

Setting up a continuous 12-lead electrocardiogram



through ensuring correct lead placement

Learning Outcomes

GMC (2019) Practical Skills & Procedures, p5

10	Carry out a 3- and 12-lead electrocardiogram	Set up a continuous recording of the electrical activity of the heart, ensuring that all leads are correctly placed.	Safe to practise under indirect supervision
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Overview of session

- ECG quiz
- Check your ability to correctly identify the anatomical land marks for placing of ECG leads, through practical application with SP

Learning supported through VLE

- ECG e-learning
- Competencies for 12-lead ECG Performance

Competencies for Standard Resting 12-lead Electrocardiogram (ECG) Performance

These competencies are to be used in conjunction with:-
Trust Policies / Procedures regarding ECG recording

Section A This section should be signed by the practitioner who provides theoretical training OR by the practitioner who verifies that the individual has received prior training. (For face-to-face training)

Section B This section is for documentation of supervised practice. The supervisor should be a registered professional who also has the skills and knowledge to be competent to undertake recording of standard resting 12-lead ECG without supervision.

Section C This section is to be completed once the individual has been assessed and deemed to have reached the required for unsupervised practice, both the assessor and the practitioner being assessed should sign this section.

Practitioner's Name: _____

Workplace: _____

SECTION A: Verification of Completion of Theoretical Instruction

I can confirm that the above named individual has received theoretical and practical training in recording a standard resting 12-lead ECG. The individual has knowledge of ANTT, appropriate equipment training and issues that might be encountered when undertaking this skill. They can state the indications for recording an ECG, the risks associated with this procedure and the limits of their practice. I am satisfied that this individual can progress to supervised practice in their workplace and have their competency assessed in due course. They are aware that they need to be supervised by a registered practitioner during this period

Course Supervisor:

Signature: _____ Date: _____

SECTION A: Verification by Candidate of Prior Instruction

I can confirm that I have previously / received theoretical and practical training in recording of standard resting 12-lead ECG. I have appropriate equipment training and can demonstrate safe ANTT. I understand the indications for recording an ECG, the risks associated with this procedure and the limits of my practice. I am aware that until I have been deemed competent to undertake this skill unsupervised, I will be observed by a registered practitioner, who will assess my competency to undertake this skill without supervision.

Signature: _____ Date: _____

Print Name: _____

SECTION B: Supervised Practice

3 supervised practices recommended

	SELF ASSESSMENTS				
	Achieved = Y	Not Achieved = X			
	1	2	3	4	5
A. Confirm equipment training has been received on equipment to be used					
B. Follows infection prevention measures as per Trust policy					
C. Greets and confirm correct identification of patient					
D. Clearly explain the procedure to the patient and responds to questions					
E. Prepare equipment and ensure it is safe to use. Check all consumables (ECG paper, electrodes, etc) are available and in date					
F. Ensure standard machine settings are in place. (Paper speed 25 mm/sec, Filter 0.5-150 Hz, Calibration 10 mm/mv)					
G. Ensure patient is comfortable and positioned at 45° angle. *Altering filter settings can distort ECG complexes especially ST segments at lower filter range.					
H. Inputs patients name, hospital number & DOB into the machine – and operator if machine allows otherwise this should be manually annotated on the trace once recorded.					
I. Accurately identify and correctly prepare and place electrodes sites in accordance to SCST/AAHA guidelines.					
J. Attach the patient to the ECG machine and check the leads are attached to the correct electrode (i.e. limb leads are correctly attached and colours are not reversed)					
K. Record an artefact-free trace					
L. Identify and document any symptoms on the ECG trace.					
M. Demonstrate awareness of situations needing discussion with the medical team urgently.					
N. Document the procedure appropriately, including annotating any modification to the procedure – i.e. wide V1 and V2 due to sternotomy dressing, modification of limb lead in amputee patients (position electrode at most distal part of affected limb).					
Initial of Supervisor:					
Initial of Practitioner:					
Date of procedure:					

