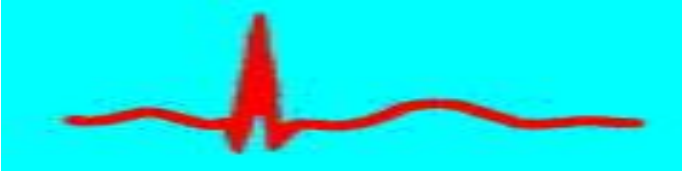
Theoretical

استاذ المادة : د. محمد جليل الزامل

F.I.B.MS M.B.CH.B

GENERAL AND

LAPAROSCOPIC SURGEON



ECG & Cardiac Arrhythmias

Introduction:

The body acts as a conductor of electricity.

As the wave of depolarization is transmitted through out the heart , electrical currents spread into tissues surrounding the heart and to the surface of the body.

The placement of electrodes on the skin on opposing sides of the heart enables the electrical current generated by the heart to be recorded.

What is an ECG ?

The electrocardiogram (ECG/EKG) is a representation of the electrical events of the cardiac cycle.

Each event has a distinctive waveform, the study of which can lead to greater insight into a patient's cardiac pathophysiology.

Cardio-diagnostic Investigations

- 1. ECG Recording**
- 2. Cardiac Monitoring**
- 3. TMT/Exercise ECG/Dobutamine Stress Test**
- 4. Holter monitoring**
- 5. Echocardiography**
- 6. Pericardiocentesis**
- 7. Pulse Oxymetry**
- 8. Chest X-ray**
- 9. Cardiac Angiography**
- 10. Others: Pulse, BP, Heart Sound, CT, MRT etc**

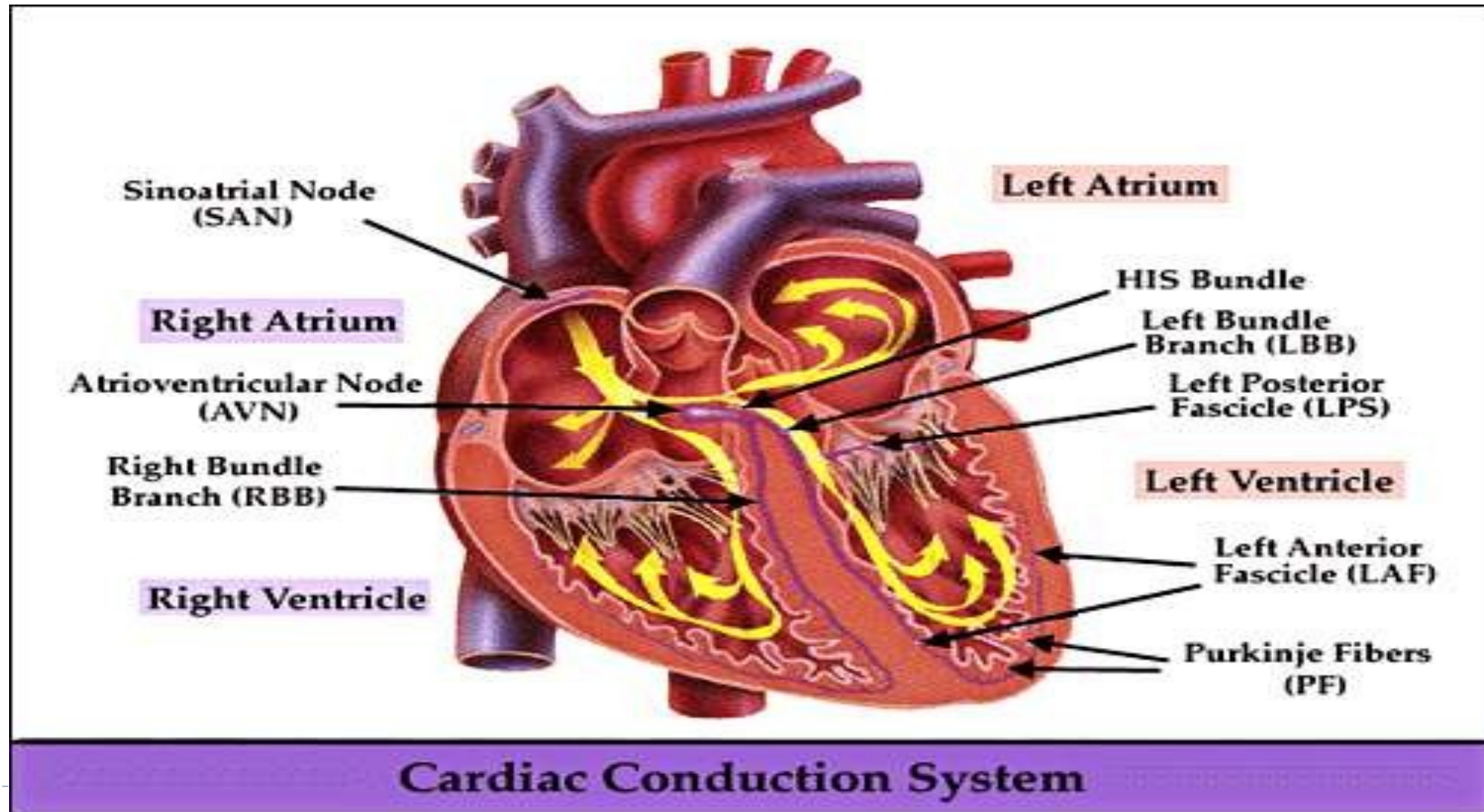
Purpose:

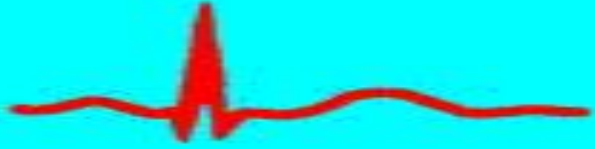
- Arrhythmias
- Myocardial ischemia and infarction
- Pericarditis
- Chamber hypertrophy / Cardiomegaly.
- Electrolyte disturbance(i.e. hyperkalemia, hypokalemia)
- Drug toxicity i.e. digoxin
- To provide vital information regarding the patient's condition and progress(**Death : flat ECG**)

Review Basic of ECG



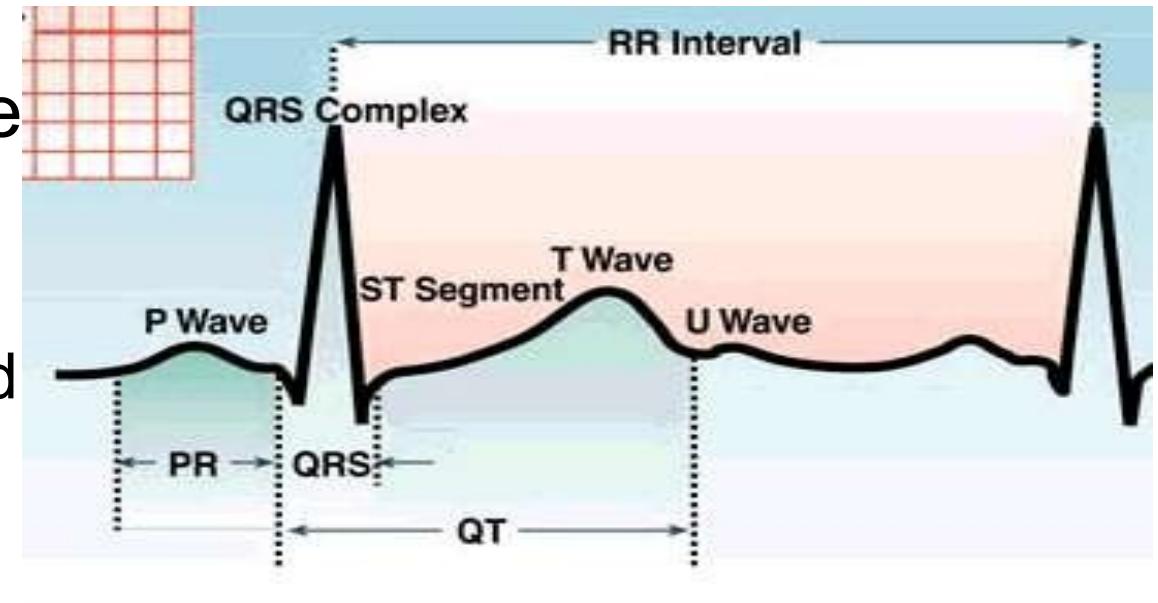
Conduction System

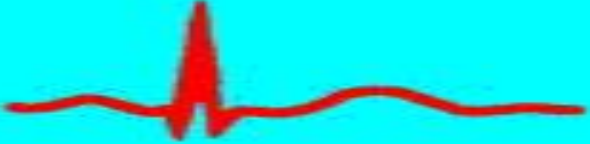




Conduction System

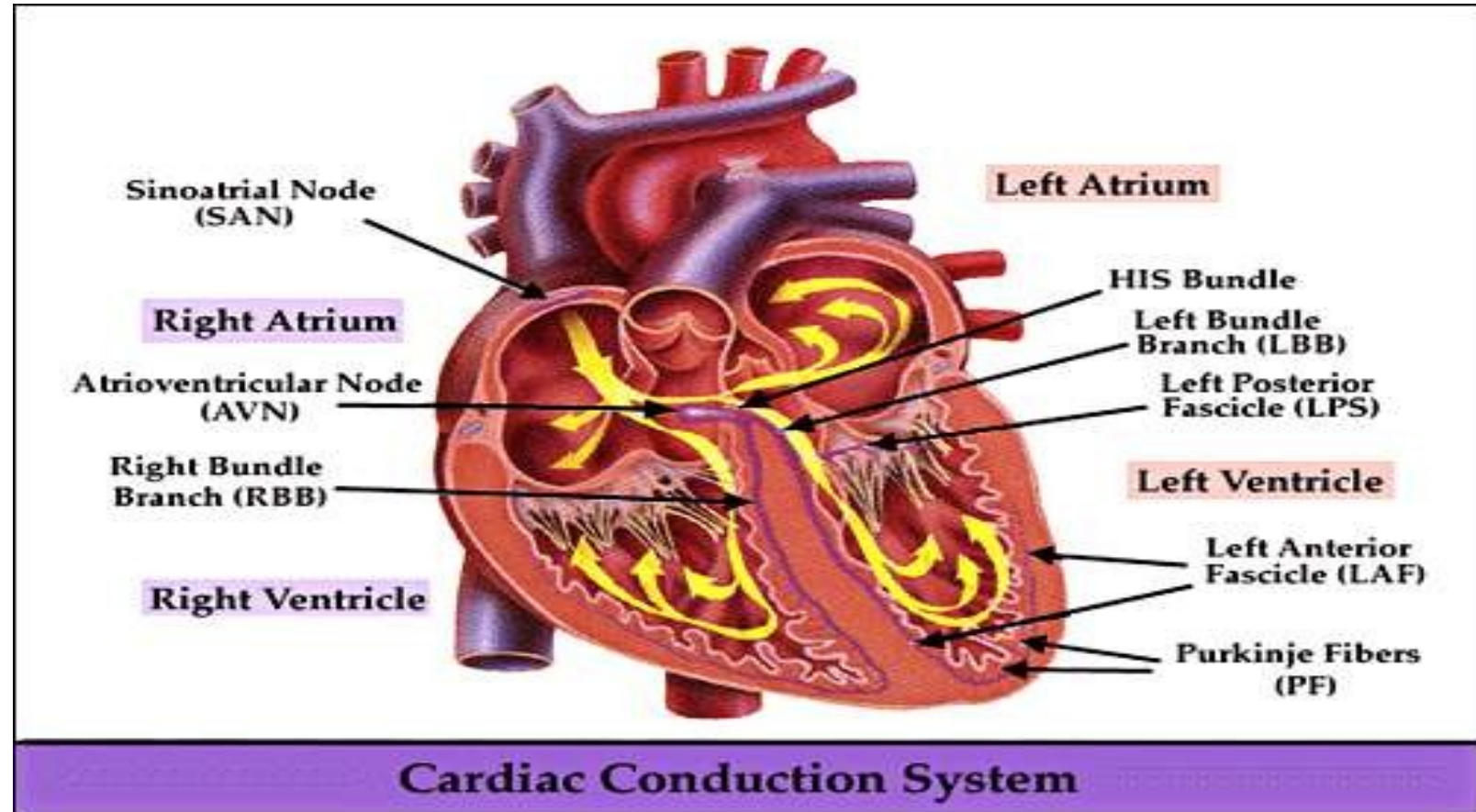
- The heart has a conduction system separate from any other system
- The conduction system makes up the PQRST complex we see on paper
- An arrhythmia is a disruption of the system
- Understanding how the heart conducts normally is essential in understanding and identifying arrhythmias

