



INTERPRETASI EKG DASAR

Ns. Yudi Elyas S.Kep
UPJT RSUPN Dr. Cipto Mangunkusumo

PENDAHULUAN

- Elektrokardiografi adalah ilmu yang mempelajari rekaman aktivitas listrik jantung pada permukaan tubuh
- Elektrokardiogram (EKG) adalah suatu grafik yang menggambarkan rekaman listrik jantung

Peran Diagnostik EKG

- ❑ Hipertrofi /dilatasi atrium dan ventrikel
- ❑ Aritmia /gangguan konduksi : RBBB, LBBB, VES, SVT, VT, AF, VF dll.
- ❑ Iskemia dan infark miokard akut atau infark lama
- ❑ Efek obat-obatan : digitalis, antiaritmia
- ❑ Gangguan keseimbangan elektrolit : kalium (hipo/hiper kalemia), kalsium

Indikasi EKG

- Gangguan irama jantung
- Sinkop/pra sinkop
- Dicurigai PJK
- Hipertensi
- Dicurigai kelainan kongenital
- Kelainan katup
- dll

Jenis Frekuensi Irama Jantung

Cepat (Tachicardia)

Normal (Rythm)

Lambat (Bradycardia)

Cardiac Rythm, How To Detec?

Palpasi

- Frekuensi HR (Cepat?, Normal?, Lambat?)
- Irama (Teratur?, Tidak Teratur?)

Auskultasi

- Frekuensi HR (Cepat?, Normal?, Lambat?)
- Irama (Teratur?, Tidak Teratur?)

EKG

- Frekuensi
- Irama
- Jenis Aritmia

Palpation of arterial pulses



Radial



Brachial



Femoral



Popliteal



Dorsalis pedis



Posterior tibial

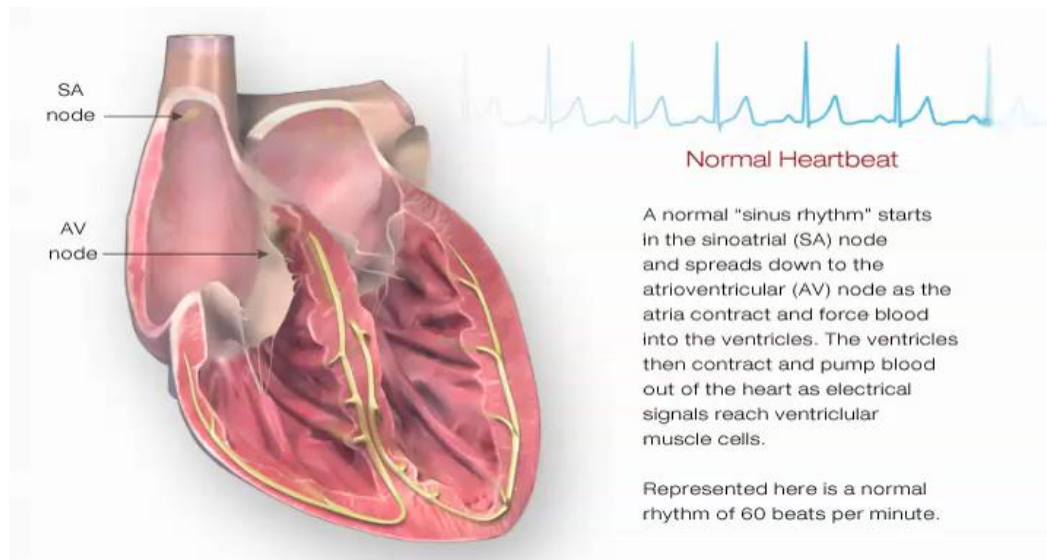
Perhitungan
denyut nadi dilakukan
selama 1 menit



Pemeriksaan arteri karotis

Arteri Karotis

Auskultasi

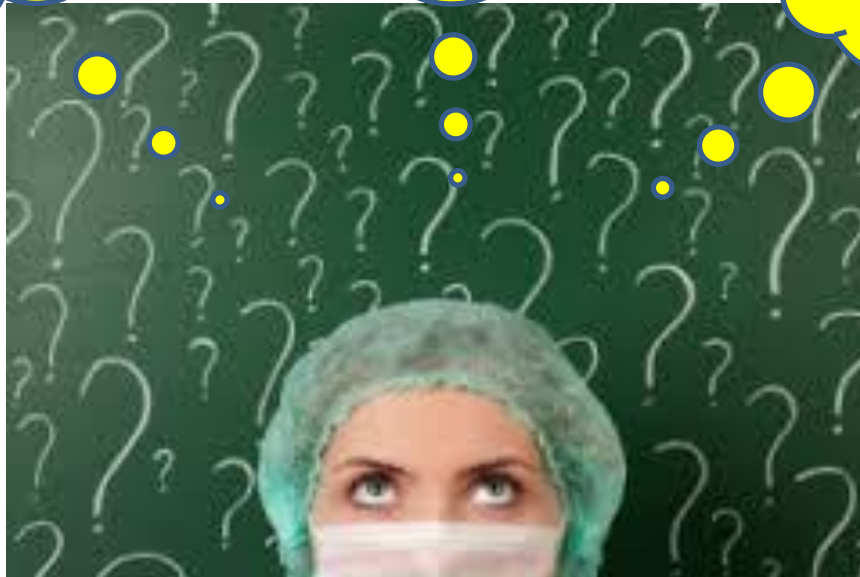




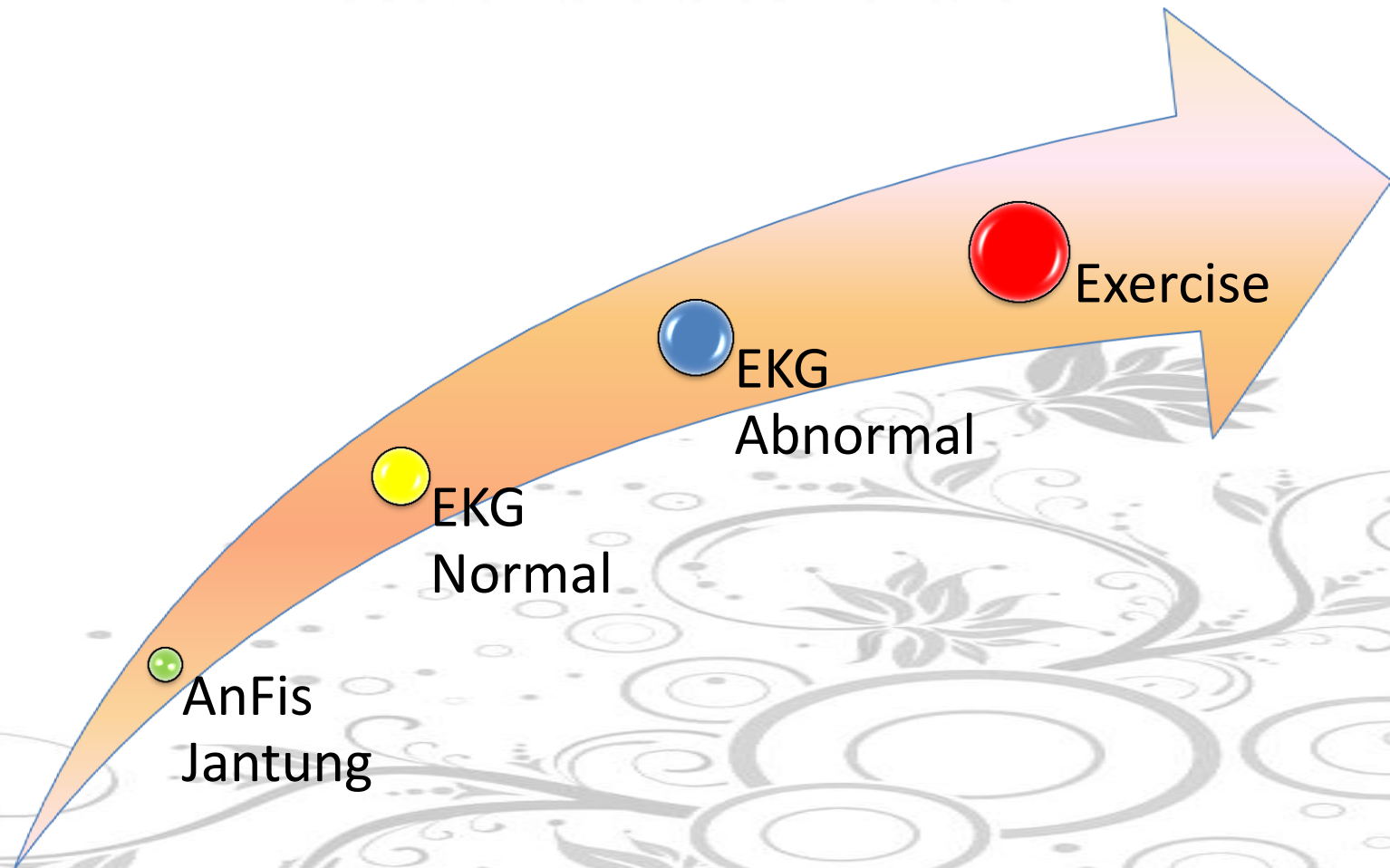
Tachicardi
Bradicardi

Reguler
Irreguler

Interpretasi
EKG ???