Number 1	Date	
Name of Supervisor (PRINT)		
Comments		
PASS/ REFER		
Assessment Rating 1-6	Self-Assessment	Supervisors Assessment
Signatures		

Number 2	Date	
Name of Supervisor (PRINT)		
Comments		
PASS/ REFER		
Assessment Rating 1-6	Self-Assessment	Supervisors Assessment
Signatures		

Number 3	Date	
Name of Supervisor (PRINT)		
Comments		
PASS/ REFER		
Assessment Rating 1-6	Self-Assessment	Supervisors Assessment
Signatures		

Number 4	Date	
Name of Supervisor (PRINT)		
Comments		
PASS/ REFER		
Assessment Rating 1-6	Self-Assessment	Supervisors Assessment
Signatures		

Number 5	Date	
Name of Supervisor (PRINT)		
Comments		
PASS/ REFER		
Assessment Rating 1-6	Self-Assessment	Supervisors Assessment
Signatures		

How many electrodes do you need to generate a 12 Lead (view) ECG?

A. 12

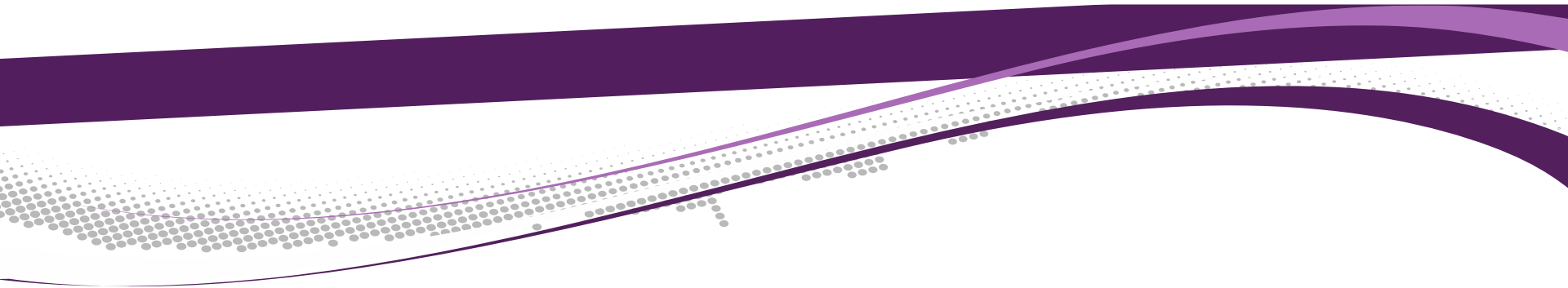


B. 10

C. 8

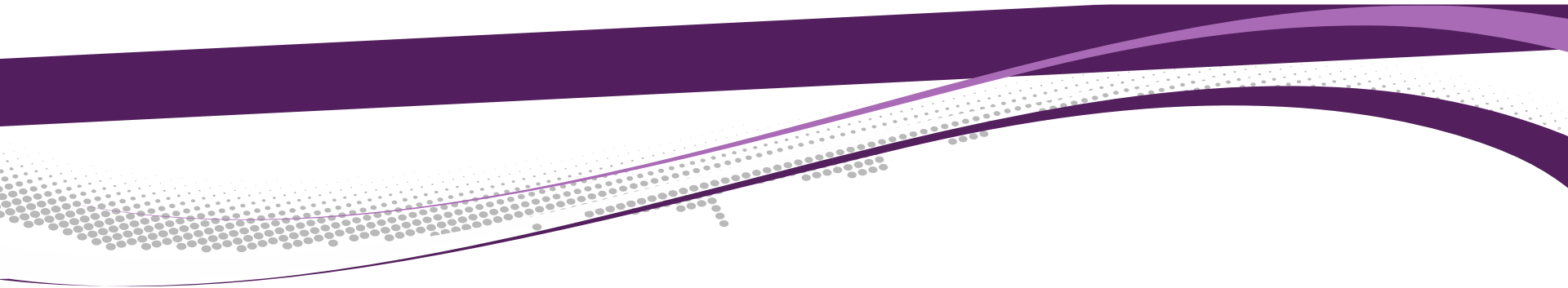
An ECG should be performed with a patient at $<45^{\circ}$ position.