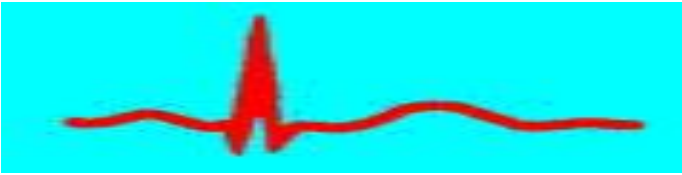




Conduction System

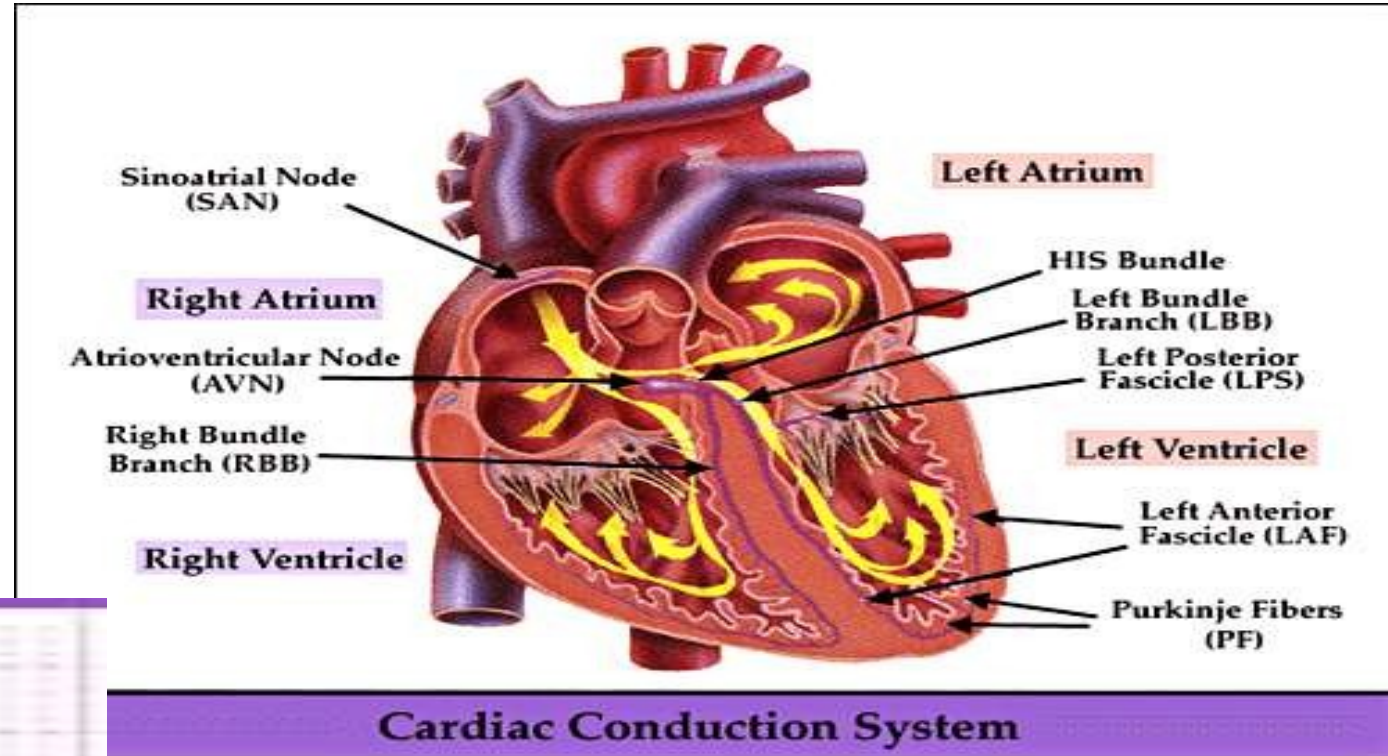
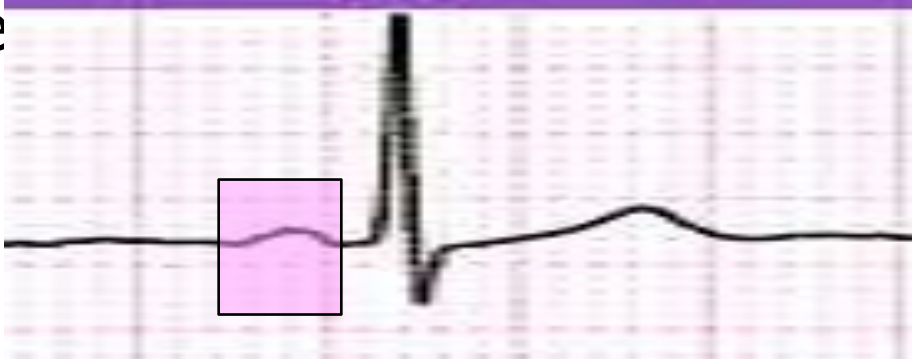
- SA Node
- Inter-nodal and inter-atrial pathways
- A-V Node
- Bundle of His
- Perkinje Fibers

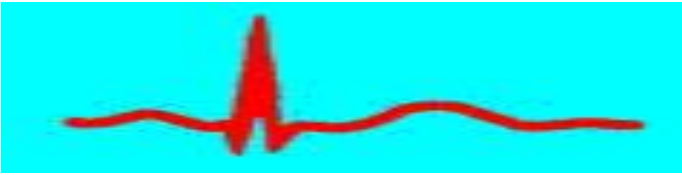




SA Node

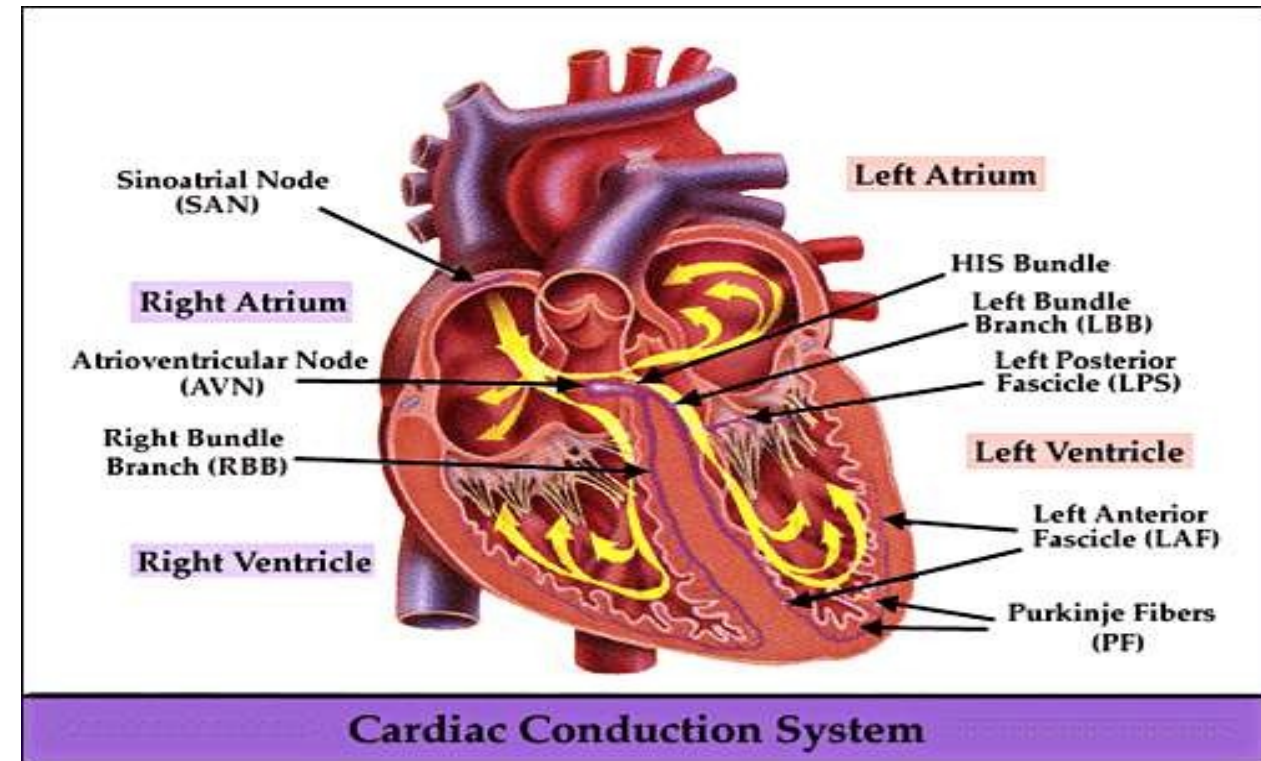
- The primary pacemaker of the heart
- Each normal beat is initiated by the SA node
- Inherent rate of 60-100 beats per minute
- Represents the P-wave in the QRS complex (firing)