TIPS BELAJAR EKG

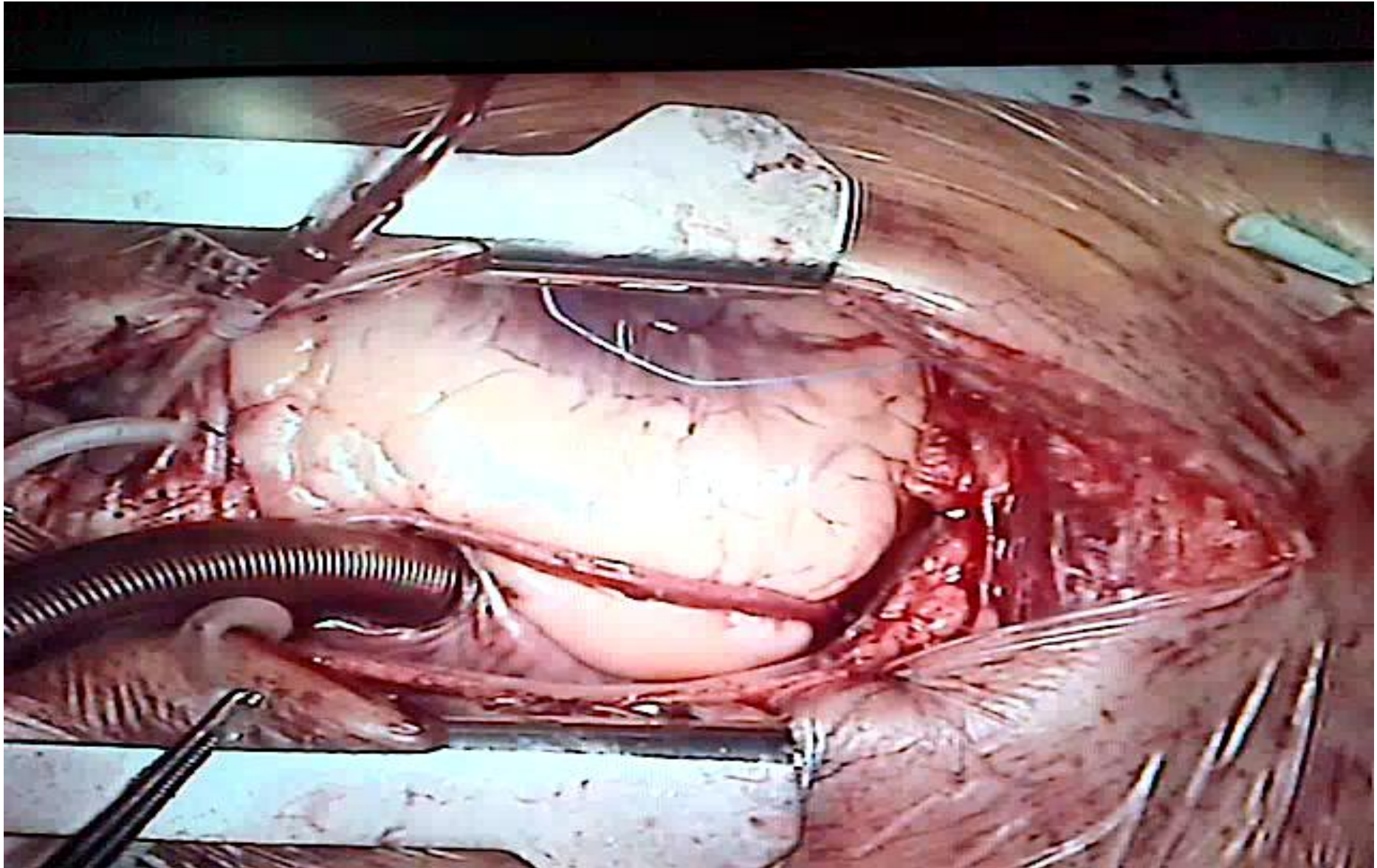


ANATOMI JANTUNG



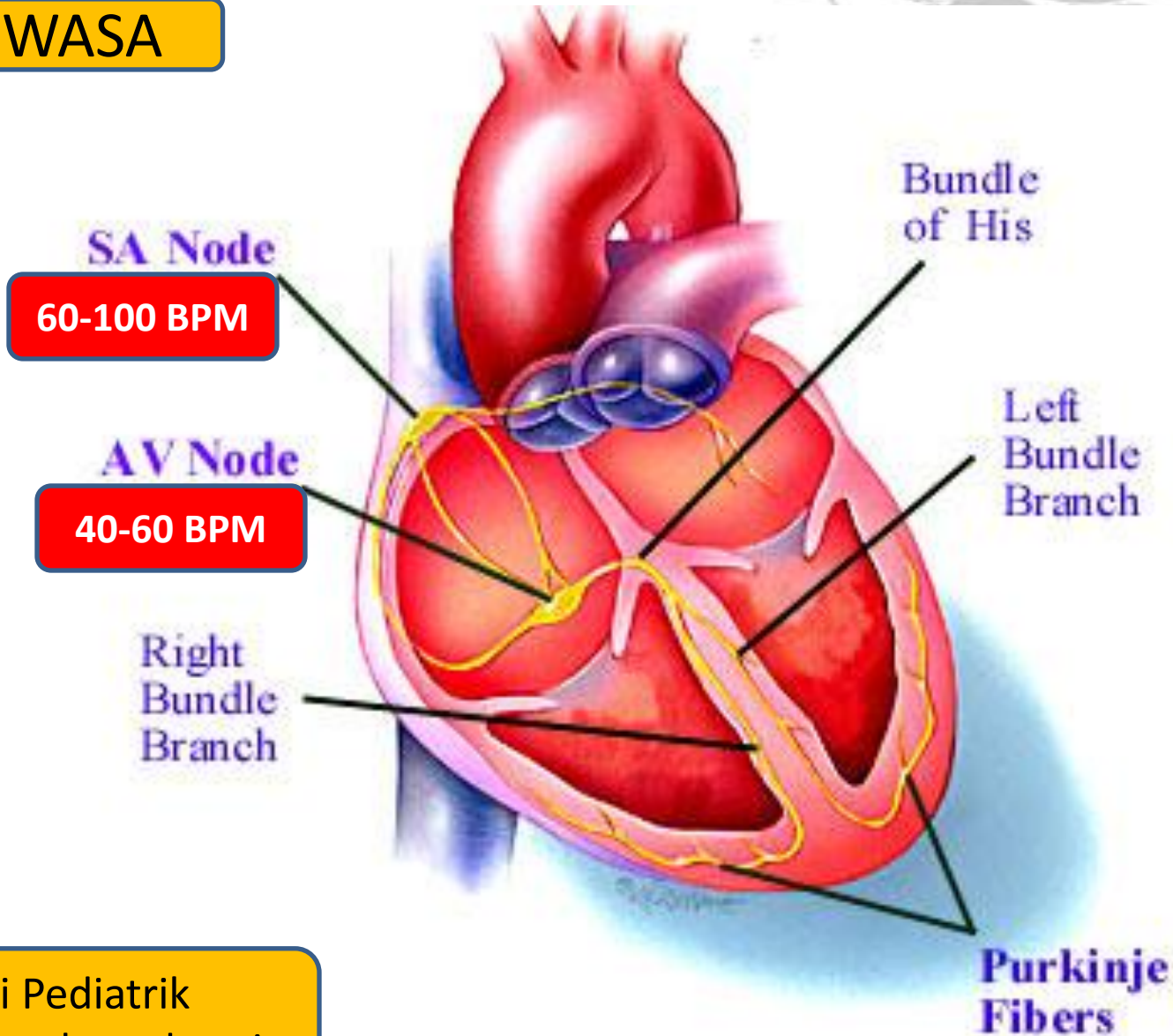
- a. Lokasi di Mid-mediastinum. 2/3 jantung berada di sebelah kiri dari sternum
- b. **Apex** (puncak) jantung berada di **ICS ke 5** atau **iga ke 6**
- c. **Dasar** jantung di level **ICS 2 - 3**

OPERASI BEDAH JANTUNG



SISTEM KONDUKSI JANTUNG

DEWASA



Nilai Pediatrik
bergantung kepada usia

Pediatric Vital Signs

Normal Heart Rate by Age (Beats/Minute)

Age	Awake Rate	Sleeping Rate
Neonate (<28 d)	100-205	90-160
Infant (1 mo-1 y)	100-190	90-160
Toddler (1-2 y)	98-140	80-120
Preschool (3-5 y)	80-120	65-100
School-age (6-11 y)	75-118	58-90
Adolescent (12-15 y)	60-100	50-90

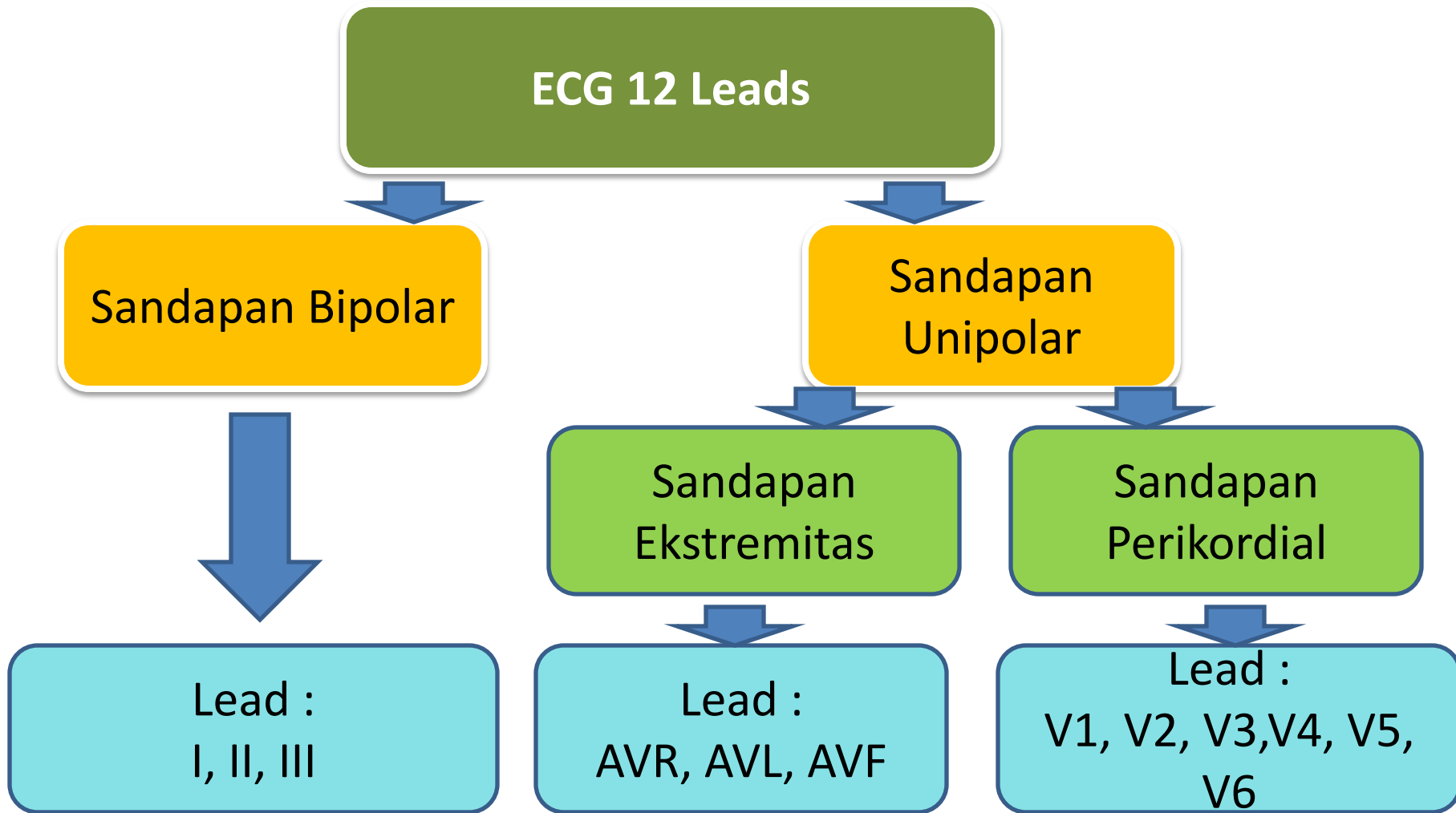
Normal Respiratory Rate by Age (Breaths/Minute)

Age	Normal Respiratory Rate
Infants (<1 y)	30-53
Toddler (1-2 y)	22-37
Preschool (3-5 y)	20-28
School-age (6-11 y)	18-25
Adolescent (12-15 y)	12-20

Normal Blood Pressure by Age

Age	Systolic Blood Pressure	Diastolic Blood Pressure
Birth (12 h)	60-76	31-45
Neonate (96 h)	67-84	35-53
Infant (1-12 mo)	72-104	37-56
Toddler (1-2 y)	86-106	42-63
Preschooler (3-5 y)	89-112	46-72
School-age (6-9 y)	97-115	57-76
Preadolescent (10-11 y)	102-120	61-80
Adolescent (12-15 y)	110-131	64-83

Sandapan EKG



SANDAPAN EKG BIPOLAR

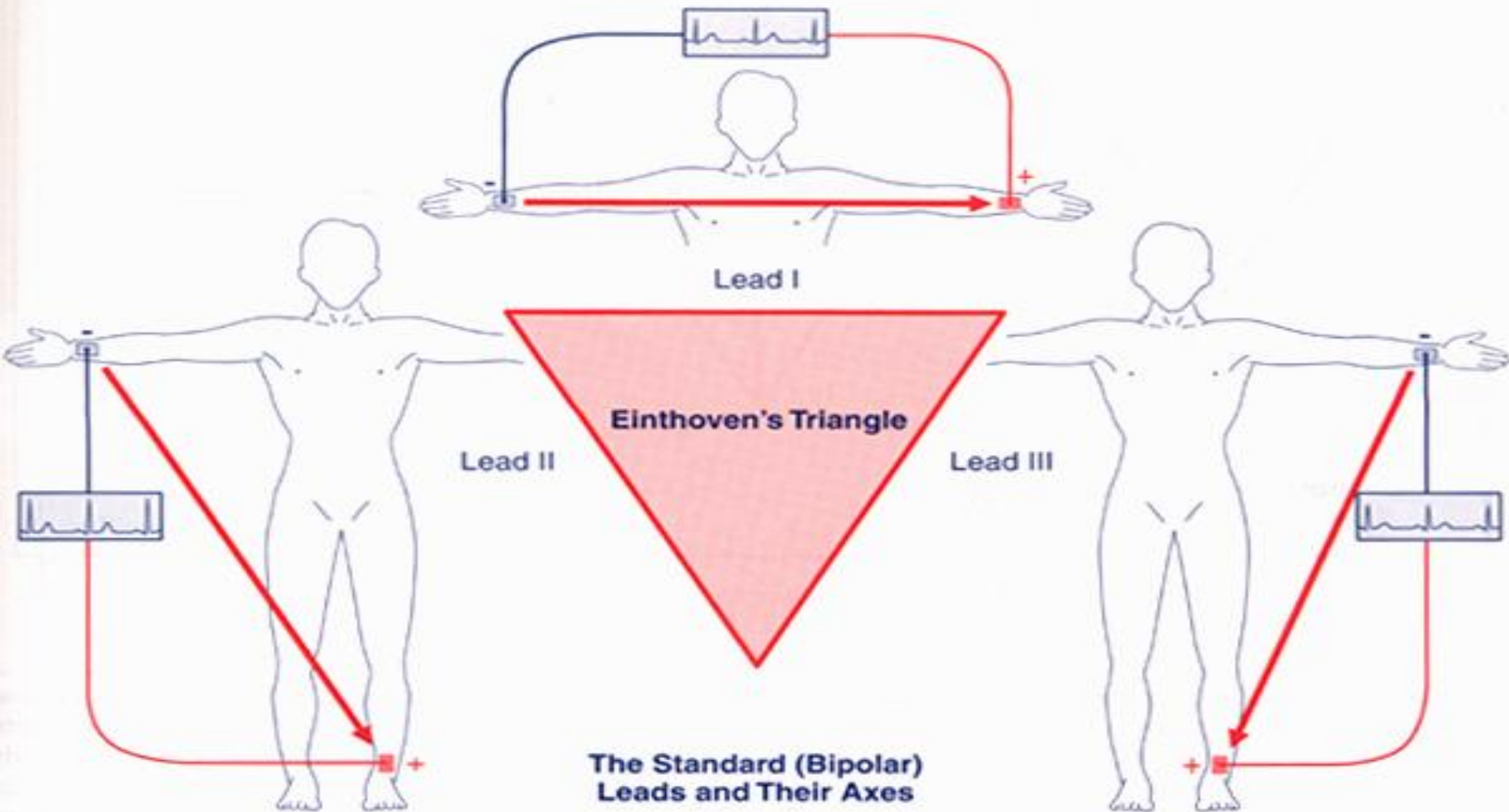
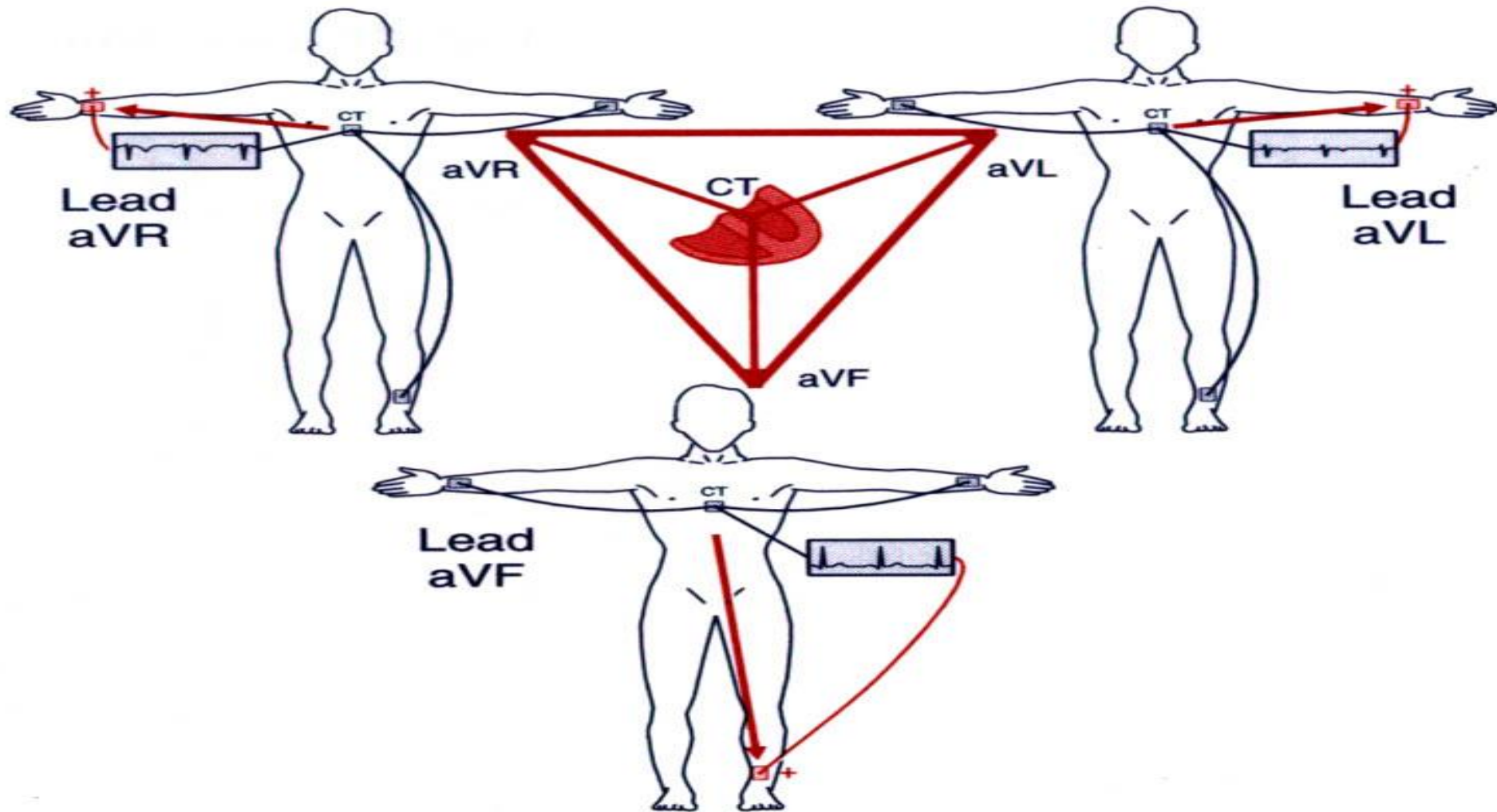


Figure 11-5 Standard (bipolar) limb leads I, II, and III and their axes.