- A. True
- B. False

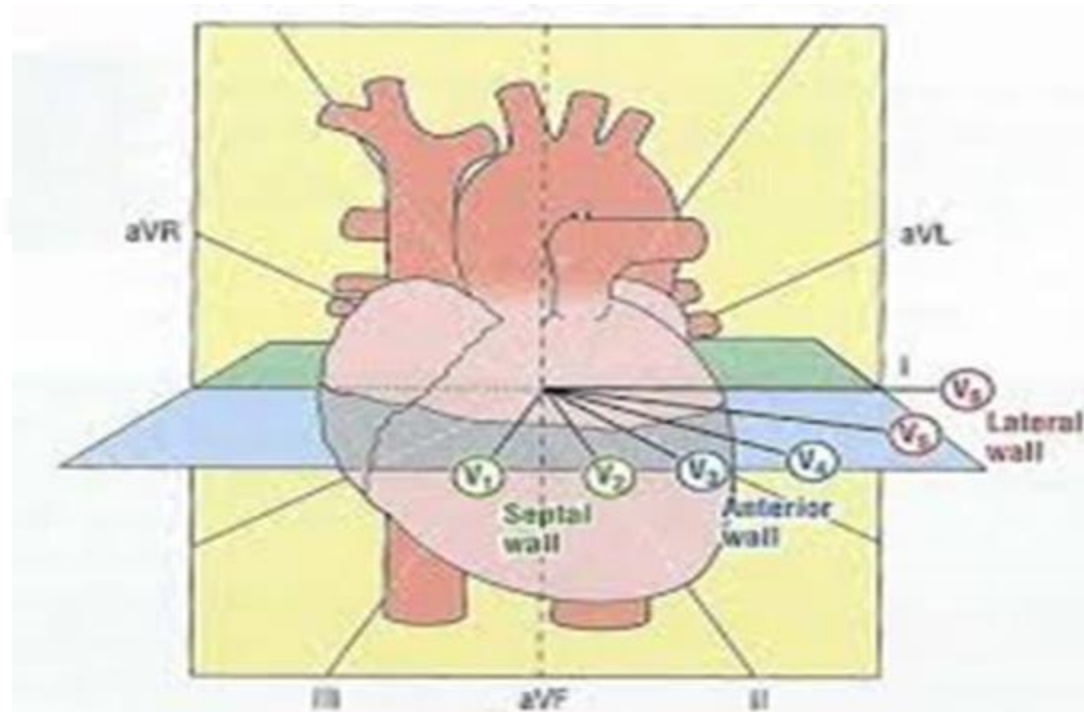


What may the cables that connect to the Electrodes also be called?

- ➔ A. Leads
- B. Circuits
- C. Lines



How many Chest Electrodes are there?