AV Node

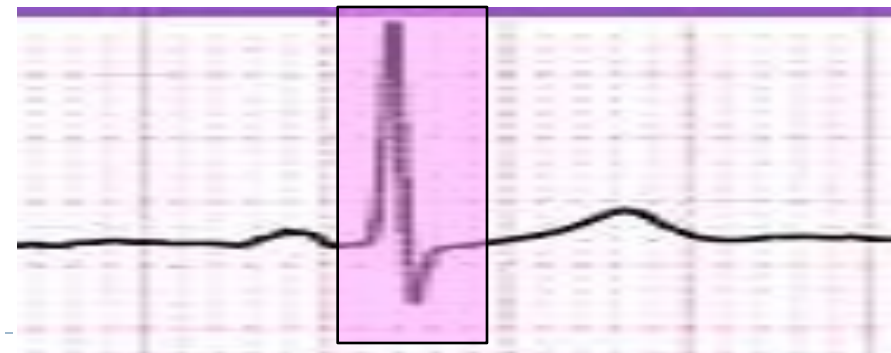
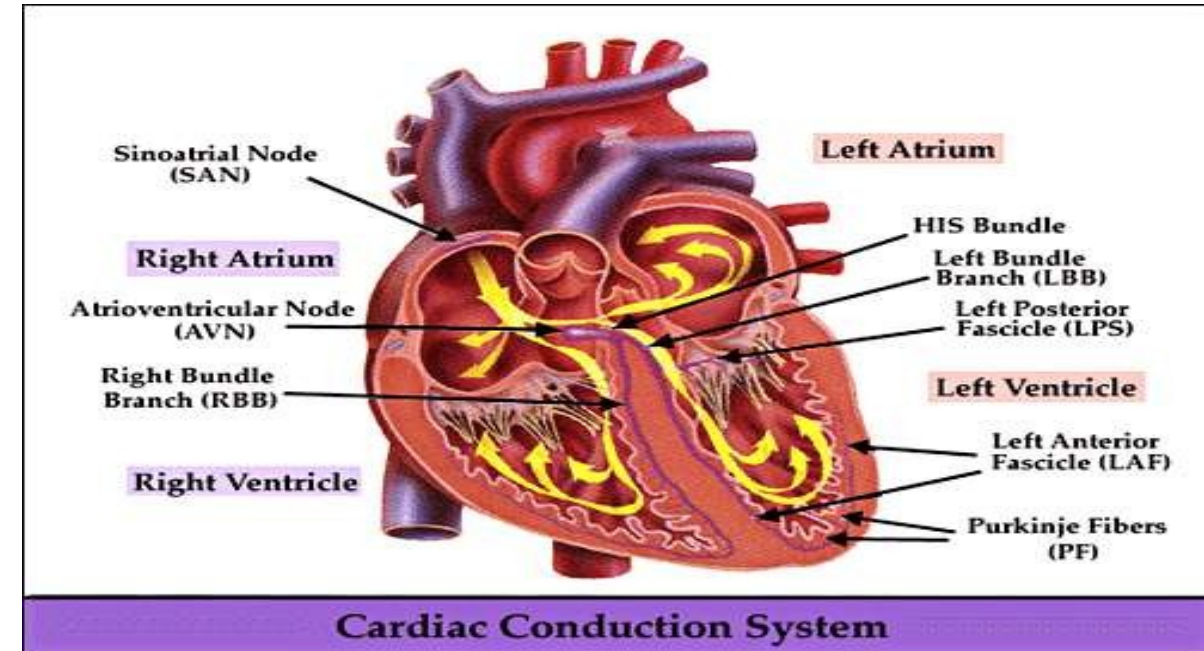
- Located in the septum of the heart
- Receives impulse from inter-nodal pathways and holds the signal before sending on to the Bundle of His
- Represents the PR segment of the QRS complex





QRS Complex

- Represents the ventricles depolarizing (firing) collectively. (Bundle of His and Purkinje fibers)
- Origin of all ventricular rhythms
- Has an inherent rate of 20-40 beats per minute