Sandapan Unipolar Eksteremitas

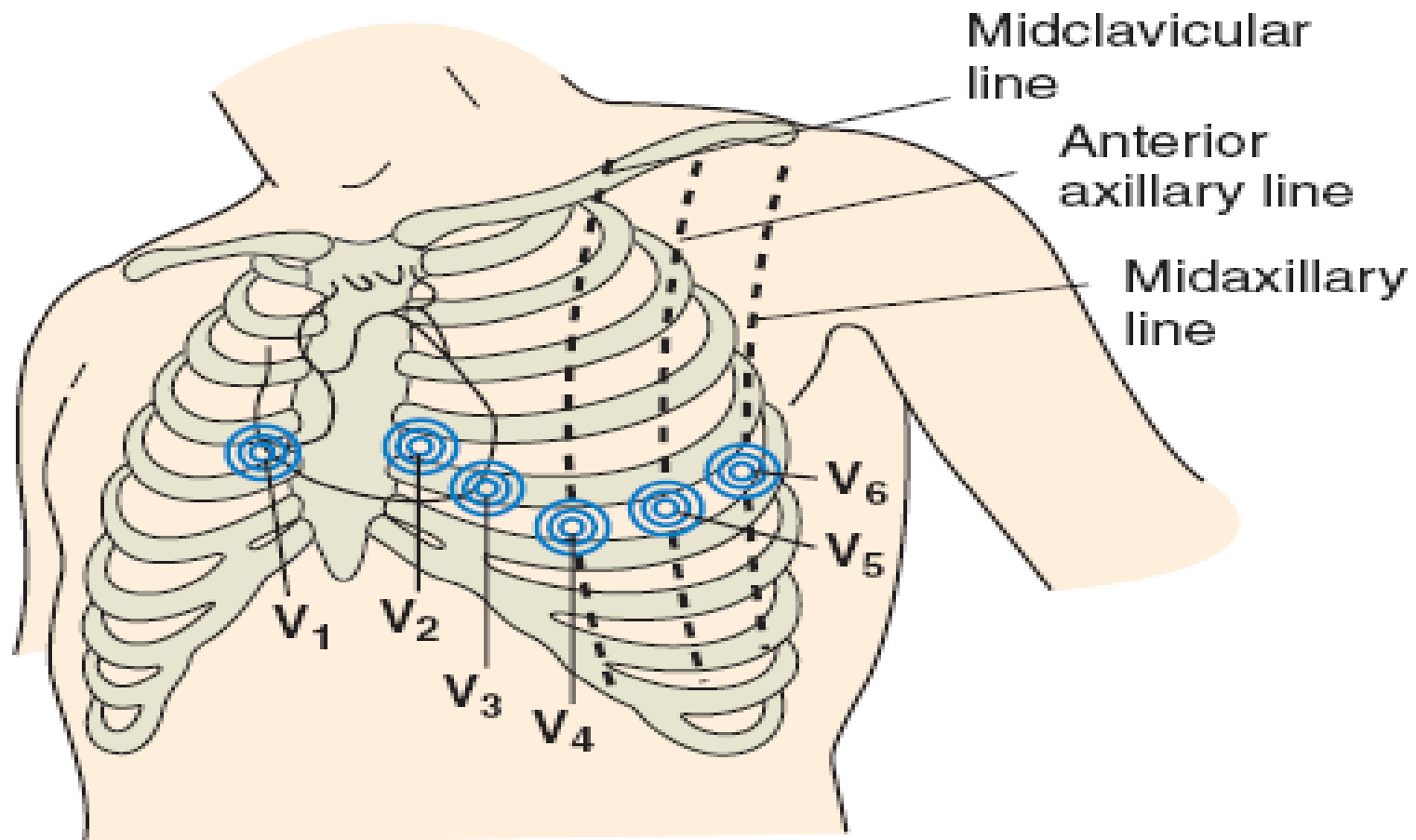


The augmented (unipolar) leads and their axes

Sandapan Unipolar Prekordial

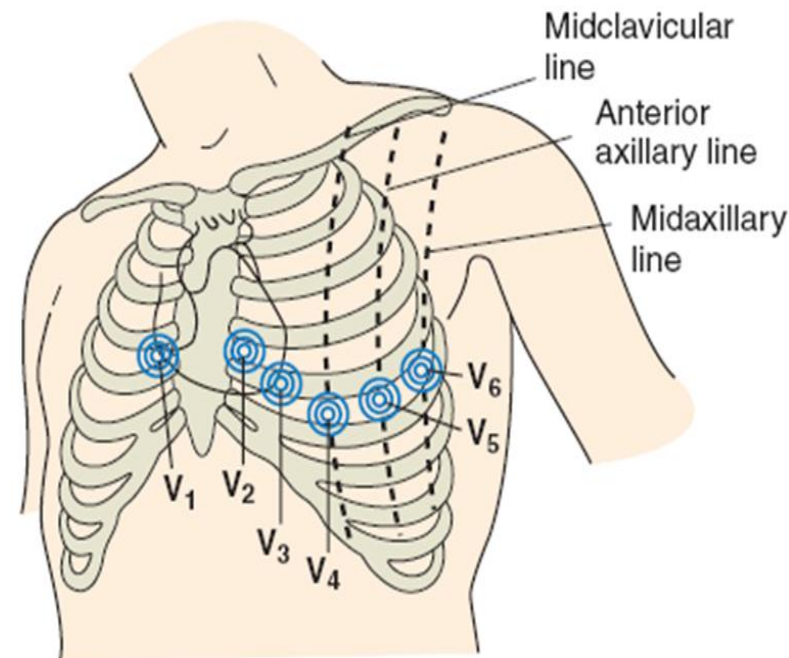
Chest Leads

Standard Chest Lead Electrode Placement

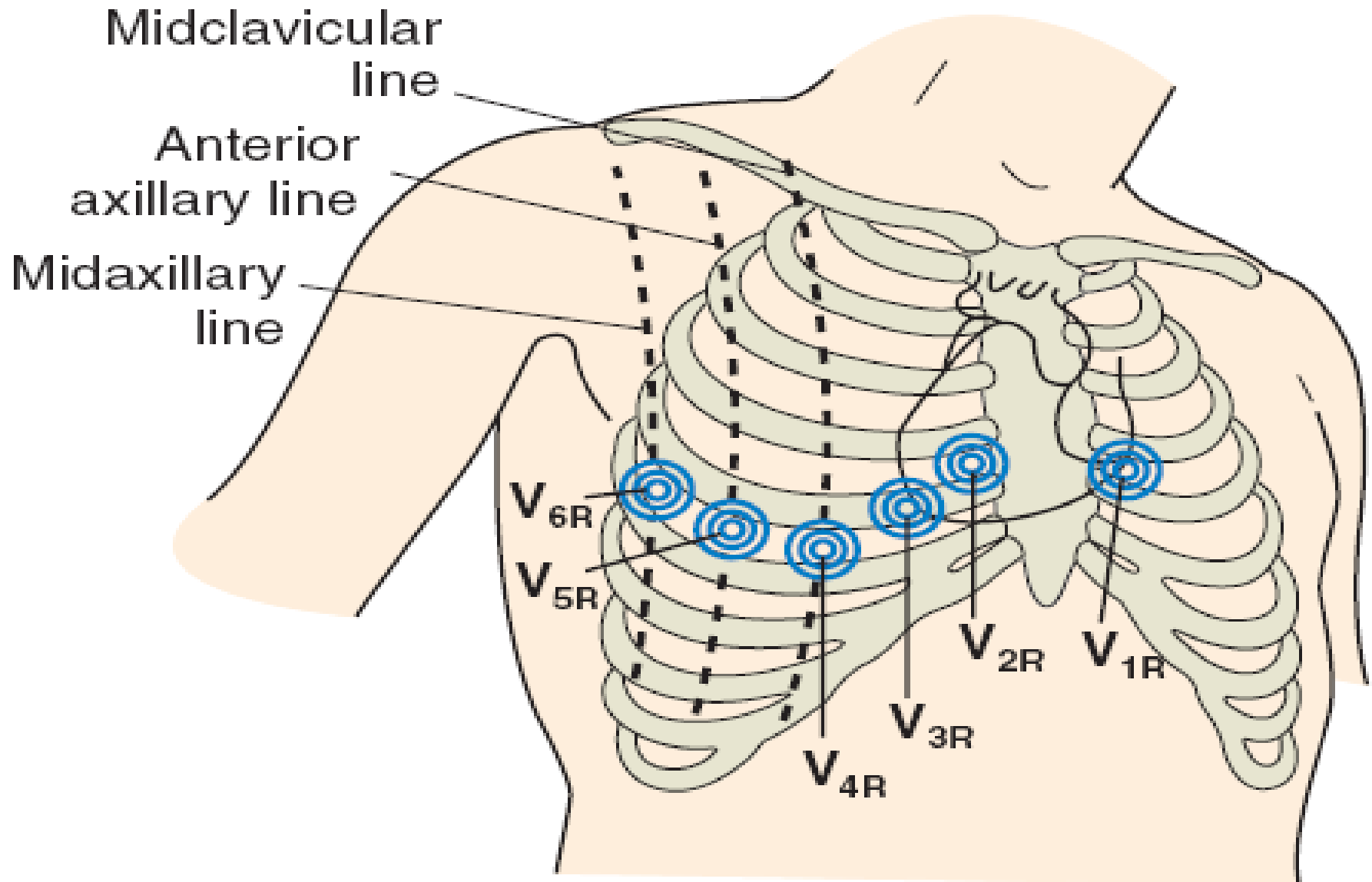


Letak Sandapan EKG

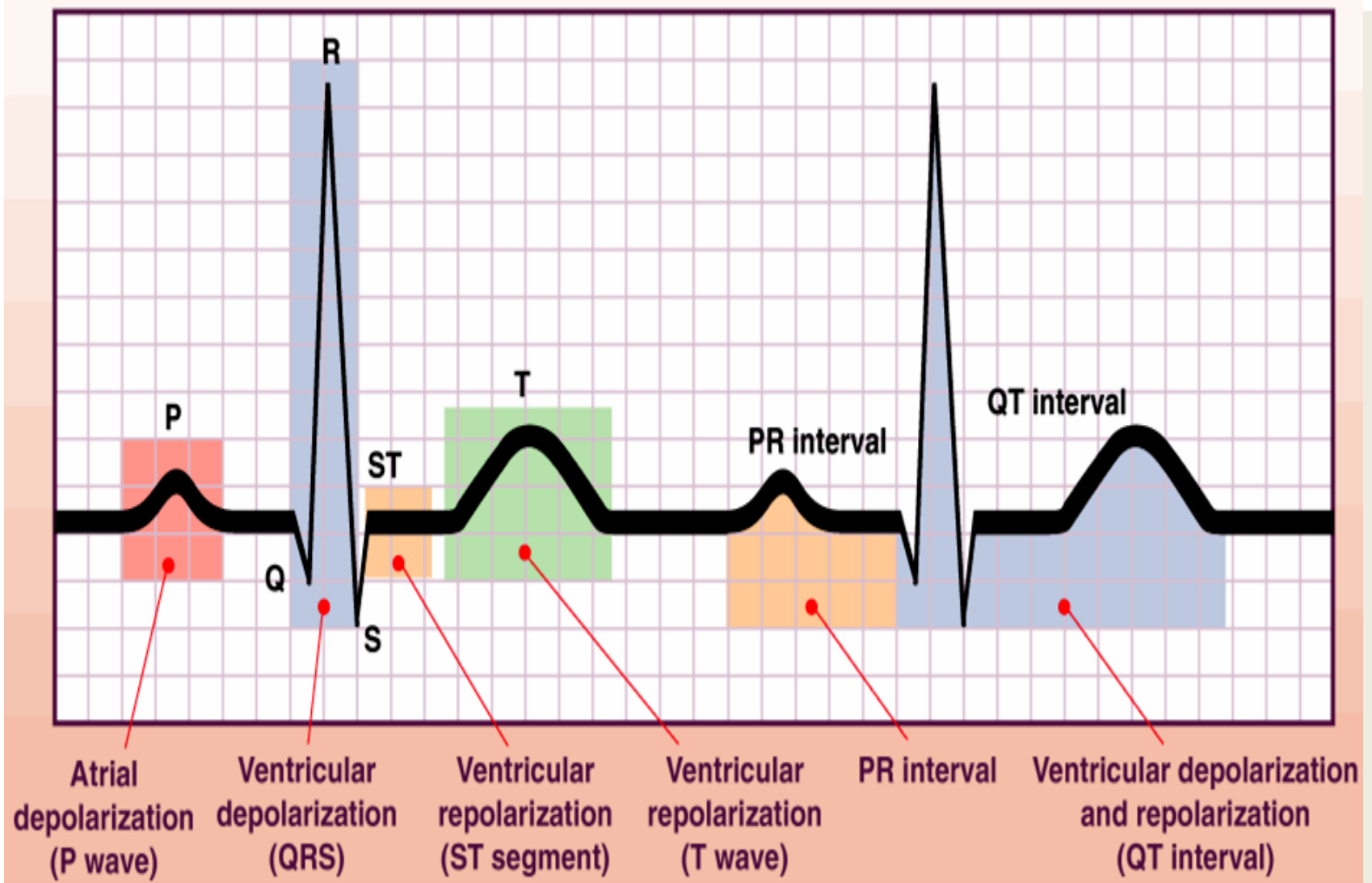
- V1 : Ruang interkostal IV garis sternal kanan
- V2 : Ruang interkostal IV garis sternal kiri
- V3 : Pertengahan antara V2 dan V4
- V4 : Ruang interkostal V garis midklavikula kiri
- V5 : Sejajar V4 garis aksilla depan
- V6 : Sejajar V5 garis aksilla tengah