What

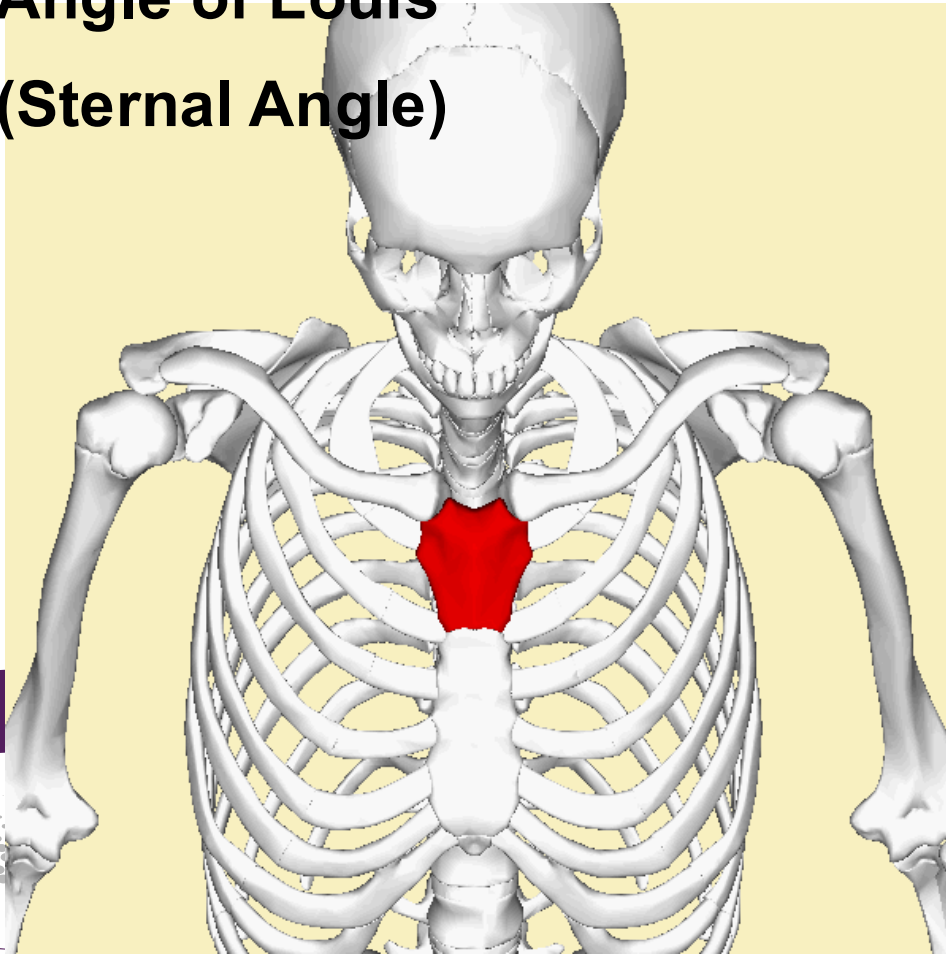
ads

Horizontal Plane

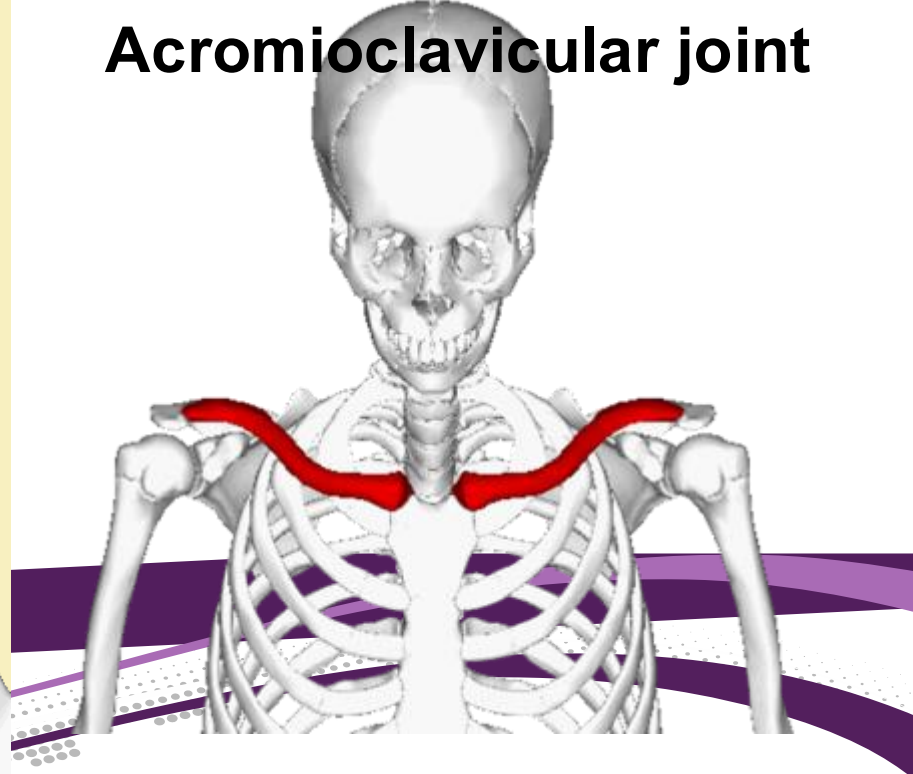
Providing Inferior & Lateral views of the Heart