Normal Impulse Conduction

Sinoatrial node
AV node ↓ Bundle of

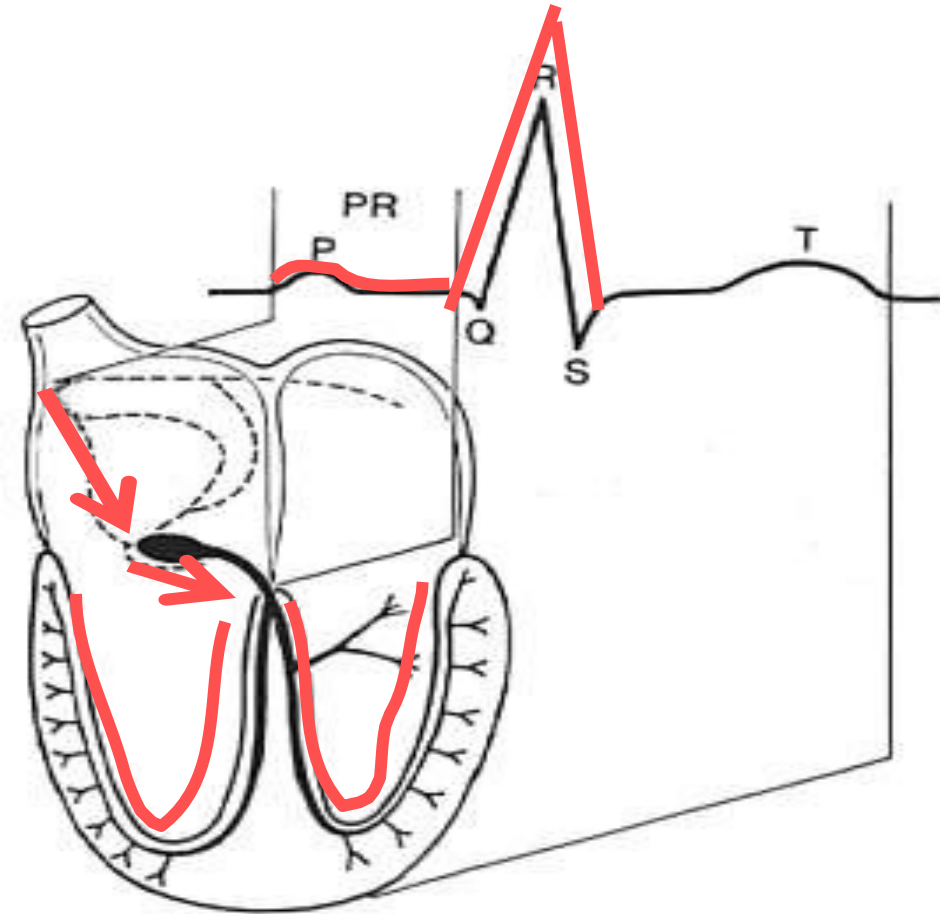
His

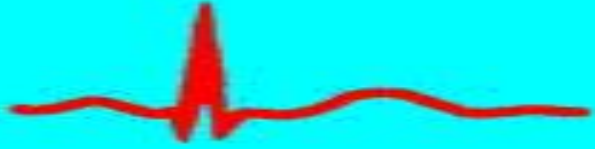


Bundle Branches



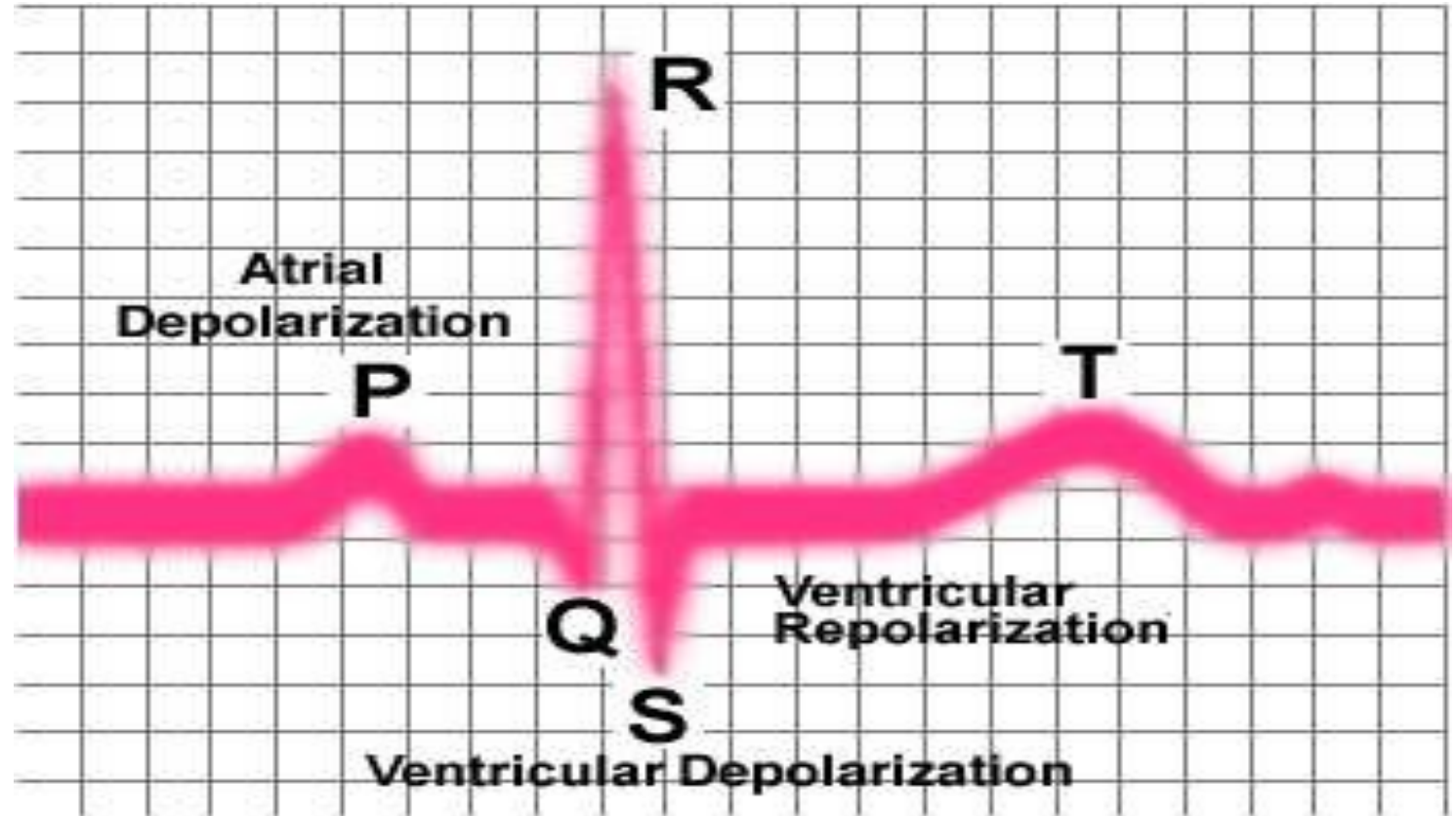
Purkinje fibers

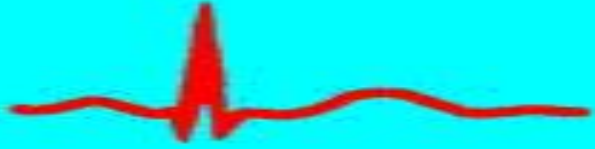




EKG Trace

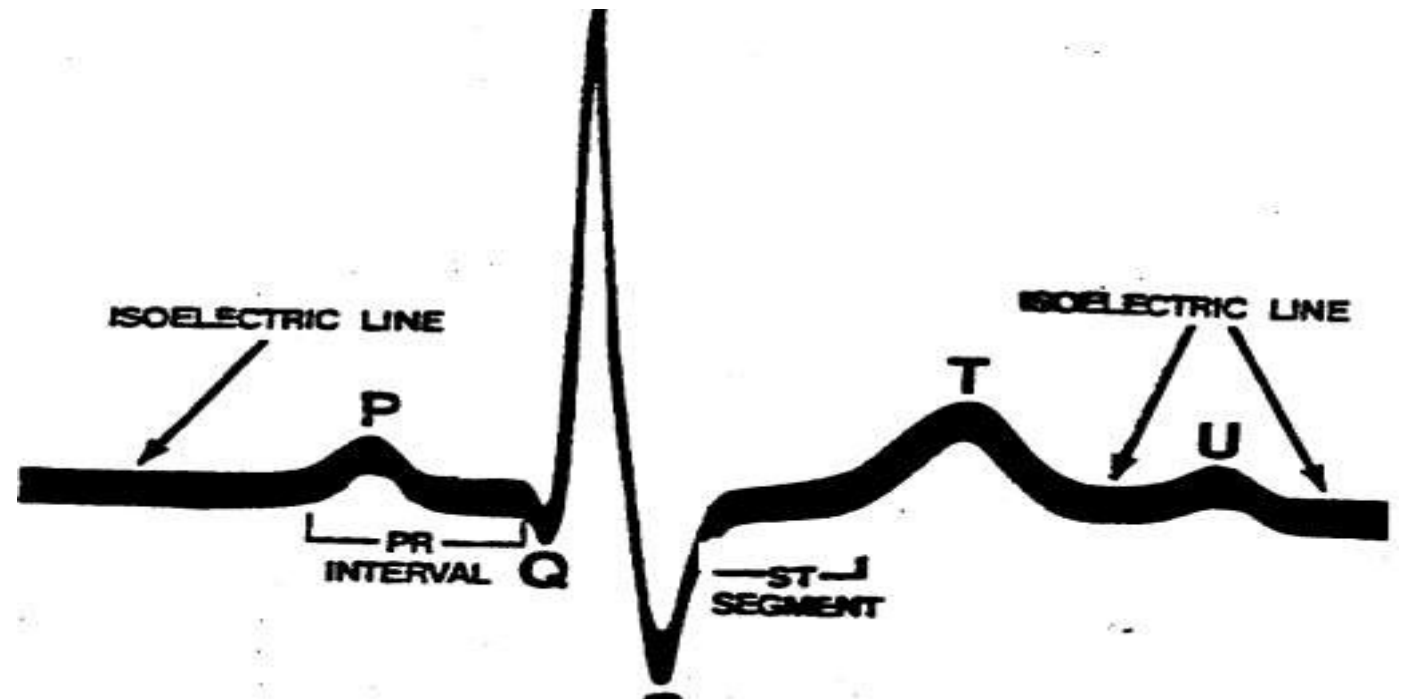
- Isoelectric line (baseline)
- P-wave
 - Atria firing
- PR interval
 - Delay at AV

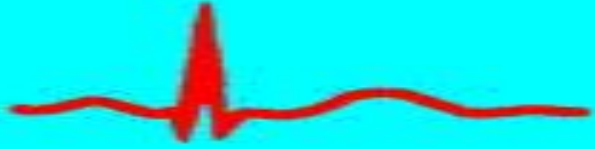




EKG Trace

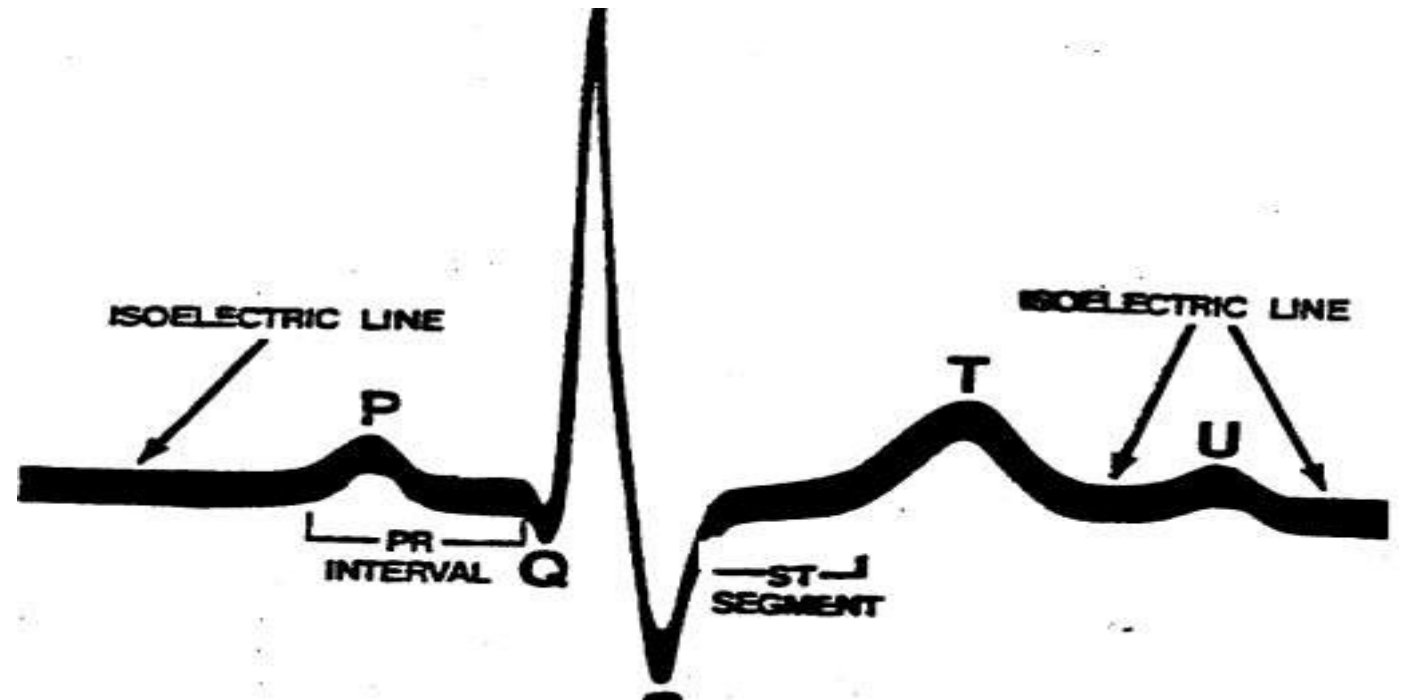
- QRS
 - Ventricles firing
- T-wave
 - Ventricles repolarizing

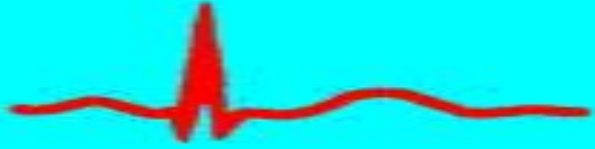




EKG Trace

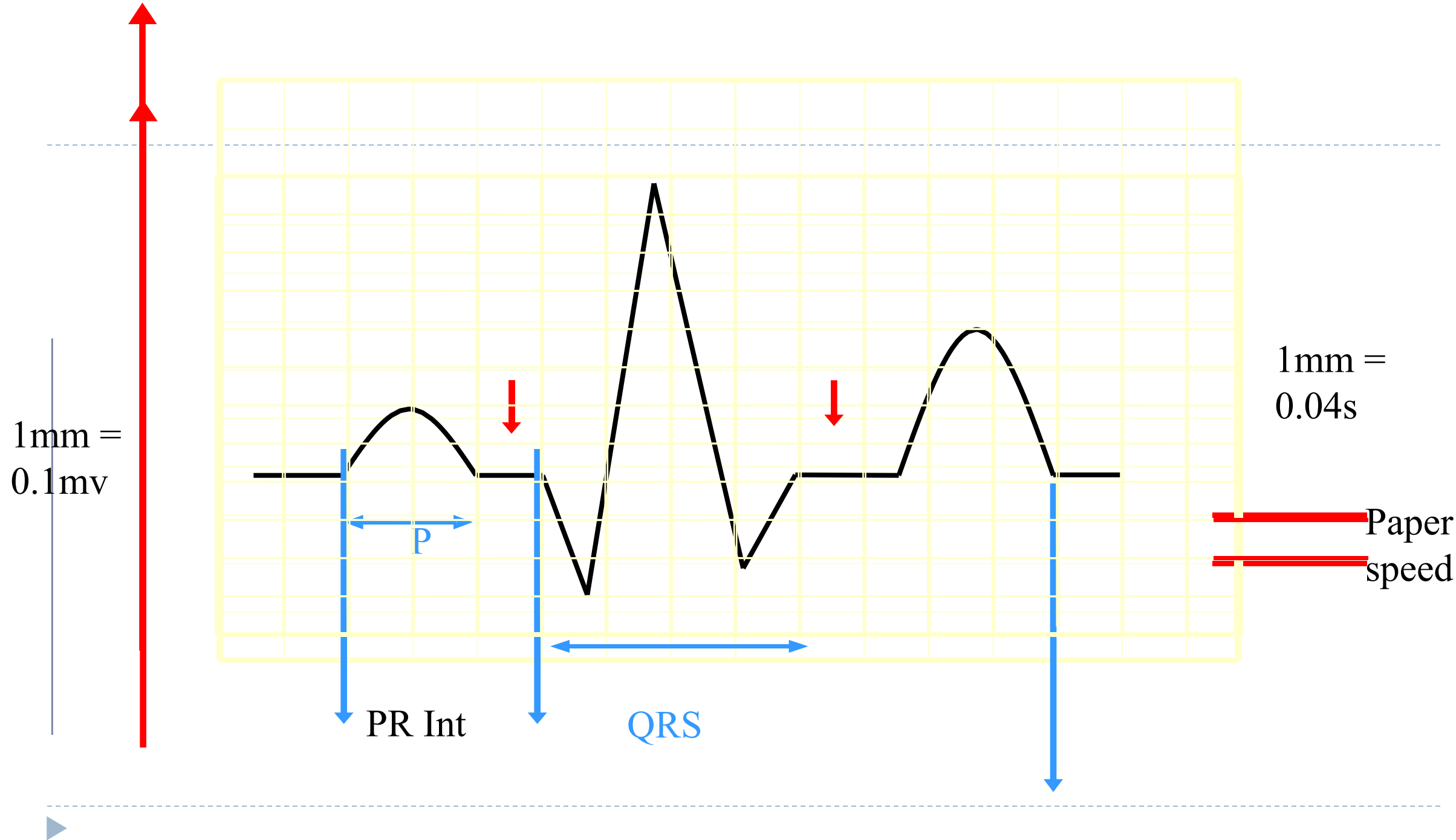
- ST segment
 - Ventricle contracting
 - Should be at isoelectric line
 - Elevation or depression may be important
- U wave
 - Perkinje fiber repolarization?