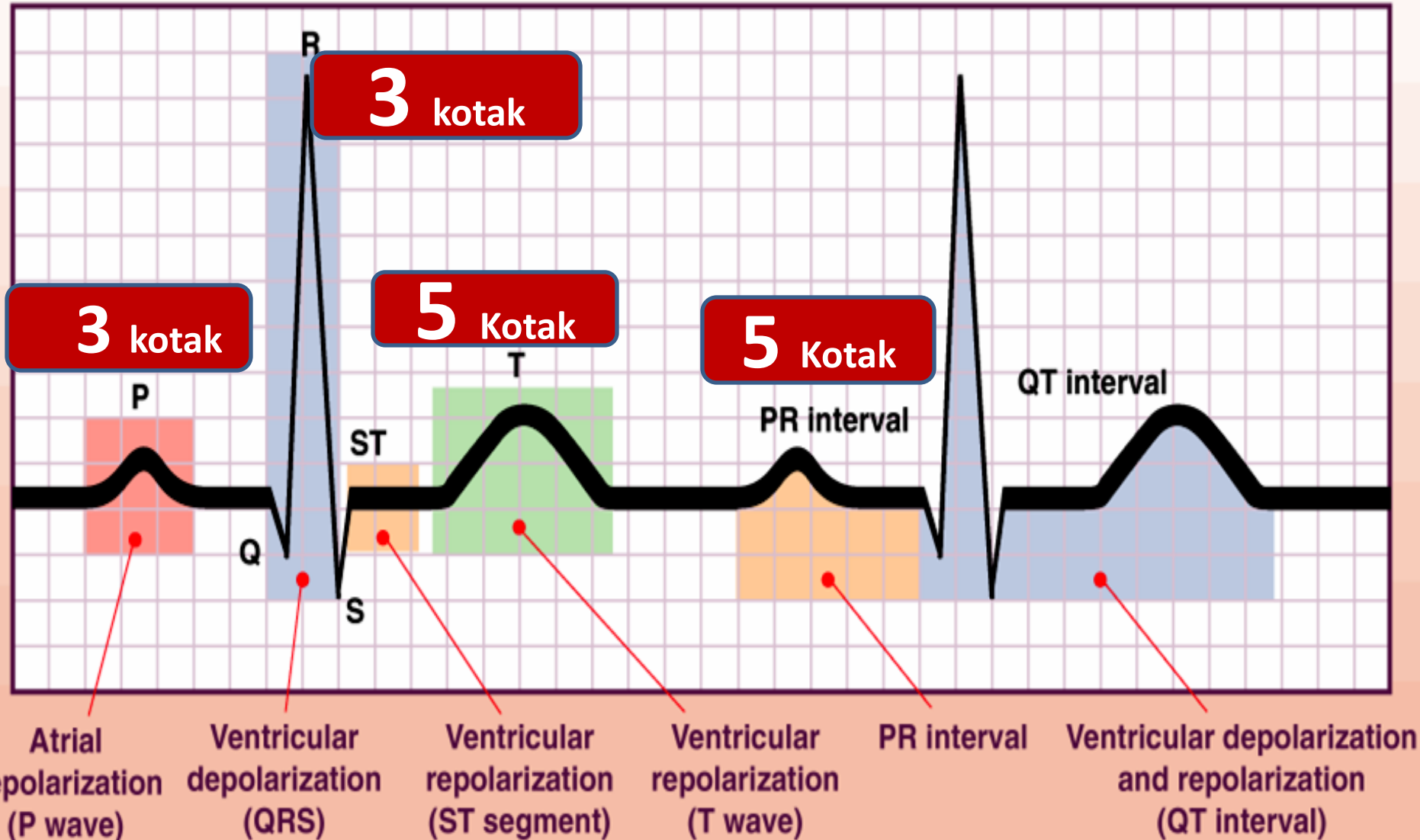
Right Side ECG 12 Leads



GELOMBANG-GELOMBANG EKG

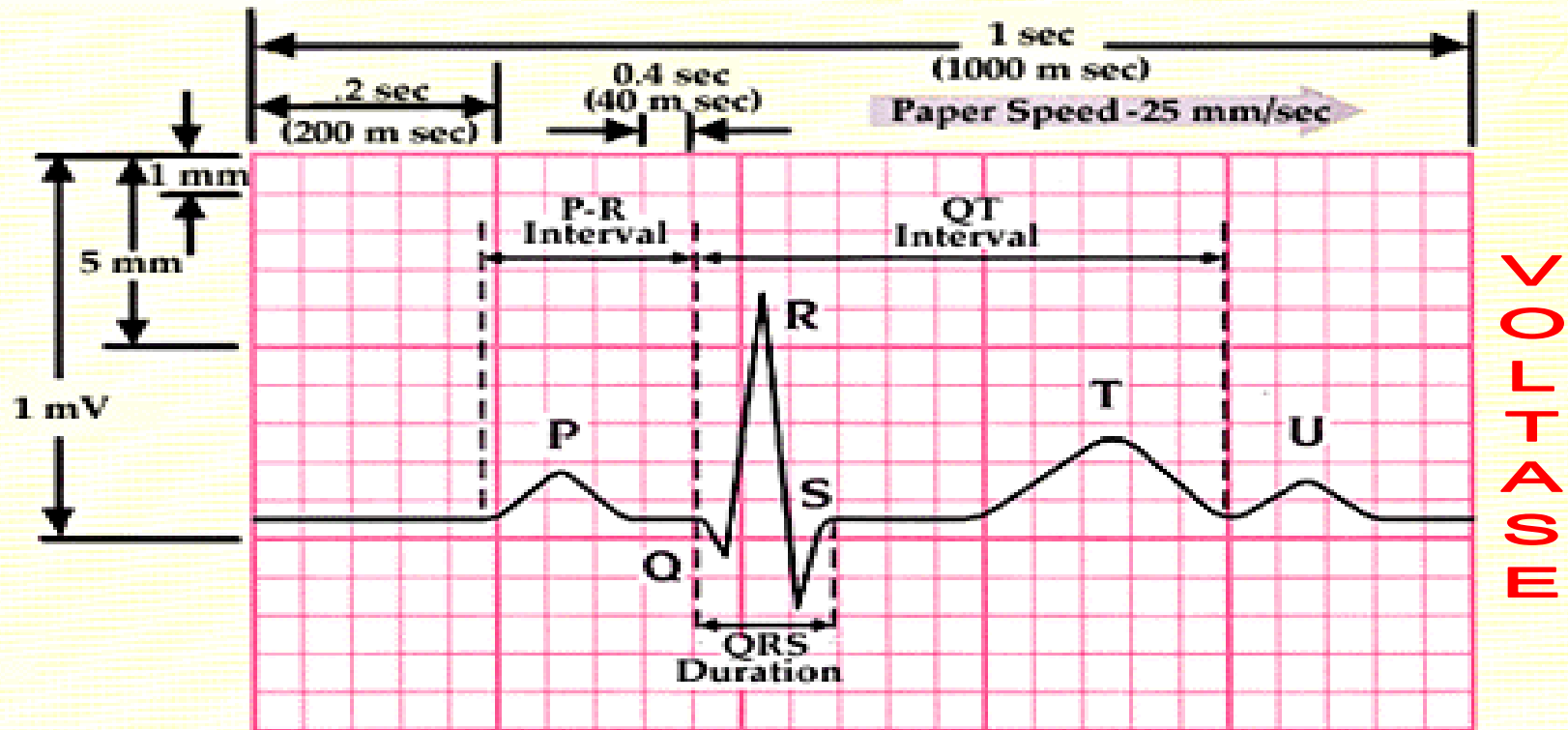


Belajar Nilai Normal Gelombang EKG



KERTAS EKG

WAKTU



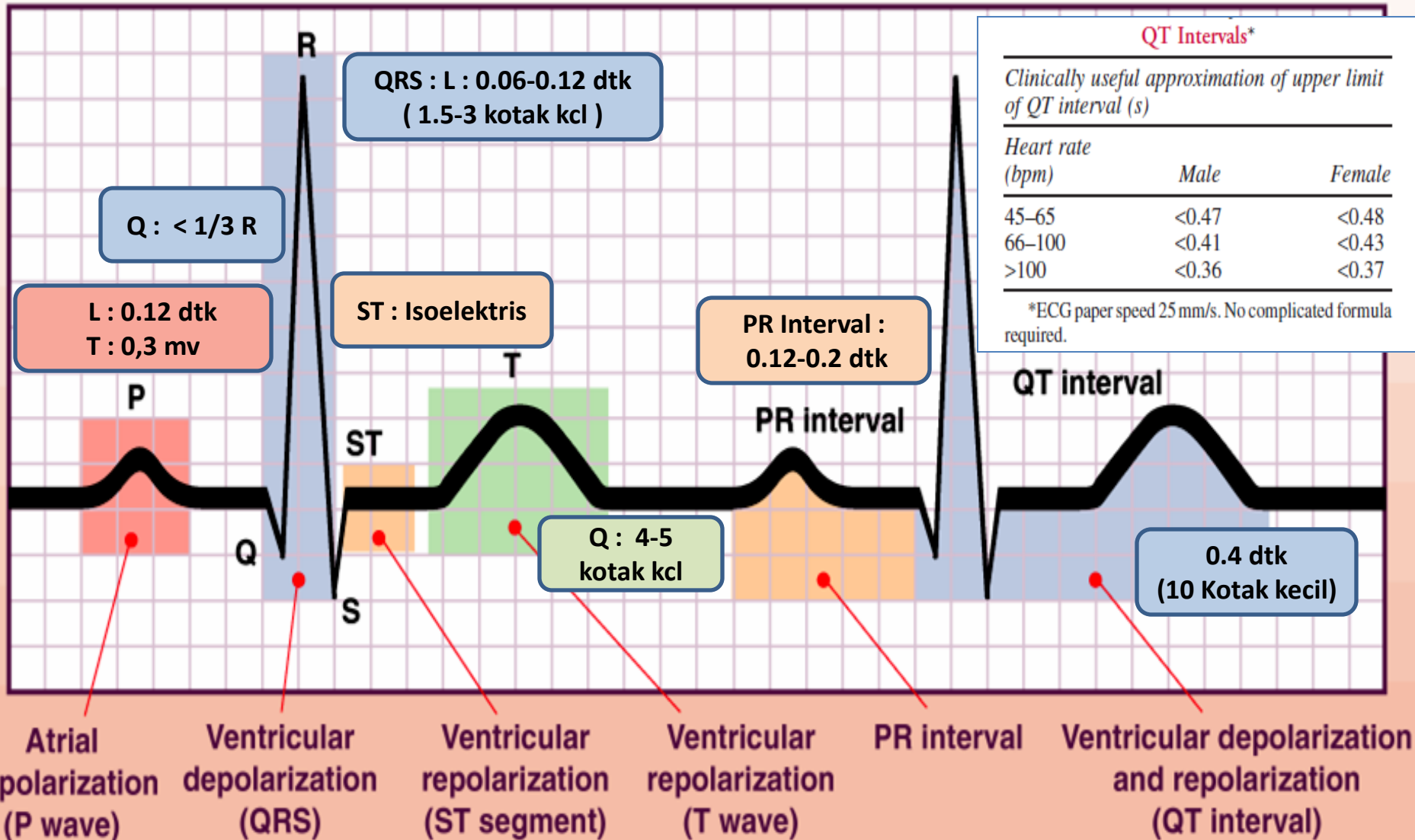
Verticle Axis

1 small square = 1mm (0.1mV)
 1 Large Square = 5mm (0.5mV)
 2 large square = 1mV

Horizontal Axis

1 small square = .04 (40 m sec)
 1 large square = .2 (200 m sec)
 5 large square = 1 sec (1000 m sec)

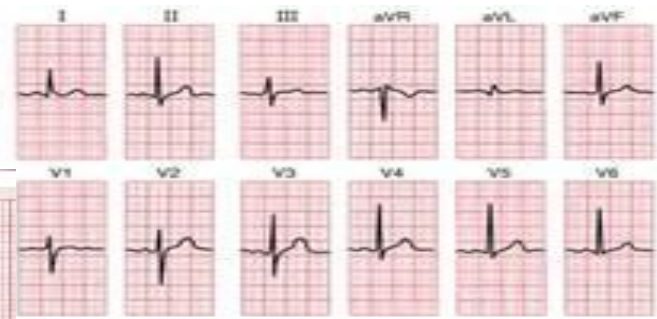
Gelombang EKG



Kriteria EKG Layak Baca

1. Identitas pasien jelas
2. Hasil EKG terbaru
3. Sesuai dengan standar pemasangan EKG
4. Ukuran dan kecepatan sesuai standar :
Kecepatan 25 mm/detik dan Voltase 10 mm.
4. Gelombang jelas tidak ada artifac dan tidak bertabrakan
5. Gelombang P selalu positif di Lead II
6. Gelombang P selalu negatif di AVR
7. Pola R dan Pola S normal