What 3 anatomical landmarks are required for correctly placing the Chest Electrodes?

**Angle of Louis
(Sternal Angle)**

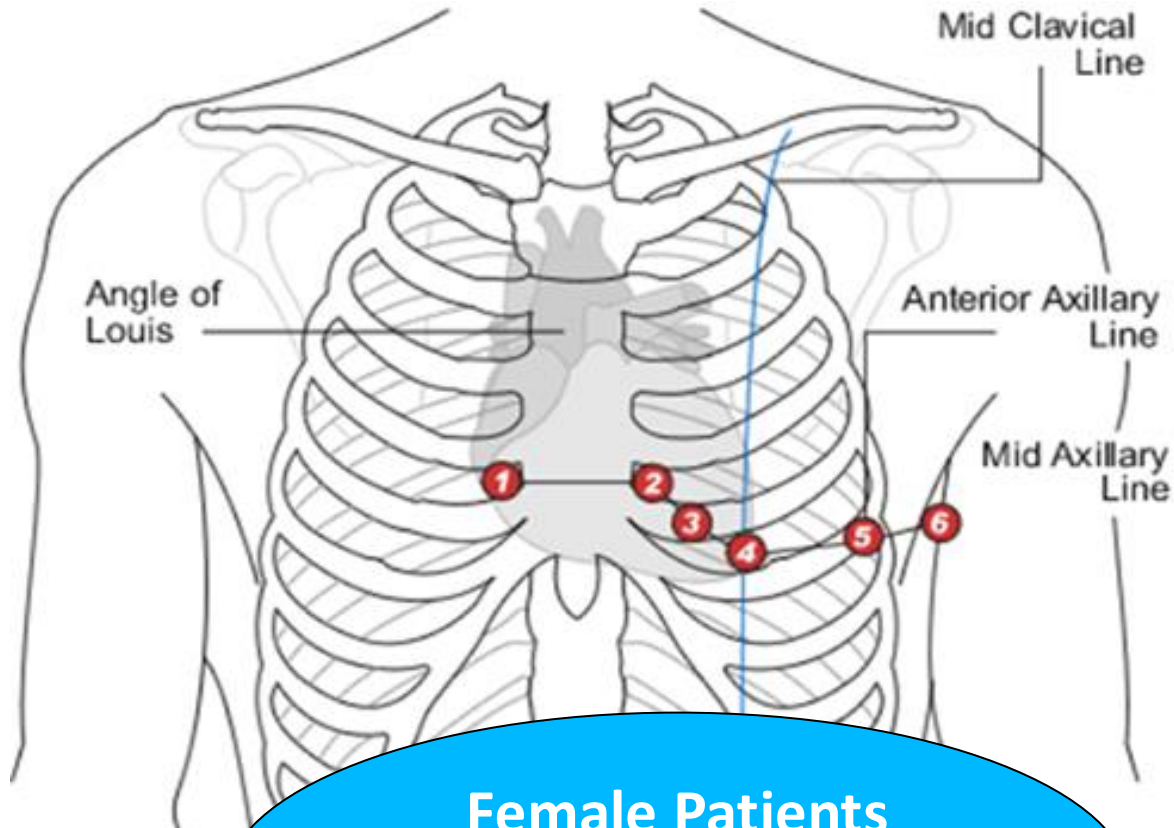


**Sternoclavicular &
Acromioclavicular joint**



Chest Electrode Placement

Chest Wires are referred to as C1 – 6 or V1 – 6.