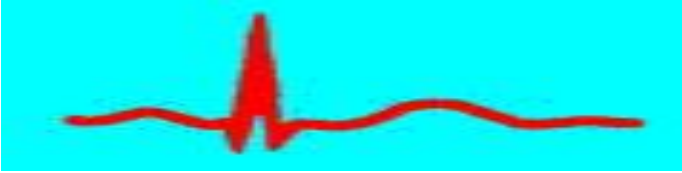




Waveform Analysis

- For each strip it is necessary to go through steps to correctly identify the rhythm
- 1. Is there a P-wave for every QRS?
 - P-waves are upright and uniform
 - One P-wave preceding each QRS
- 2. Is the rhythm regular?
 - Verify by assessing R-R interval
 - Confirm by assessing P-P interval
- 3. What is the rate?
 - Count the number of beats occurring in one minute
 - Counting the p-waves will give the atrial rate
 - Counting QRS will give ventricular rate

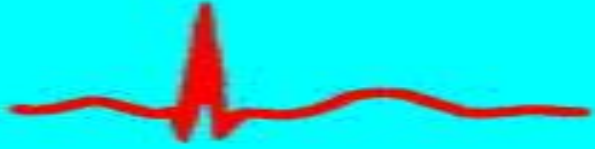




Summary

- Normal
 - Heart rate = 60 – 100 bpm
 - PR interval = 0.12 – 0.20 sec
 - QRS interval <0.12
 - SA Node discharge = 60 – 100 / min
 - AV Node discharge = 40 – 60/min
 -





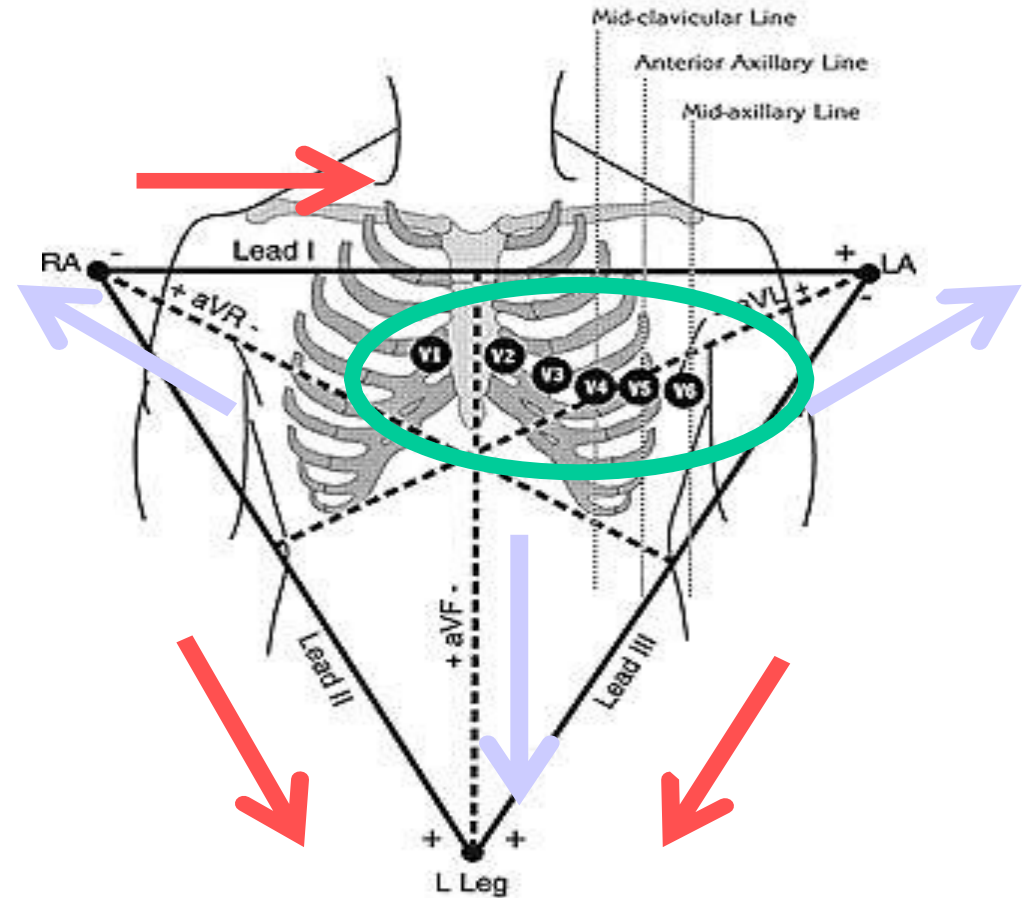
Summary

- Cardiac cycle
 - P wave = atrial depolarization
 - PR interval = pause between atrial and ventricular depolarization
 - QRS = ventricular depolarization
 - T wave = ventricular repolarization

The 12-Leads

The 12-leads include:

- 3 Limb leads (I, II, III)
- 3 Augmented leads (aVR, aVL, aVF)
- 6 Precordial leads (V_1 - V_6)



Lead Views

Standard 12 Lead ECG Placement

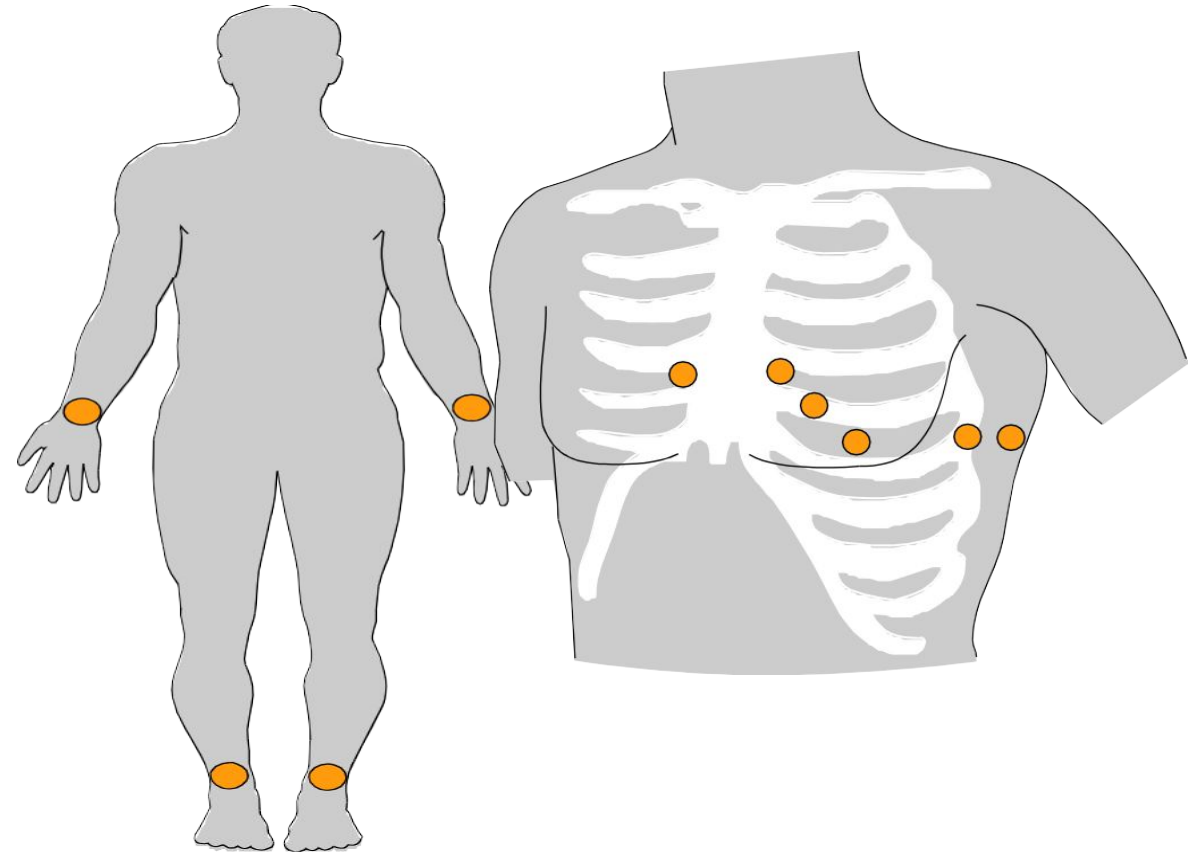
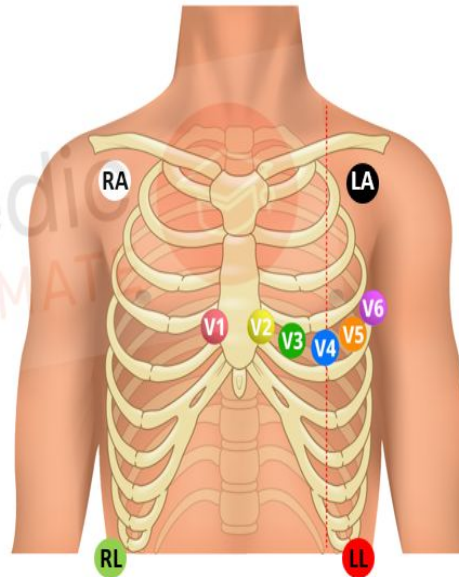
The Paramedic
STUDY MATE

Precordial Lead Placement

- V1** 4th intercostal space, right sternal margin
- V2** 4th intercostal space, left sternal margin
- V3** Midway between V2 & V4
- V4** 5th intercostal space, left mid-clavicular line
- V5** 5th intercostal space, left anterior axillary line
- V6** 5th intercostal space, left mid-axillary line

Limb Lead Placement

- RA** Right arm or shoulder
- LA** Left arm or shoulder
- RL** Right leg or lower right abdomen
- LL** Left leg or lower left abdomen



The information on these reference cards is for educational purposes only. It is not intended as medical, treatment or health advice & should not be relied upon as such. The author does not represent that the information is accurate, reliable, up-to-date, complete or suitable for any particular purpose. Always refer to & follow local guidelines.

How to Place a 12 Lead ECG

You won't believe these
MEMORY TRICKS!