NORMAL ECG

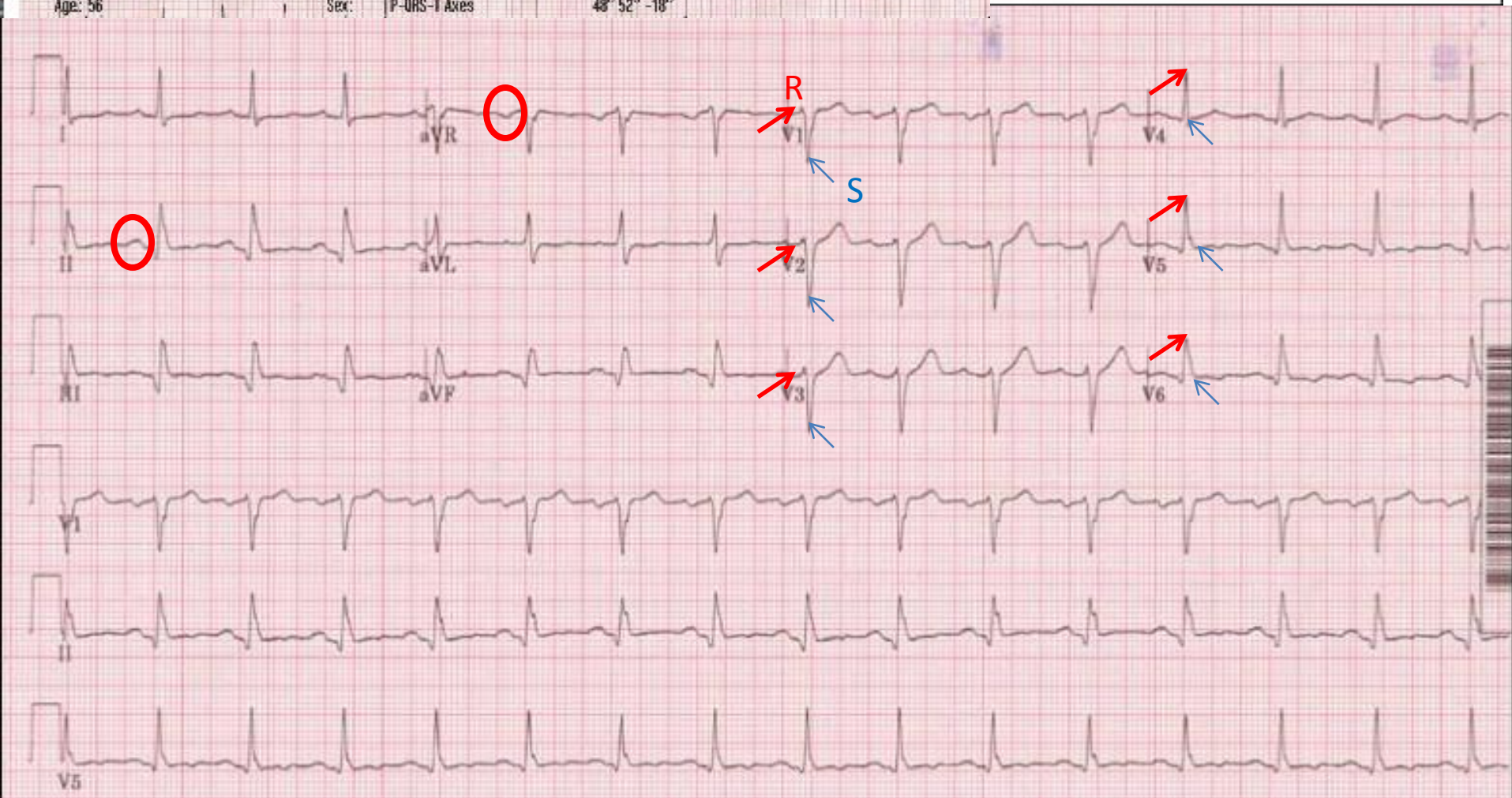


Name: [redacted]
ID: [redacted]
Patient ID: [redacted]
Incident: [redacted]
Age: 56
Sex: [redacted]

12-Lead 1
PR 0.110s
QT/QTc
P-QRS-T Axes

HR 118 bpm
15:56:38
QRS 0.104s
0.316s/0.442s
48° 52° -18°

• Abnormal ECG **Unconfirmed**
• Sinus tachycardia with short PR
• Incomplete right bundle branch block
• Nonspecific ST and T wave abnormality



LANGKAH-LANGKAH INTERPRETASI EKG

R

- Rhythm / Irama

R

- Rate

A

- Axis

H

- Hyperthrophy

I

- Ischemia

I

- Infarc

Catatan

Pasien Dewasa

- Frekuensi jantung yang normal :
60 – 100 x/menit
- Lebih dari 100 x/menit :
Takikardi
- Kurang dari 60 x/menit:
Bradikardi

Pediatric Vital Signs

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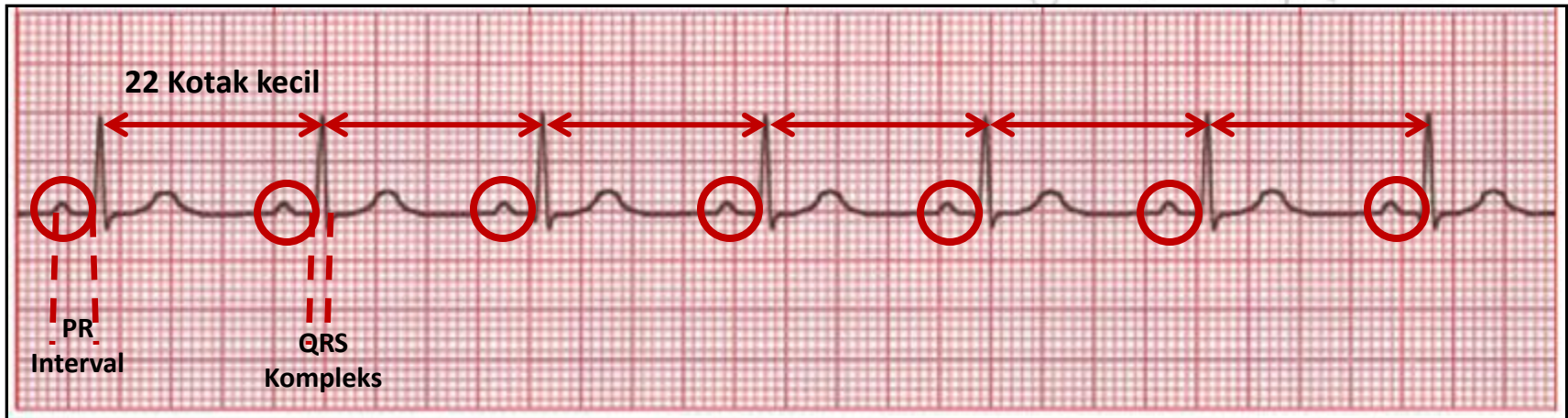
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Adolescent (12-15 y)	110-131	64-83

SINUS RHYTHM



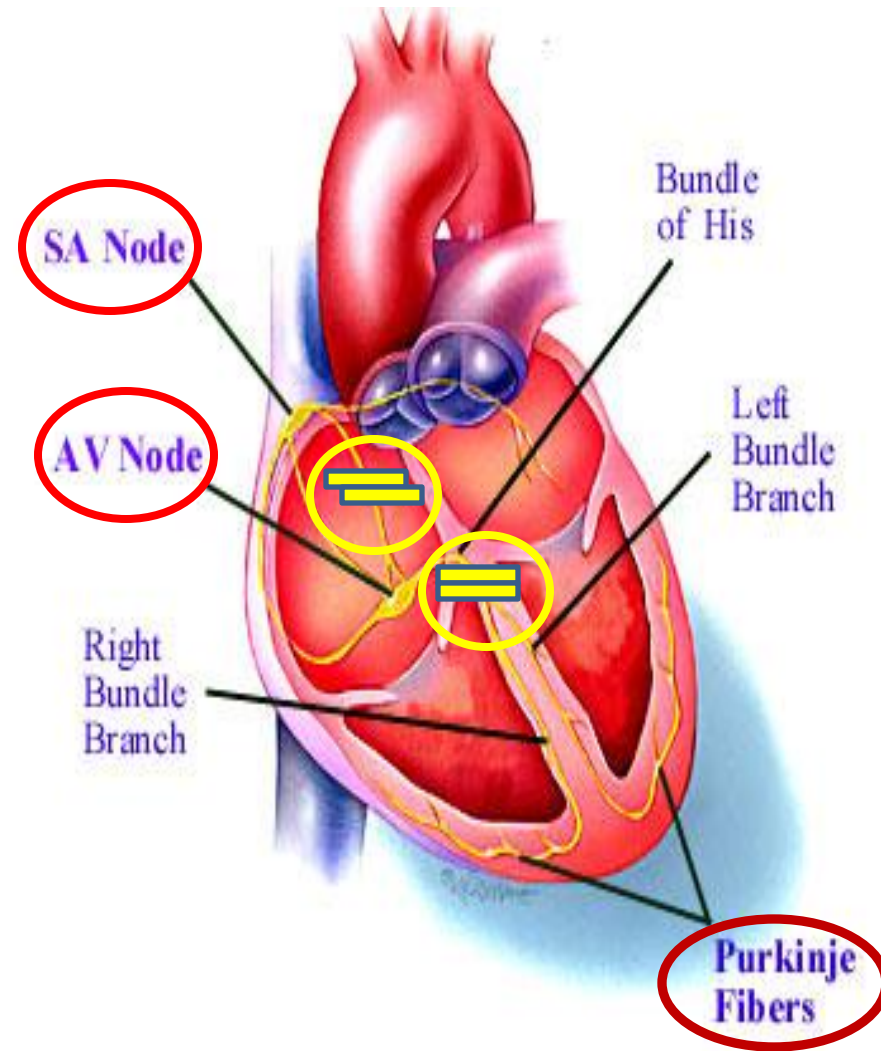
- Berasal dari nodus SA
- Irama teratur
- Frekwensi jantung (HR) antara 60 -100 x/menit (Dewasa)
- Gelombang P normal , setiap gelombang P selalu diikuti gelombang QRS dan T
- Interval PR normal (0,12 -0,20 detik)
- Gelombang QRS normal (0,06 – 0,12 detik)
- Semua gelombang sama

Irama EKG yang tidak memenuhi kriteria diatas disebut dengan Arritmia / Disritmia

ARRHYTHMIA

1. Gangguan pembentukan impuls

2. Gangguan penghantaran impuls



JENIS – JENIS ARITMIA GANGGUAN PEMBENTUKAN IMPULS

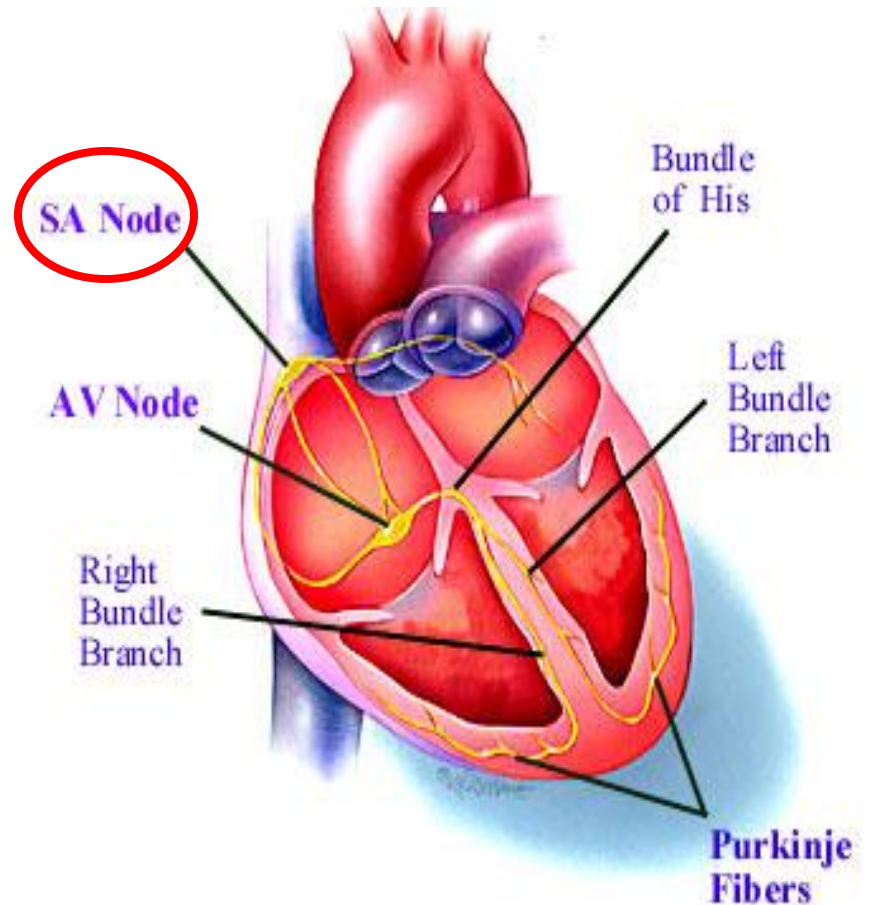
SA NODE RHYTHM

SINUS BRADIKARDI

SINUS TAKIKARDI

SINUS ARITMIA

SINUS ARREST





ATRIAL RHYTHM

WANDERING ATRIAL
PACEMAKER (WAP)