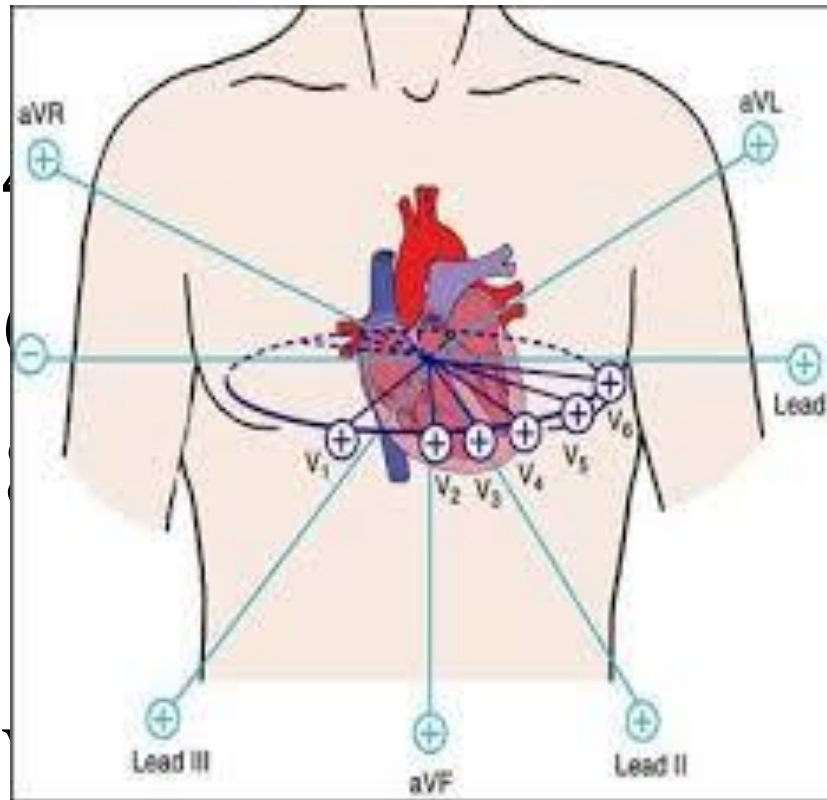
The middle of the electrode

Female Patients
- Electrodes placed
under breast

al edge, not to the

How many Limb Electrodes are there?

- A.
- B.
- C.



What view does the limb leads show?

Vertical (frontal) plane

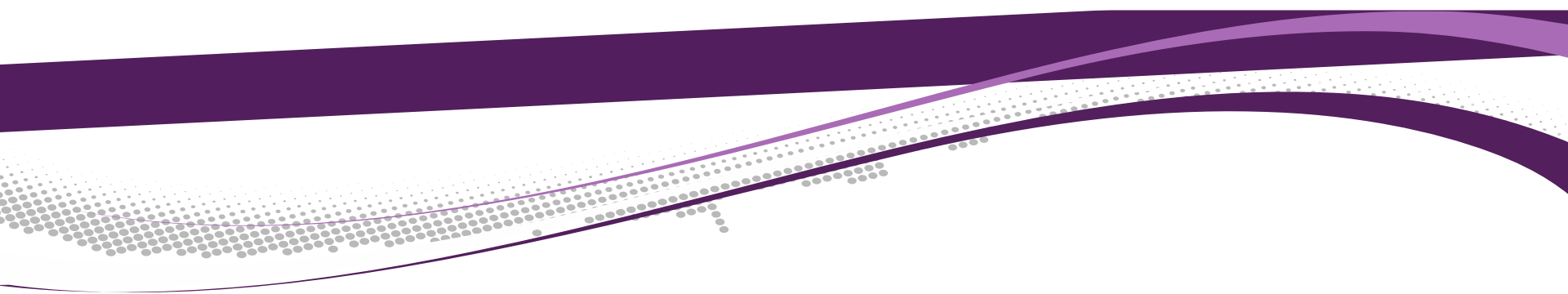
Providing Inferior & Lateral views of the Heart

How many views of the heart do you get from the Limb Electrodes ?