**ECGs
MADE
EASY!**

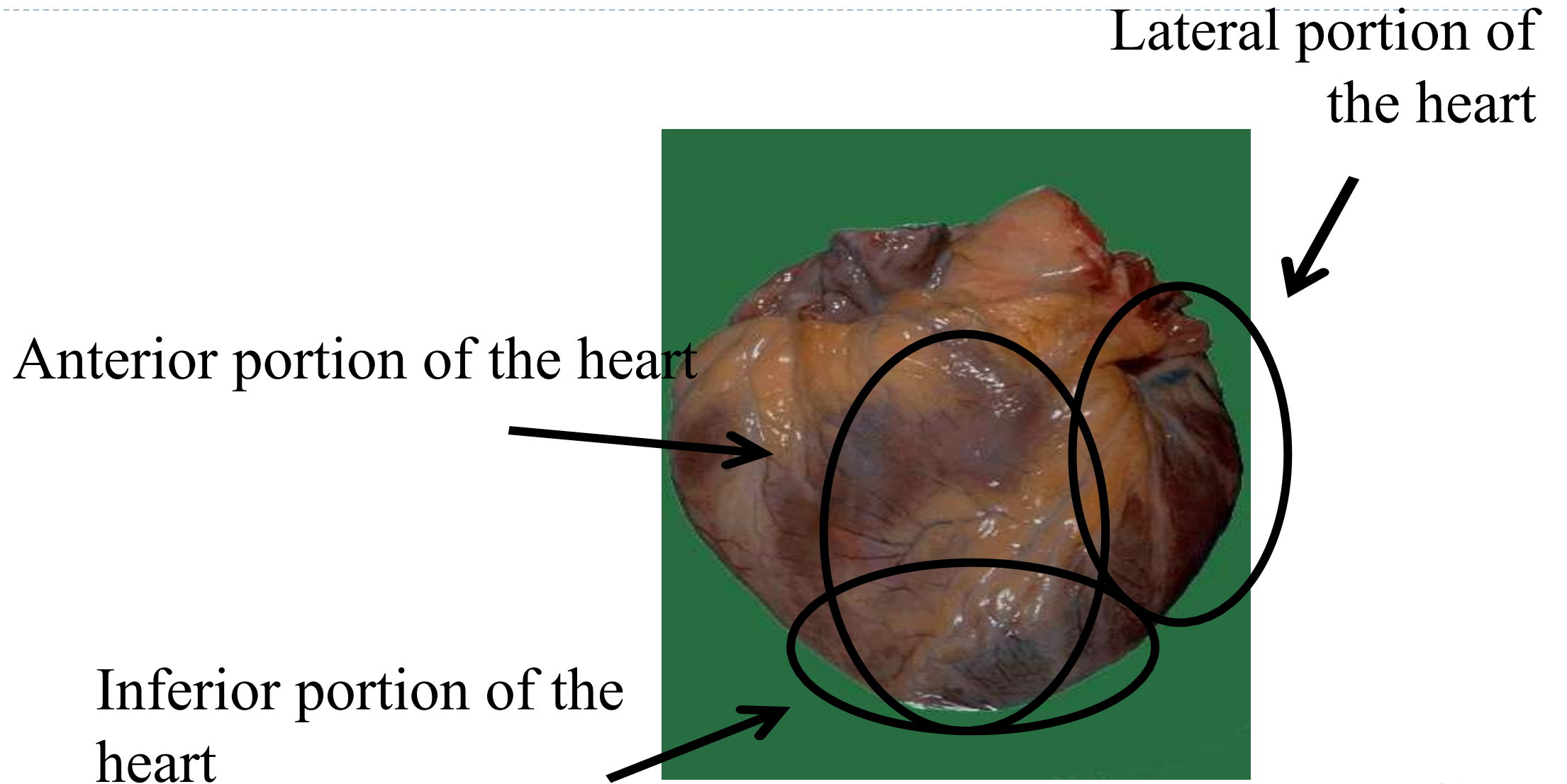
Electrode/ Lead Wire	Position	Color
V1	4th ICS, right of sternum	Red (ride)
V2	4th ICS, left of sternum	Yellow (your)
V3	Between V2 and V4	Green (green)
V4	5th ICS, midclavicular	Blue (bike)
V5	5th ICS, anterior axillary	Orange (on)
V6	5th ICS, left midaxillary	Pink (pink)

Anatomic Groups

(Summary)

I Lateral	aVR None	V ₁ Septal	V ₄ Anterior
II Inferior	aVL Lateral	V ₂ Septal	V ₅ Lateral
III Inferior	aVF Inferior	V ₃ Anterior	V ₆ Lateral

Other MI Locations



Features to Analyze on every ECG

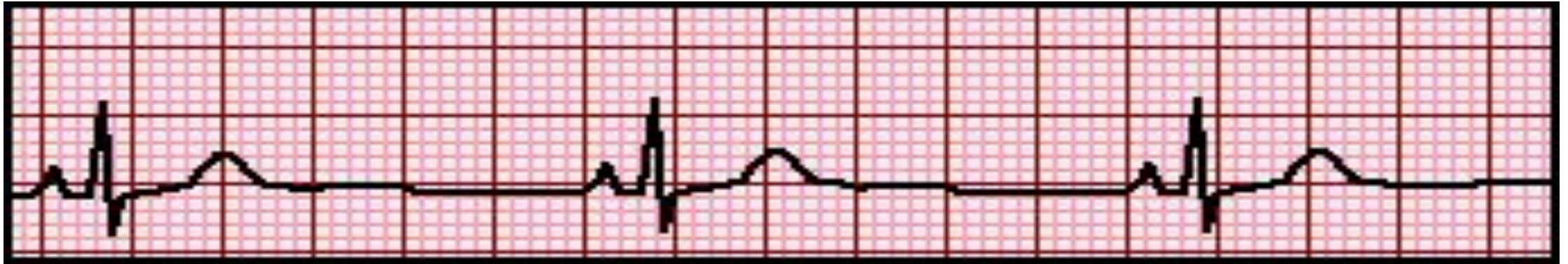
1. Standardization / Calibration / Technical Quality
2. Heart Rate
3. Rhythm
4. PR interval
5. P-wave Size
6. QRS-width/interval
7. QT interval
8. R-wave progression in chest leads
9. Abnormal q-wave
10. ST Segment
11. T-wave
12. U- wave
13. Others-Axis, voltage etc

Rule of 300 (Clinical use)

□ Take the number of “big boxes” between neighboring QRS complexes, and divide this into 300. The result will be approximately equal to the rate

□ **300/ No of large squares between 2 „R” wave= HR/min (300/4=75 min)**

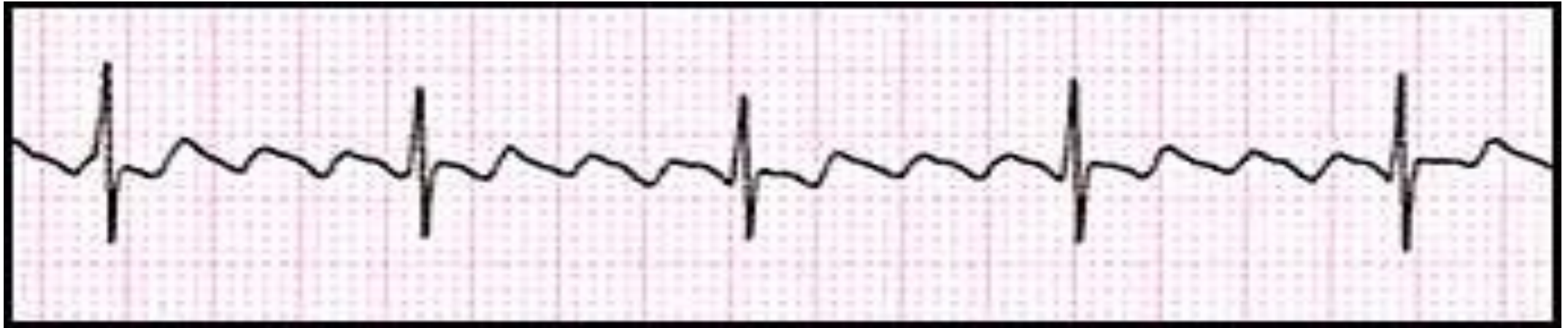
What is the heart rate?



www.uptodate.com

$$(300 / 6) = 50 \text{ bpm}$$

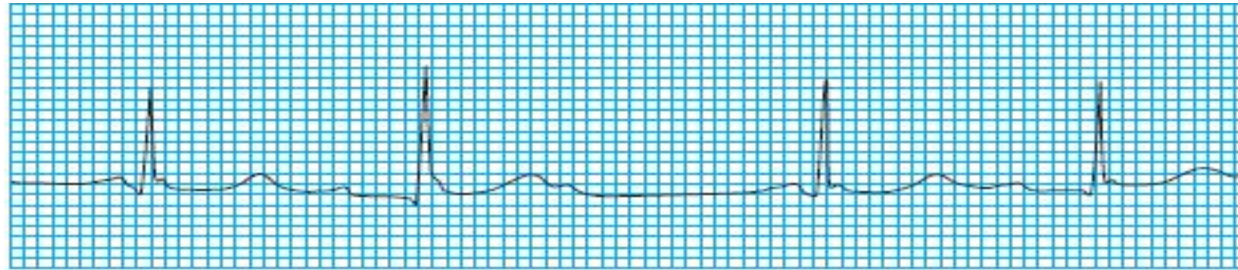
What is the heart rate?



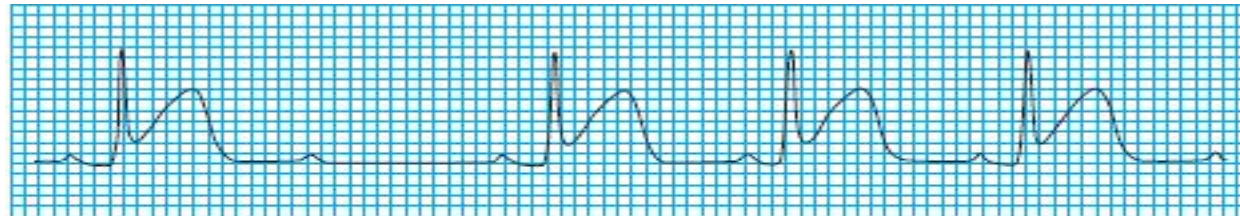
www.uptodate.com

$$(300 / \sim 4) = \sim 75 \text{ bpm}$$

Rhythm



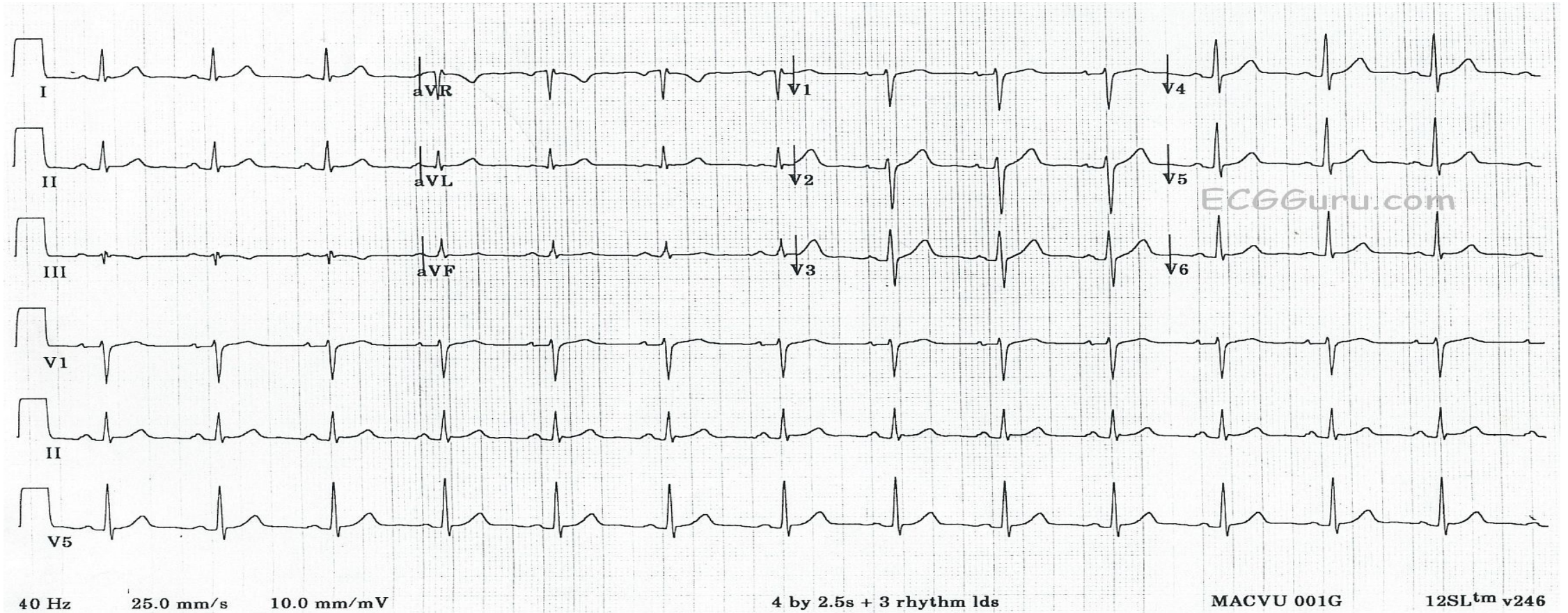
Mobitz type I block (Wenckebach phenomenon)