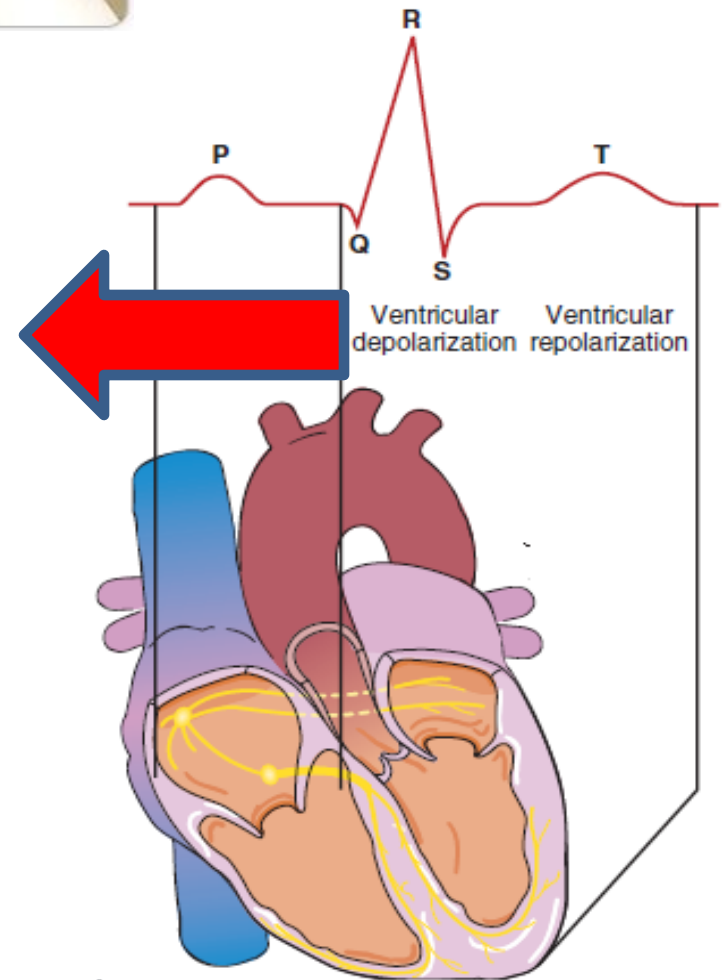
PREMATURE ATRIAL
CONTRACTION (PAC)

ATRIAL TACHYCARDIA

SUPRAVENTRICULAR
TACHYCARDIA (SVT)

ATRIAL FLUTTER

ATRIAL FIBRILLATION (AF)





AV NODE RHYTHM

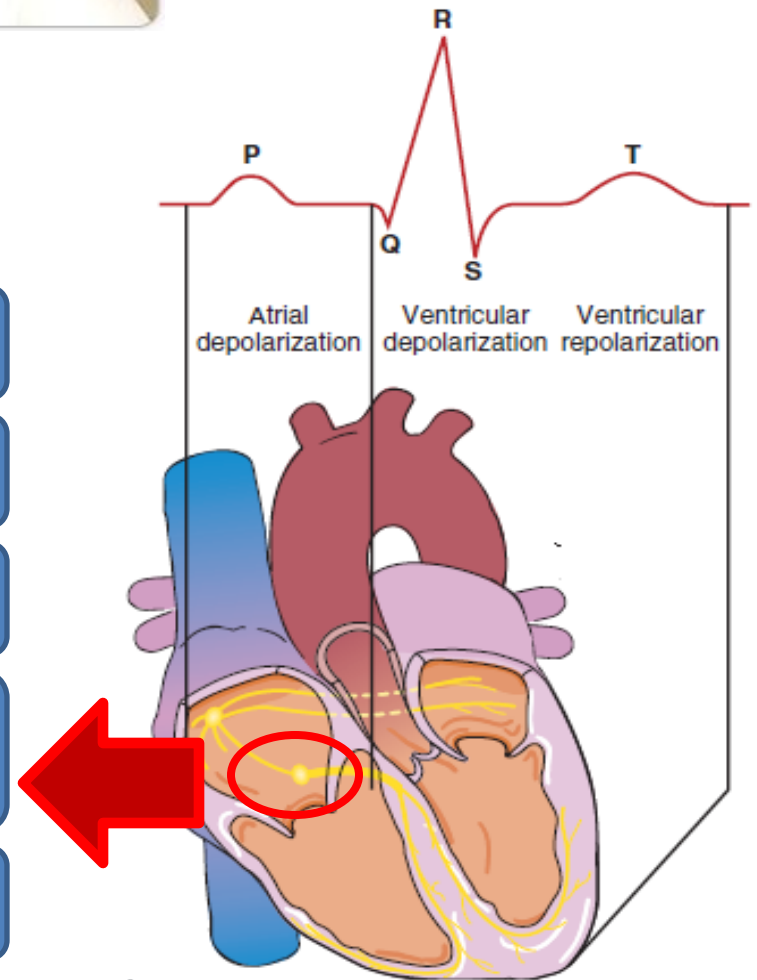
JUNCTIONAL RHYTHM

JUNCTIONAL TACHYCARDI

**ACCELERATED
JUNCTIONAL RHYTHM**

**PREMATUR JUNCTIONAL
TACHYCARDI**

JUNCTIONAL ESCAPE BEAT





VENTRICULAR ARRHYTHMIA

IDIOVENTRICULAR RHYTHM

ACCELERATED
IDIOVENTRICULAR RHYTHM

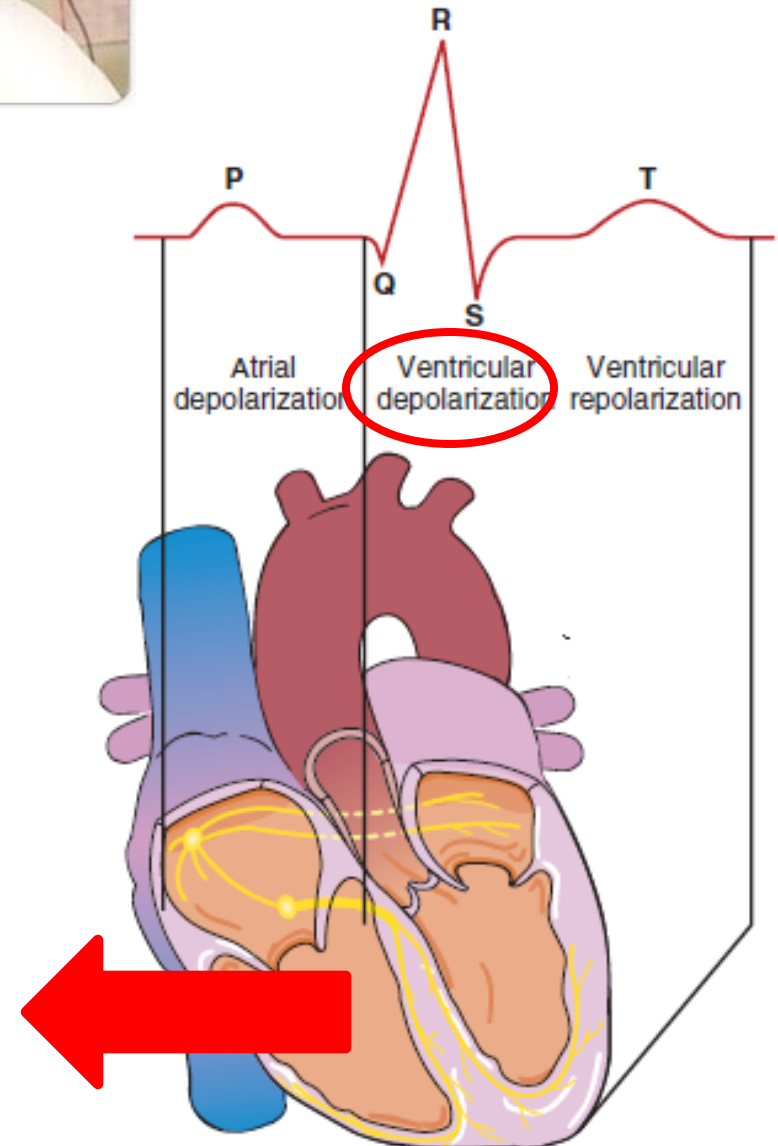
PREMATURE VENTRICULAR
CONTRACTION (PVC)

PVC BIGEMINY

PVC TRIGEMINY

VENTRICULAR TACHYCARDI

VENTRICULAR FIBRILASI



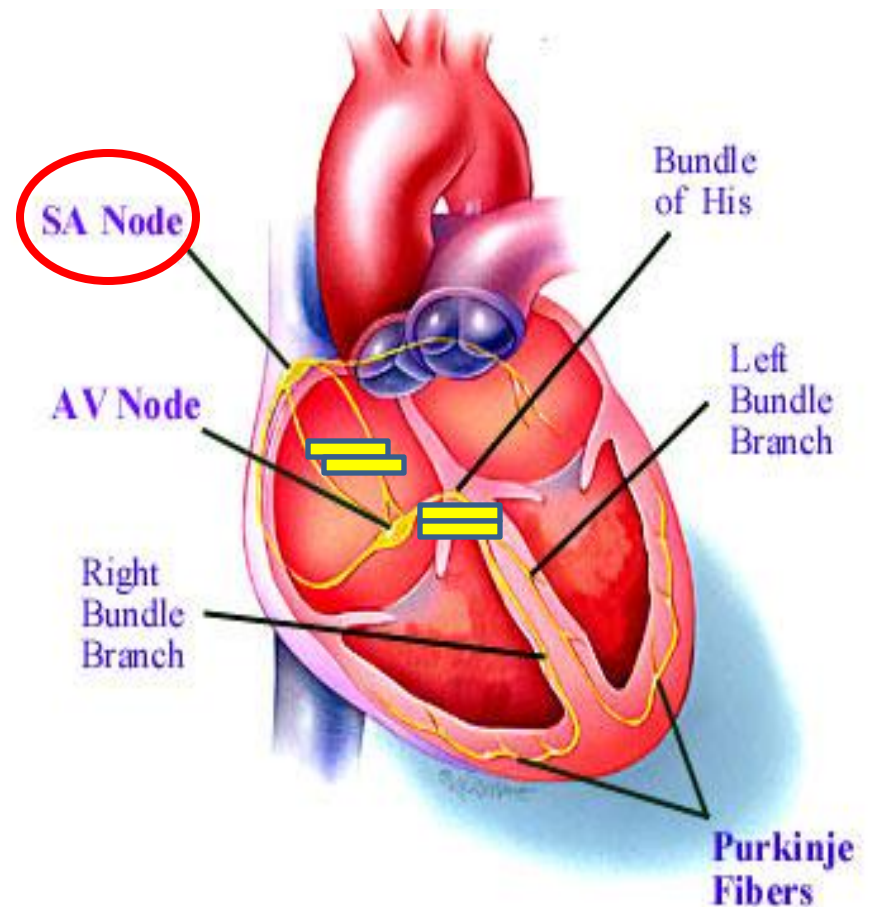
JENIS – JENIS ARITMIA GANGGUAN HANTARAN IMPULS

SA BLOCK

AV BLOCK DERJAT 1

AV BLOCK DERJAT 2

AV BLOCK DERJAT 3



INTERPRETASI EKG 1 STRIP



- Irama : ?
 - Frekuensi HR : ?
 - Gel.P : ?
 - Gel.PR Interval : ?
 - Gel.QRS : ?
- Interpretasi : ?



1. MENENTUKAN IRAMA JANTUNG

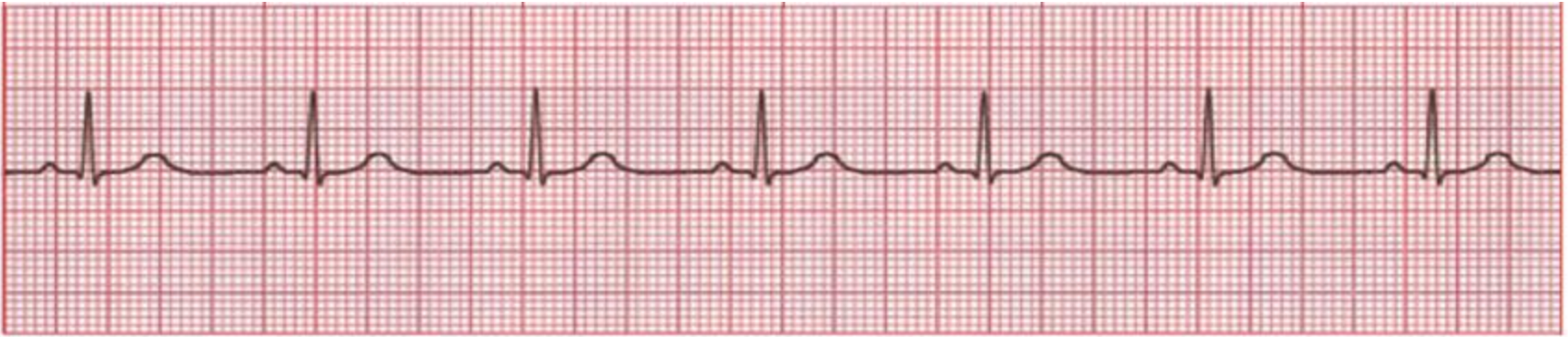
- Tentukan denyut jantung berirama teratur atau tidak
- Tentukan gelombang P normal atau tidak
- Tentukan interval PR normal atau tidak
- Tentukan gelombang QRS normal atau tidak





2 MENENTUKAN RATE

- Tentukan berapa frekwensi jantung (HR)



300

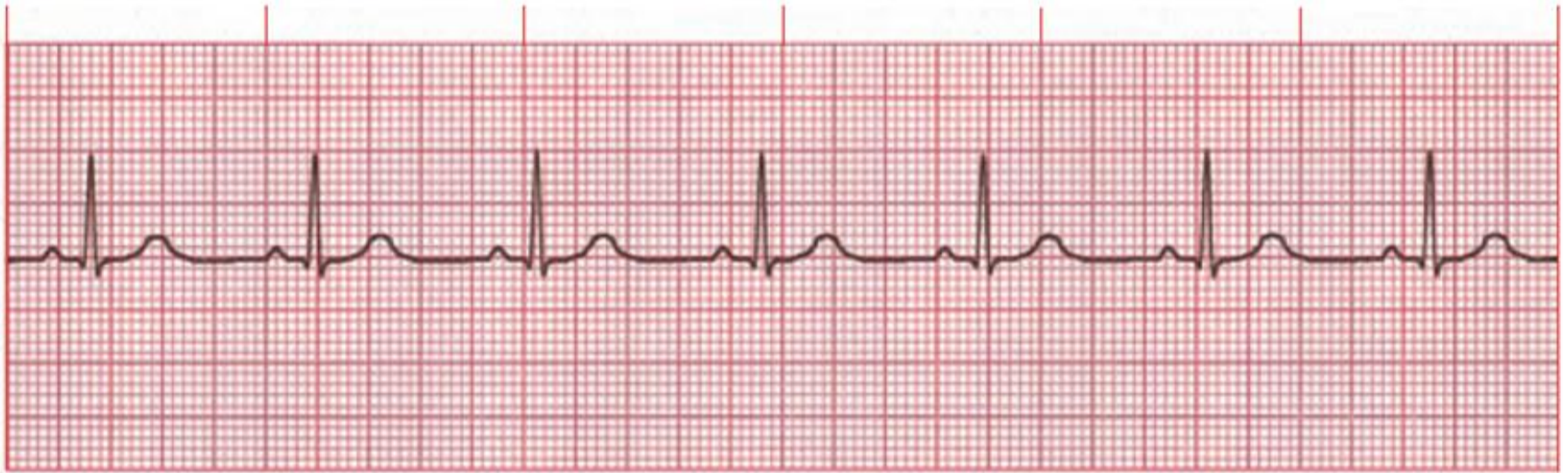
Jumlah kotak besar antara R – R

1500

Jumlah kotak kecil antara R - R

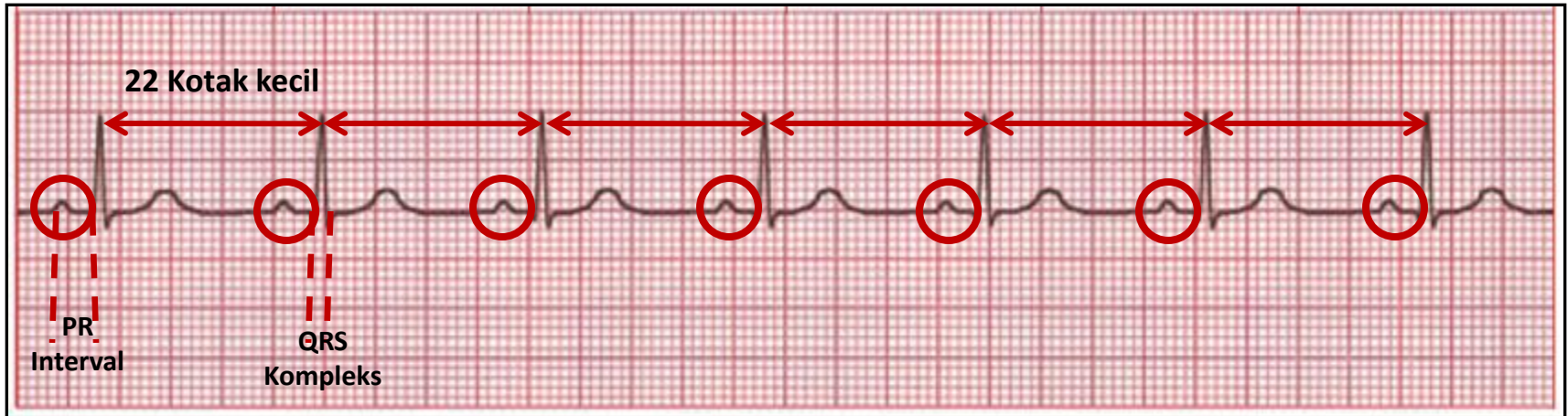
- Ambil EKG strip sepanjang 6 detik, hitung jumlah QRS dan kalikan 10.
- Atau ambil EKG 12 detik, hitung jumlah QRS dan kalikan dengan 5.

Normal Sinus Rhythm (NSR)



Rhythm	=	Reguler / Irreguler ? =	Reguler
Rate	=	$1500/22 = 68$	x/mnt
Gelombang P	=	0,06 detik (1,5 kotak)	(N= < 0.12 detik/3 kotak)
PR Interval	=	0,16 detik (4 kotak)	(N= 0.12-0.2 detik/3-5 kotak)
QRS Kompleks	=	0.08 detik (2 kotak)	(N= < 0.12 detik/3 kotak)
Interpretasi	=	Sinus Rhythm	

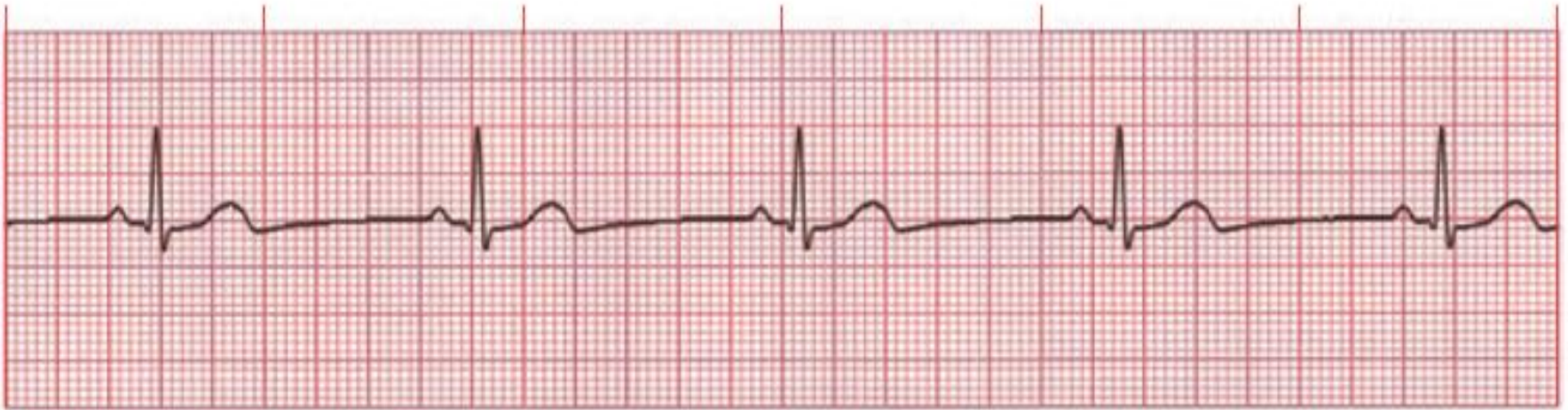
SINUS RHYTHM



- Berasal dari nodus SA
- Irama teratur
- Frekwensi jantung (HR) antara 60 -100 x/menit (Dewasa)
- Gelombang P normal , setiap gelombang P selalu diikuti gelombang QRS dan T
- Interval PR normal (0,12 -0,20detik)
- Gelombang QRS normal (0,06 – 0,12 detik)
- Semua gelombang sama

Irama EKG yang tidak memenuhi kriteria diatas disebut dengan Arritmia / Disritmia

Sinus Bradycardia



Rhythm	=	Reguler / Irreguler ? =	Reguler
Rate	=	$1500/31 = 48$	x/mnt
Gelombang P	=	0,08 detik (2 kotak)	(N= < 0.12 detik/3 kotak)
PR Interval	=	0,16 detik (4 kotak)	(N= 0.12-0.2 detik/3-5 kotak)
QRS Kompleks	=	0.06 detik (1,5 kotak)	(N= < 0.12 detik/3 kotak)
Interpretasi	=	Sinus Bradycardia	

Sinus Tachycardia



Rhythm = Regular / Irregular ? = **Regular**

Rate = **1500/9 = 167** x/mnt

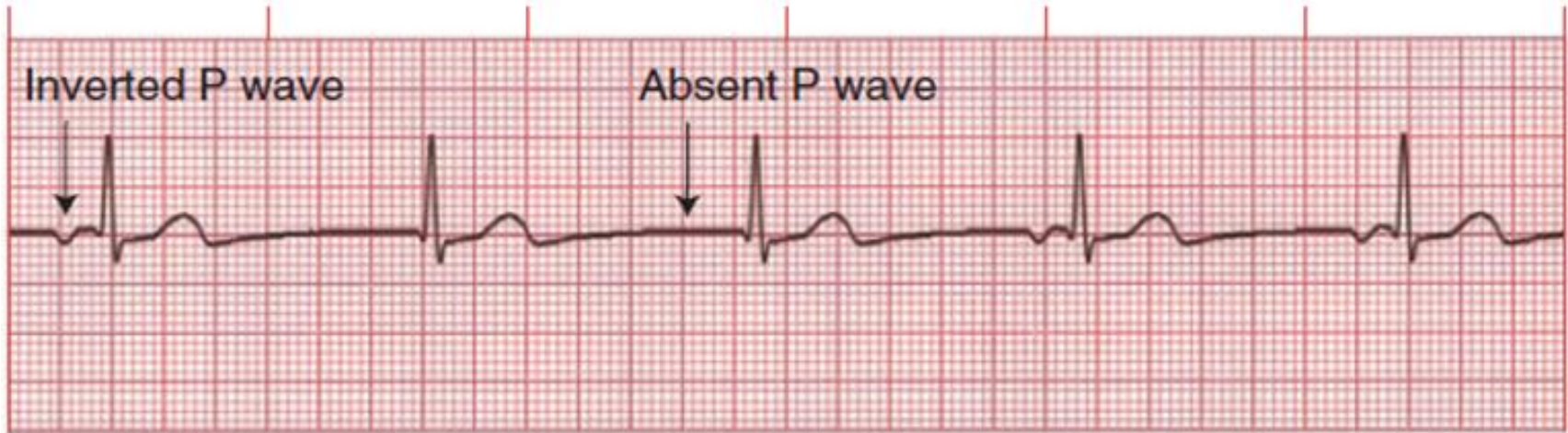
Gelombang P = **0,06 detik (1,5 kotak)** (N= < 0.12 detik/3 kotak)

PR Interval = **0,14 detik (3,5 kotak)** (N= 0.12-0.2 detik/3-5 kotak)

QRS Kompleks = **0.06 detik (1,5 kotak)** (N= < 0.12 detik/3 kotak)

Interpretasi = **Sinus Tachycardia**

Junctional Rhythm



Rhythm	=	Reguler / Irreguler ? =	Reguler
Rate	=	$1500/31 = 48$	x/mnt (40-60 x/mnt)
Gelombang P	=	Tidak ada atau terbalik	(N= < 0.12 detik/3 kotak)
PR Interval	=	Tidak ada atau terbalik	(N= 0.12-0.2 detik/3-5 kotak)
QRS Kompleks	=	0.08 detik (2 kotak)	(N= < 0.12 detik/3 kotak)
Interpretasi	=	Junctional Rhythm	

JUNCTIONAL TACHICARDIA



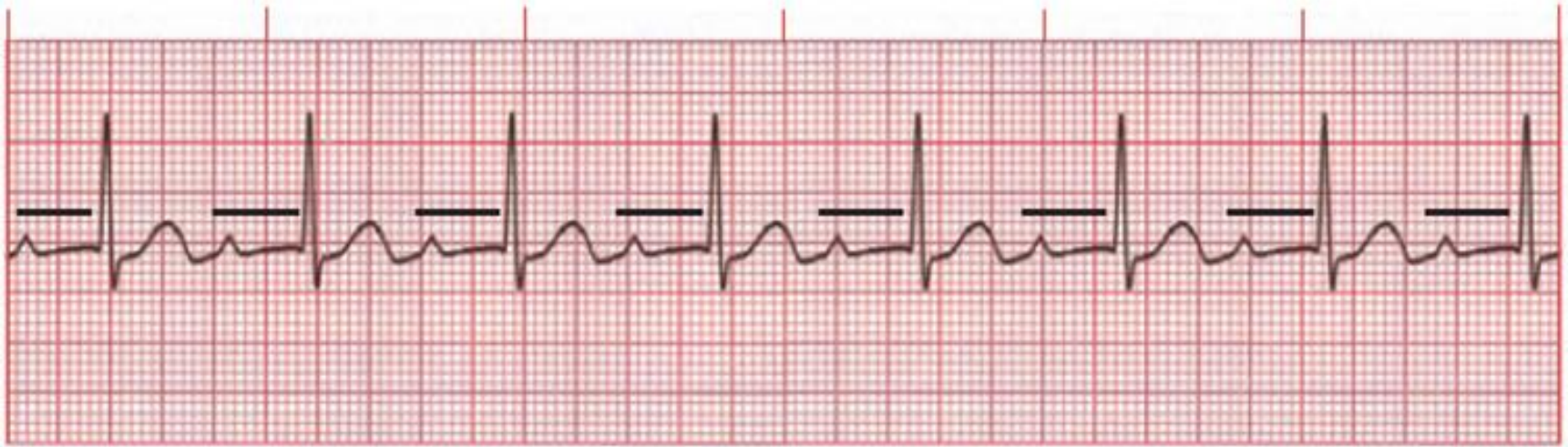
Rhythm	=	Reguler / Irreguler ?	=	Reguler
Rate	=	150x/mnt	x/mnt (40-60 x/mnt)	
Gelombang P	=	Tidak ada atau terbalik	(N= < 0.12 detik/3 kotak)	
PR Interval	=	Tidak ada atau terbalik	(N= 0.12-0.2 detik/3-5 kotak)	
QRS Kompleks	=	0.08 detik (2 kotak)	(N= < 0.12 detik/3 kotak)	
Interpretasi	=	Junctional Tachicardia		