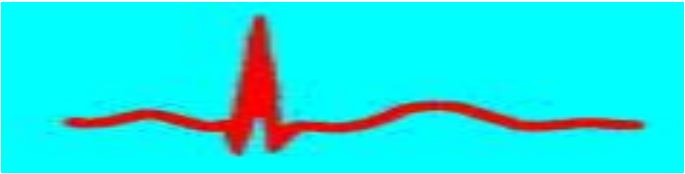


Mobitz type II block—a complication of an inferior myocardial infarction. The PR interval is identical before and after the P wave that is not conducted

Common ECG View

Normal ECG strip



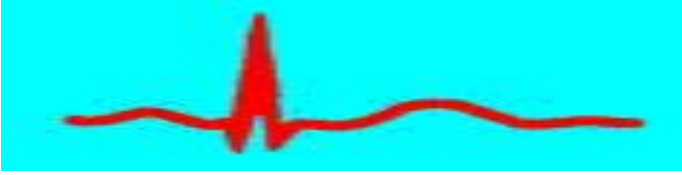


Sinus Rhythms

Normal Sinus Rhythm

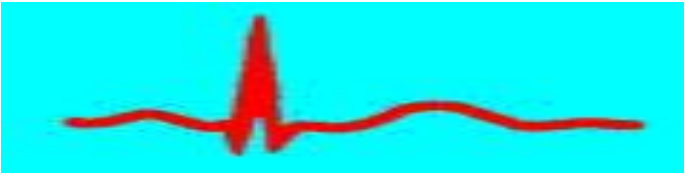


Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
60 - 100	Regular	Before each QRS, Identical	.12 - .20	<.12



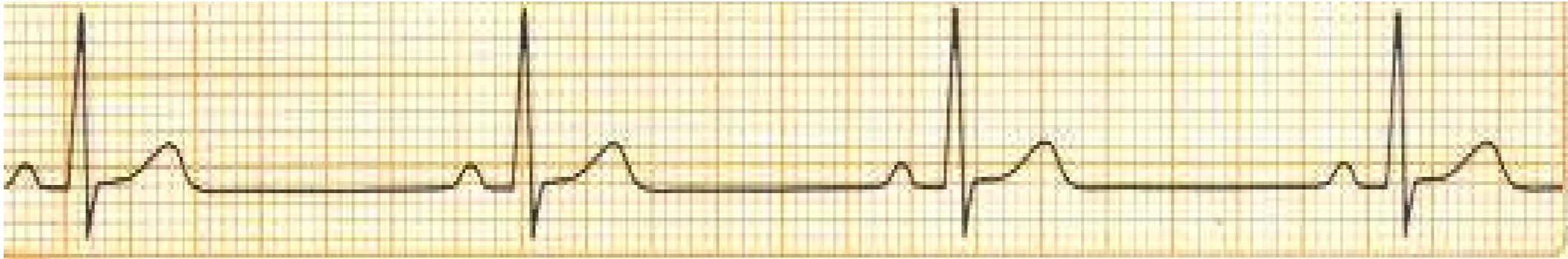
Cardiac Arrhythmias

Abnormal Rhythm?

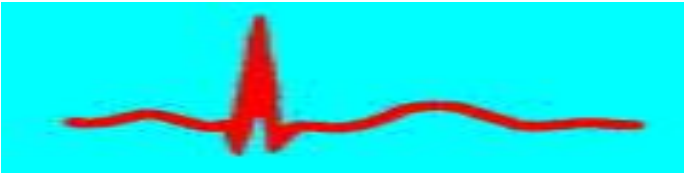


Sinus Rhythms

Sinus Bradycardia



Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
<60	Regular	Before each QRS, Identical	.12 - .20	<.12

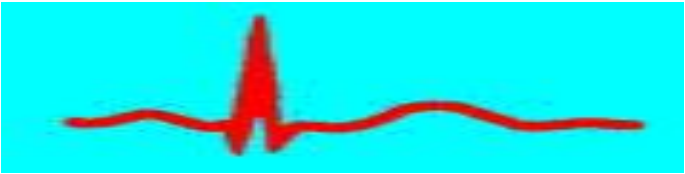


Sinus Rhythms

Sinus Tachycardia



Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
>100	Regular	Before each QRS, Identical	.12 - .20	<.12

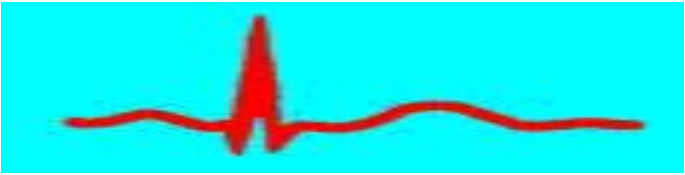


Atrial Rhythms

Atrial Fibrillation

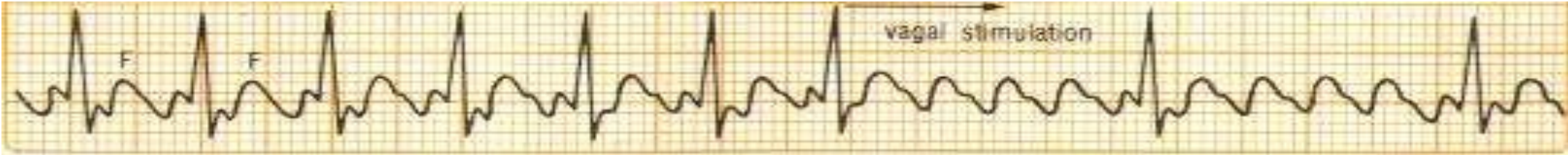


Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
Var.	Irregular	Wavy irregular	NA	<.12

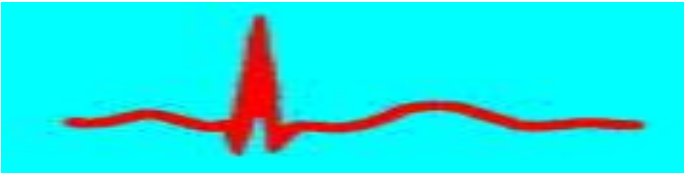


Atrial Rhythms

Atrial Flutter



Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
Atrial=250 – 400 Ventricular Var.	Irregular	Sawtooth	Not Measurable	<.12

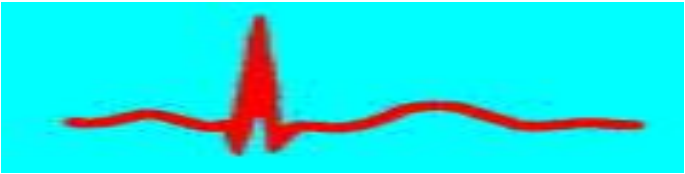


Ventricular Rhythms

Ventricular Tachycardia

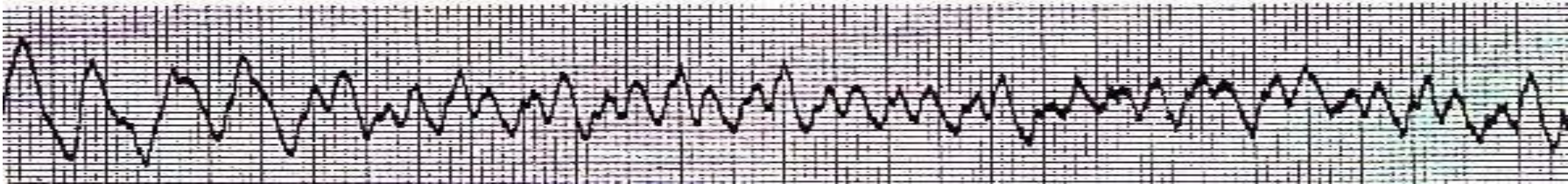


Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
100 – 250	Regular	No P waves corresponding to QRS, a few may be seen	NA	>.12