Idioventricular Rhythm



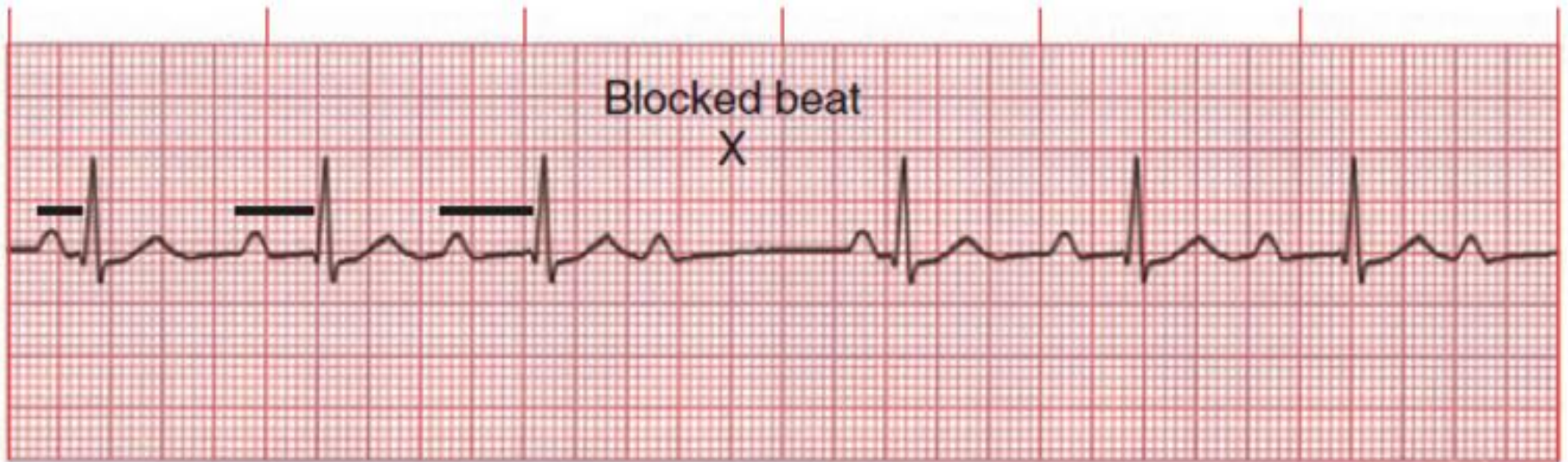
Rhythm	=	Reguler / Irreguler ? =	Reguler
Rate	=	40x/mnt	x/mnt (40-60 x/mnt)
Gelombang P	=	Tidak ada	(N= < 0.12 detik/3 kotak)
PR Interval	=	Tidak ada	(N= 0.12-0.2 detik/3-5 kotak)
QRS Kompleks	=	Lebar (> 3 kotak kecil)	(N= < 0.12 detik/3 kotak)
Interpretasi	=	Ideoventrikular Rhythm	

First-Degree AV Block



Rhythm	=	Reguler / Irreguler ? =	Reguler
Rate	=	$1500/20 = 75$	x/mnt
Gelombang P	=	0,06 detik (1,5 kotak)	(N= < 0.12 detik/3 kotak)
PR Interval	=	0,32 detik (8 kotak)	(N= 0.12-0.2 detik/3-5 kotak)
QRS Kompleks	=	0.08 detik (2 kotak)	(N= < 0.12 detik/3 kotak)
Interpretasi	=	AV Block derajat satu	

Second-Degree AV Block



Rhythm = Regular / Irregular ? = Irregular

Rate = $1500/22 = 68$ x/mnt

Gelombang P = 0,06 detik (1,5 kotak) (N= < 0.12 detik/3 kotak)

PR Interval = Semakin lama memanjang dan satu gelombang P tdk diikuti QRS Kompleks

QRS Kompleks = 0.08 detik (2 kotak) (N= < 0.12 detik/3 kotak)

Interpretasi = AV Block derajat dua

Second-Degree AV Block

Type II (Mobitz II)

- Conduction ratio (P waves to QRS complexes) is commonly 2:1, 3:1, or 4:1.
- QRS complexes are usually wide because this block usually involves both bundle branches.



Rate: Atrial rate (usually 60–100 bpm); faster than ventricular rate

Rhythm: Atrial regular and ventricular irregular

P Waves: Normal (upright and uniform); more P waves than QRS complexes

PR Interval: Normal or prolonged but constant

QRS: Usually wide (>0.10 sec)

Third-Degree AV Block

- Conduction between atria and ventricles is absent because of electrical block at or below the AV node.
- "Complete heart block" is another name for this rhythm.



Rate: Atrial: 60–100 bpm; ventricular: 40–60 bpm if escape focus is junctional, <40 bpm if escape focus is ventricular

Rhythm: Usually regular, but atria and ventricles act independently

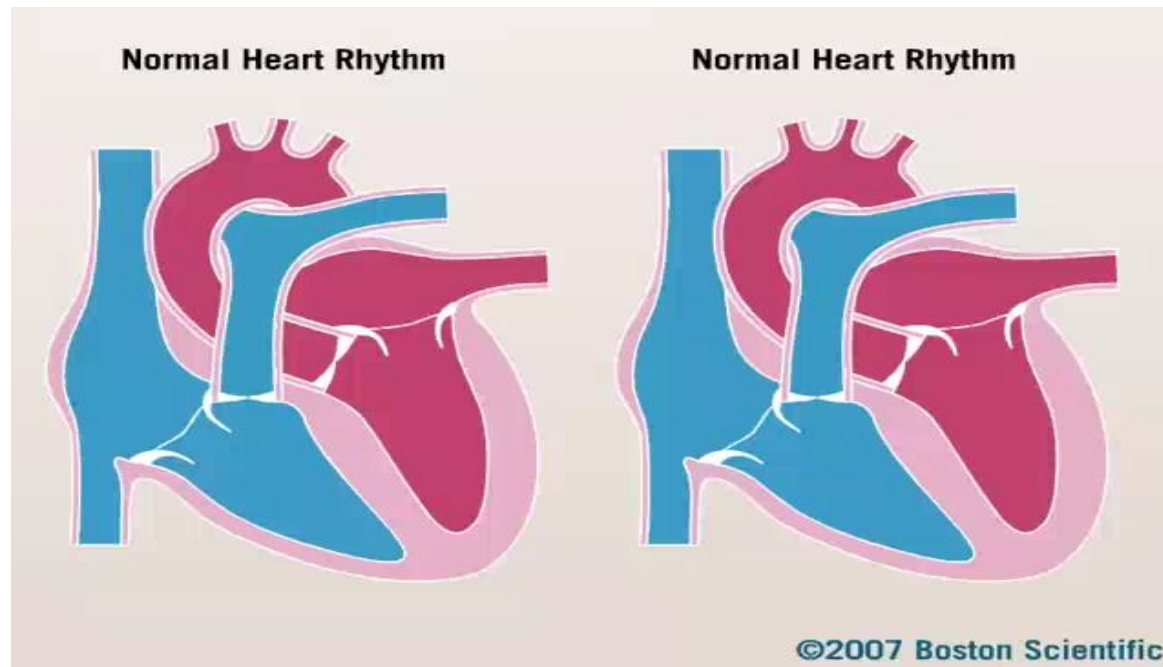
P Waves: Normal (upright and uniform); may be superimposed on QRS complexes or T waves

PR Interval: Varies greatly

QRS: Normal if ventricles are activated by junctional escape focus; wide if escape focus is ventricular

Cardiac Arrest

- Keadaan **terhentinya aliran darah** dalam sistem sirkulasi tubuh secara tiba-tiba akibat terganggunya efektivitas kontraksi jantung saat sistolik



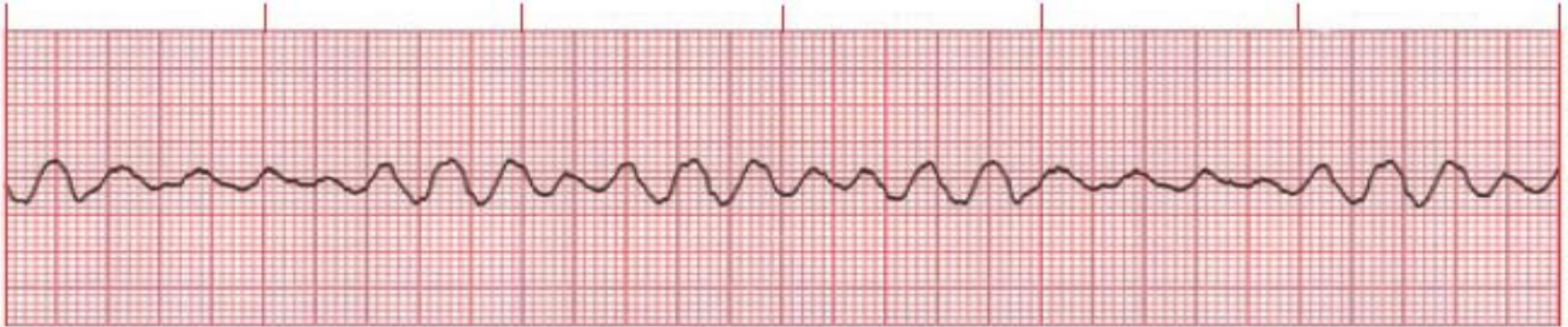
Cardiac Arrest

Diagnosis :

1. Pasien tidak sadar
2. Pasien tidak bernafas dan tidak teraba nadi
3. EKG:
 - Pulseless Ventricular Tachycardia (VT)
 - Ventricular Fibrillation (VF)
 - Pulseless electrical activity (PEA)
 - Asistole

Ventricular Fibrillation (VF)

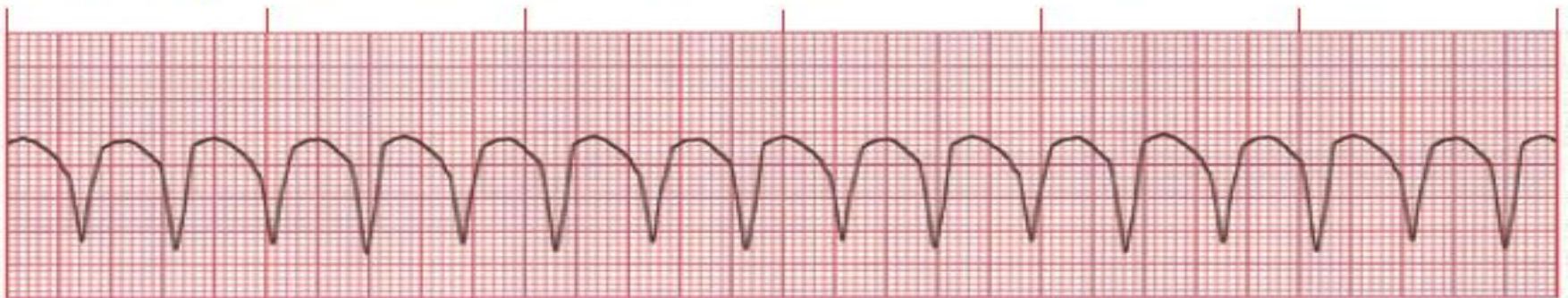
- Chaotic electrical activity occurs with no ventricular depolarization or contraction.
- The amplitude and frequency of the fibrillatory activity can be used to define the type of fibrillation as coarse, medium, or fine.



Rate: Indeterminate
Rhythm: Chaotic
P Waves: None
PR Interval: None
QRS: None

Ventricular Tachycardia (VT): Monomorphic

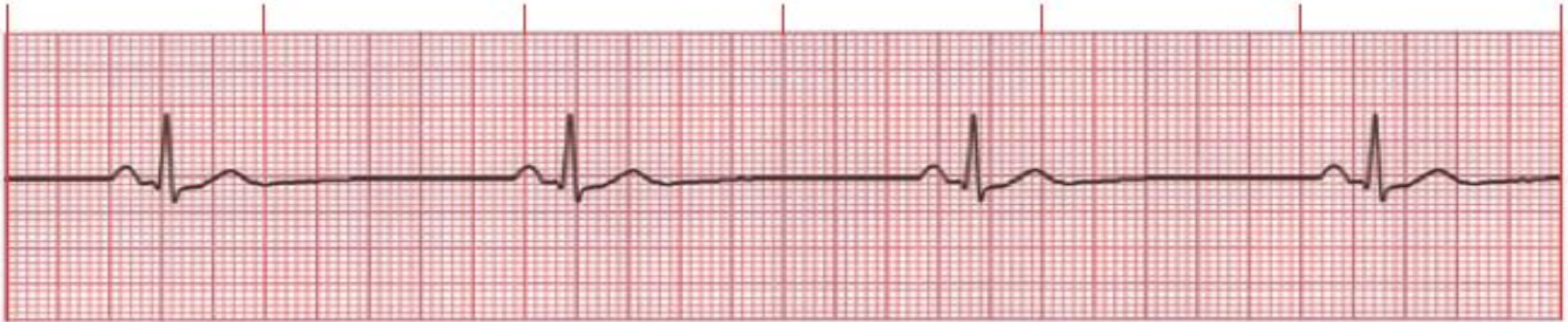
- QRS complexes in monomorphic VT have the same shape and amplitude.



Rate: 100–250 bpm
Rhythm: Regular
P Waves: None or not associated with the QRS
PR Interval: None
QRS: Wide (>0.10 sec), bizarre appearance

Pulseless Electrical Activity (PEA)

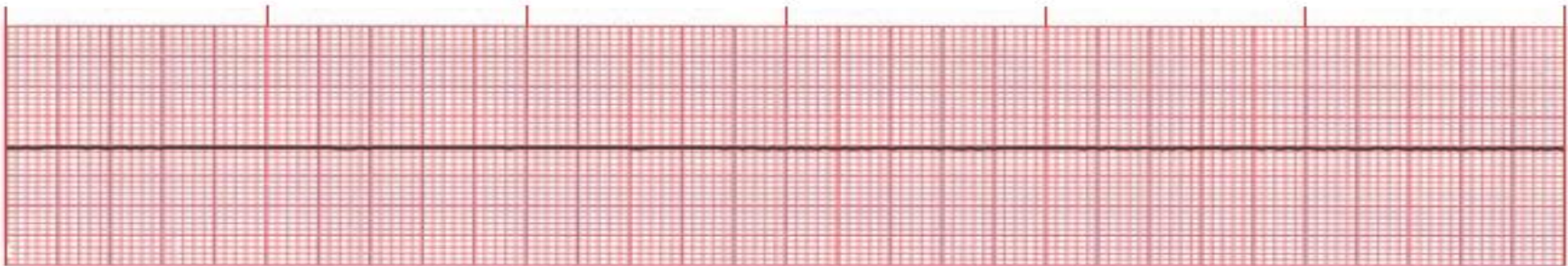
- Monitor shows an identifiable electrical rhythm, but no pulse is detected.
- Rhythm may be sinus, atrial, junctional, or ventricular in origin.
- PEA is also called electromechanical dissociation (EMD).



Rate, rhythm, P waves, P-R interval, and QRS: Reflect underlying rhythm.

Asystole

- Electrical activity in the ventricles is completely absent.



Rate: None
Rhythm: None
P Waves: None
PR Interval: None
QRS: None



TERIMAKASIH