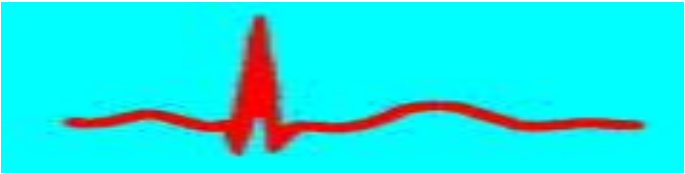


Ventricular Rhythms

Ventricular Fibrillation



Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
0	Chaotic	None	NA	None

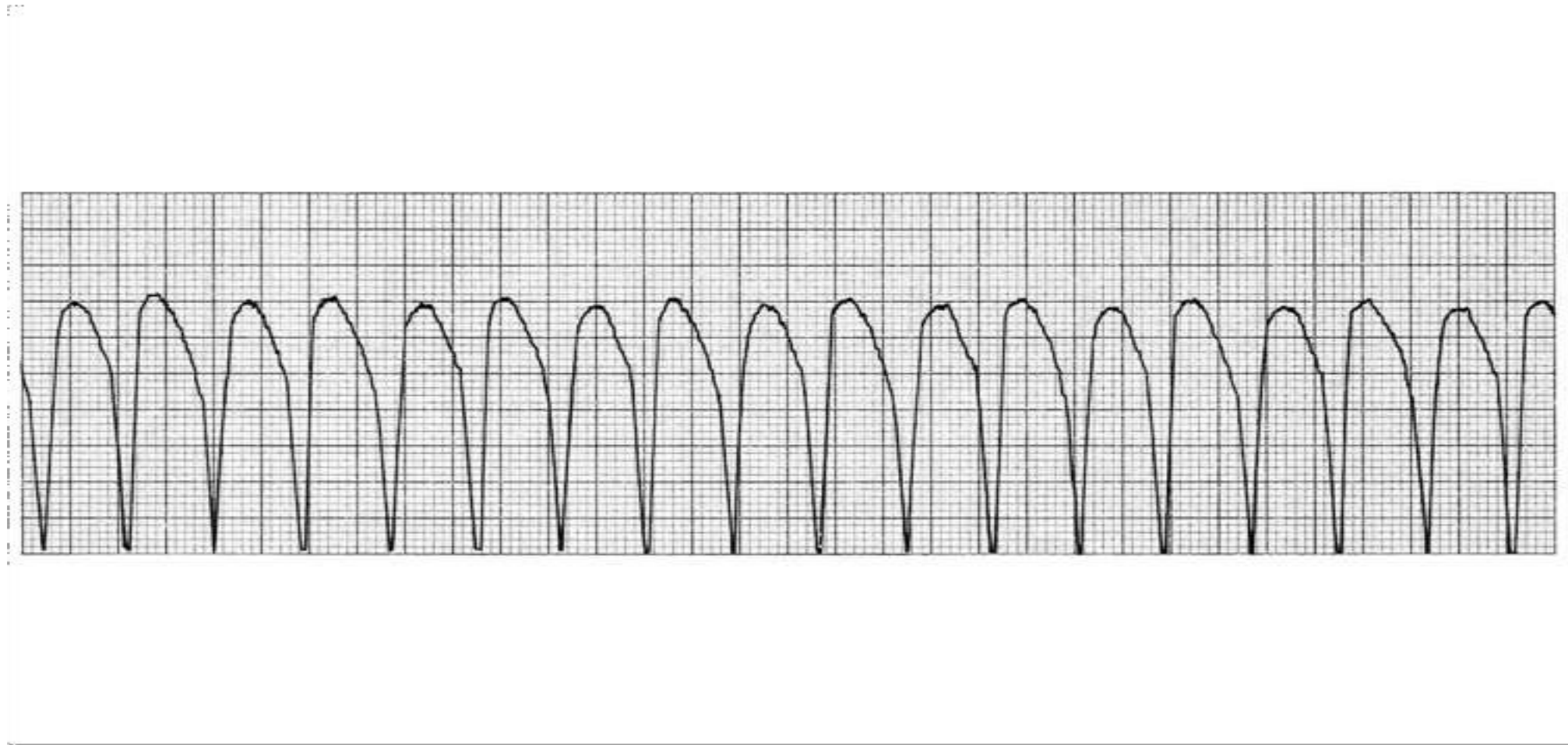


Asystole

Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
None	None	None	None	None

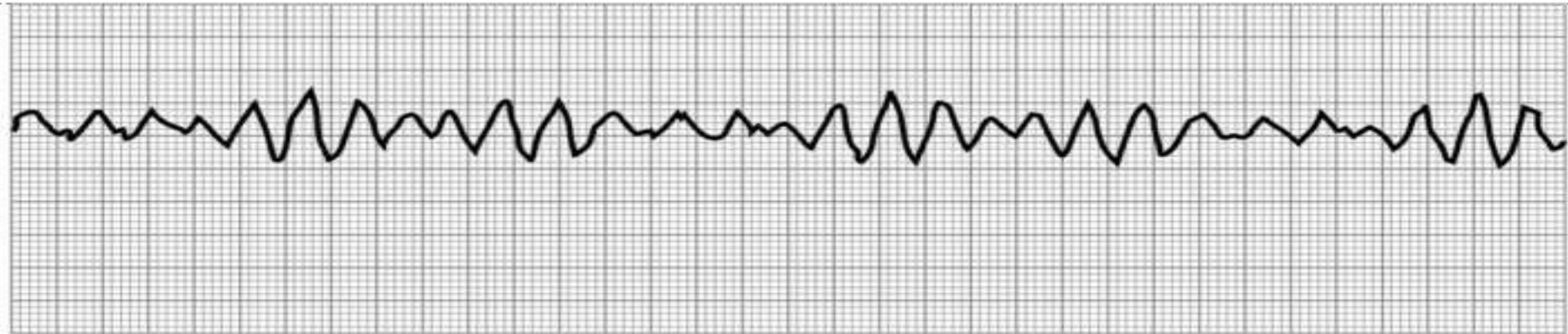
Look Some ECGs

Ventricular Tachycardia

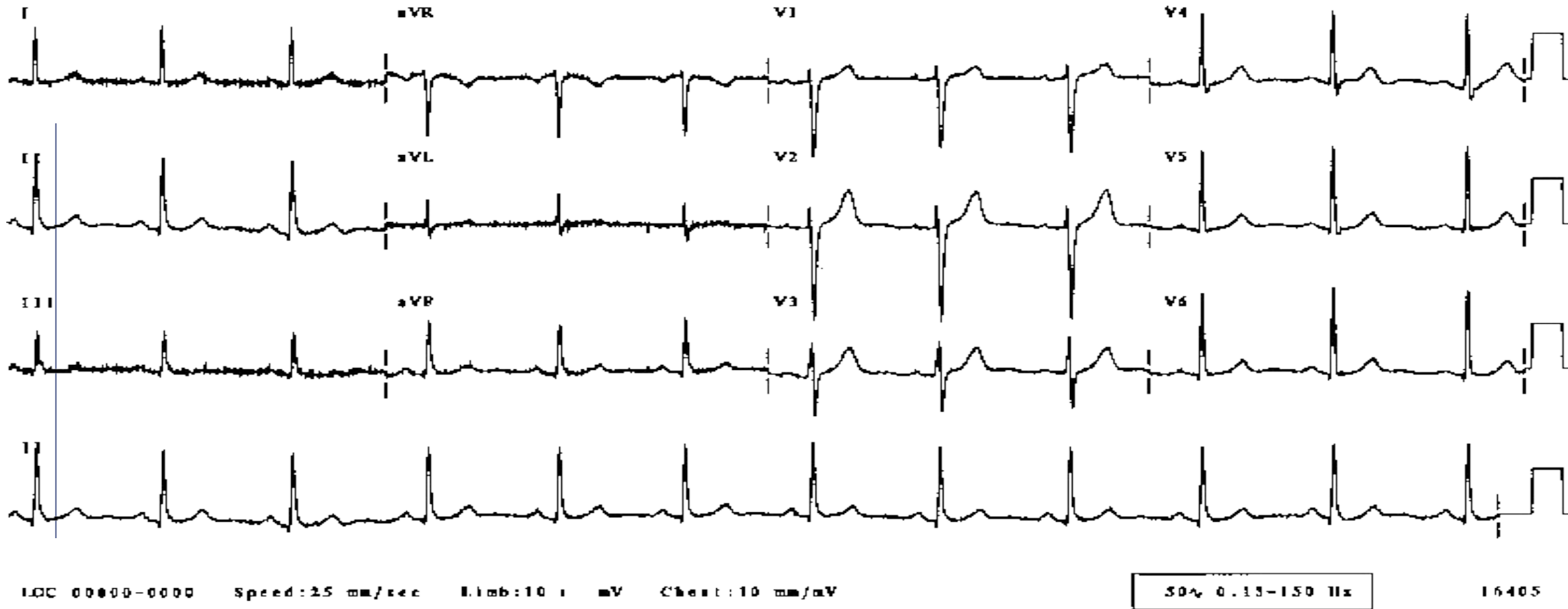


Ventricular Fibrillation

Agonal Rhythm



Normal EKG



DC Cardio version



150-200, 200-250, 270-260



SHOCKABLE

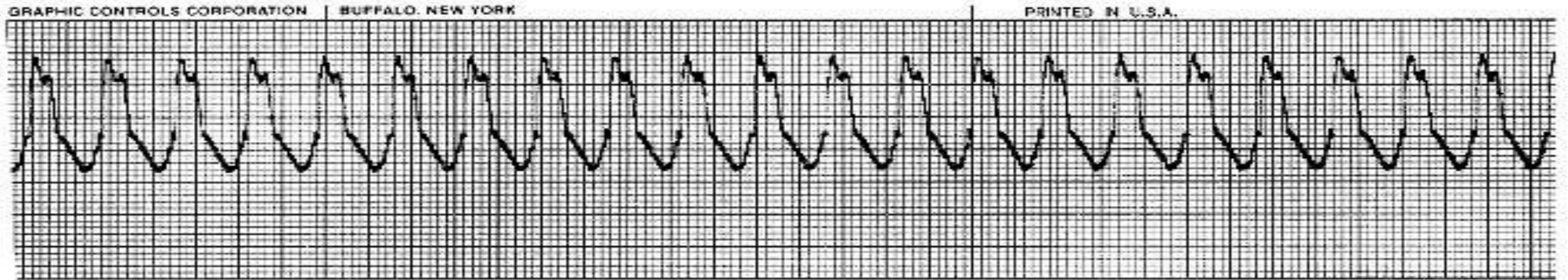


Figure 27-16 Ventricular tachycardia in lead V1.

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SHOCKABLE

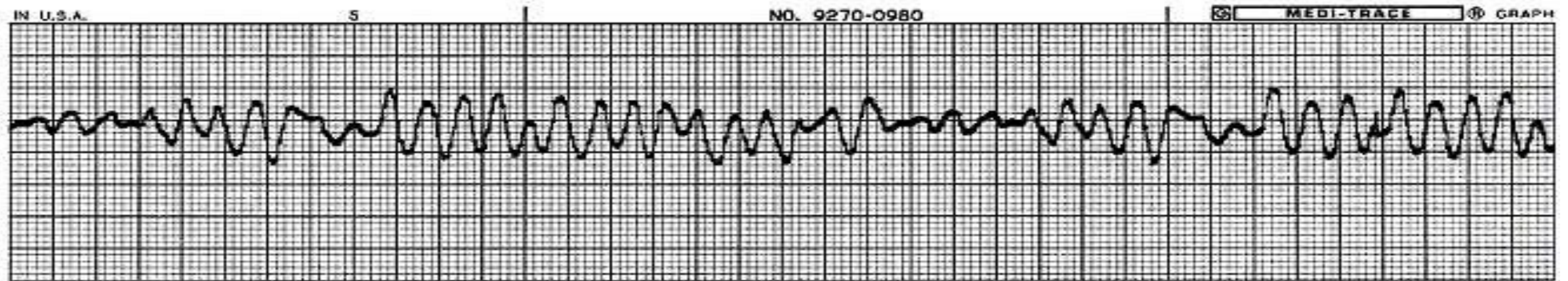


Figure 27-17 Ventricular fibrillation in lead II.

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NONSHOCKABLE

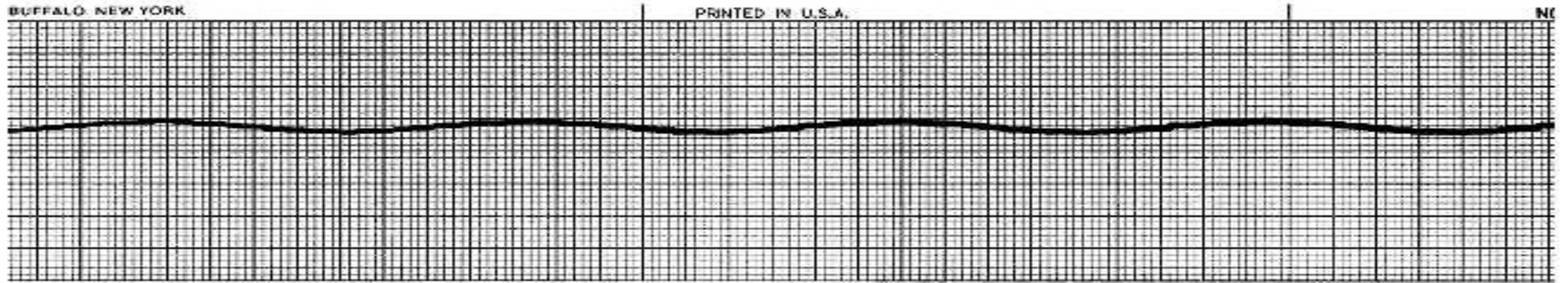


Figure 27-19 Asystole. (Always check two different leads to confirm rhythm.)

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Thank you