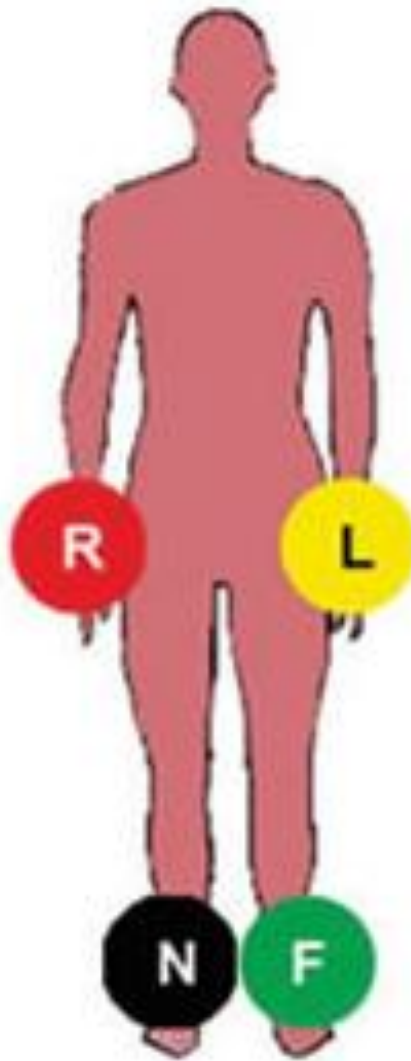
A. 4

→ B. 6

C. 8



Where should the limb leads be placed?



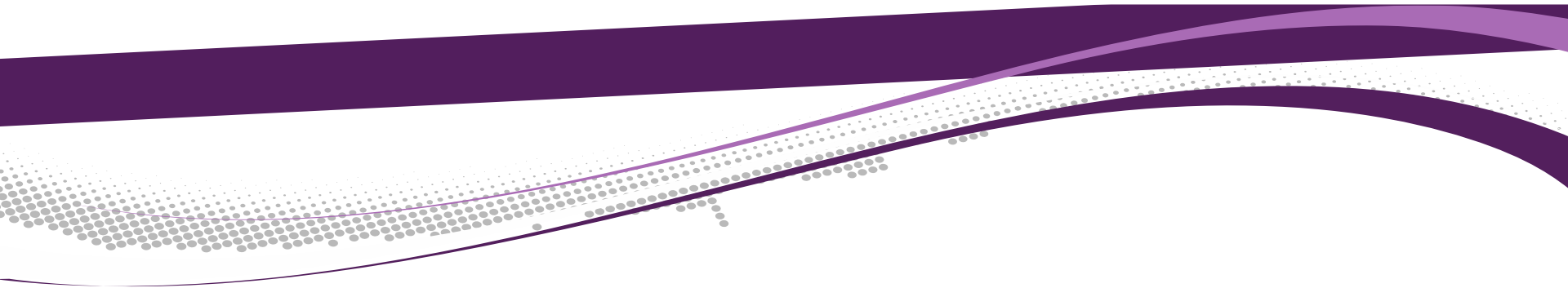
Limb leads placed proximally to wrist & ankle bones.

UNLESS – clinical reason, Amputee/injured limbs/burns/ limb dressing - leads moved to lowest part of affected limb. ECG annotated

Electrodes NEVER placed on trunk or shoulders/thighs in normal patient.

If the machine speed and calibration is not set correctly the size of wave forms may be misinterpreted

- ➔ A.True
- B.False



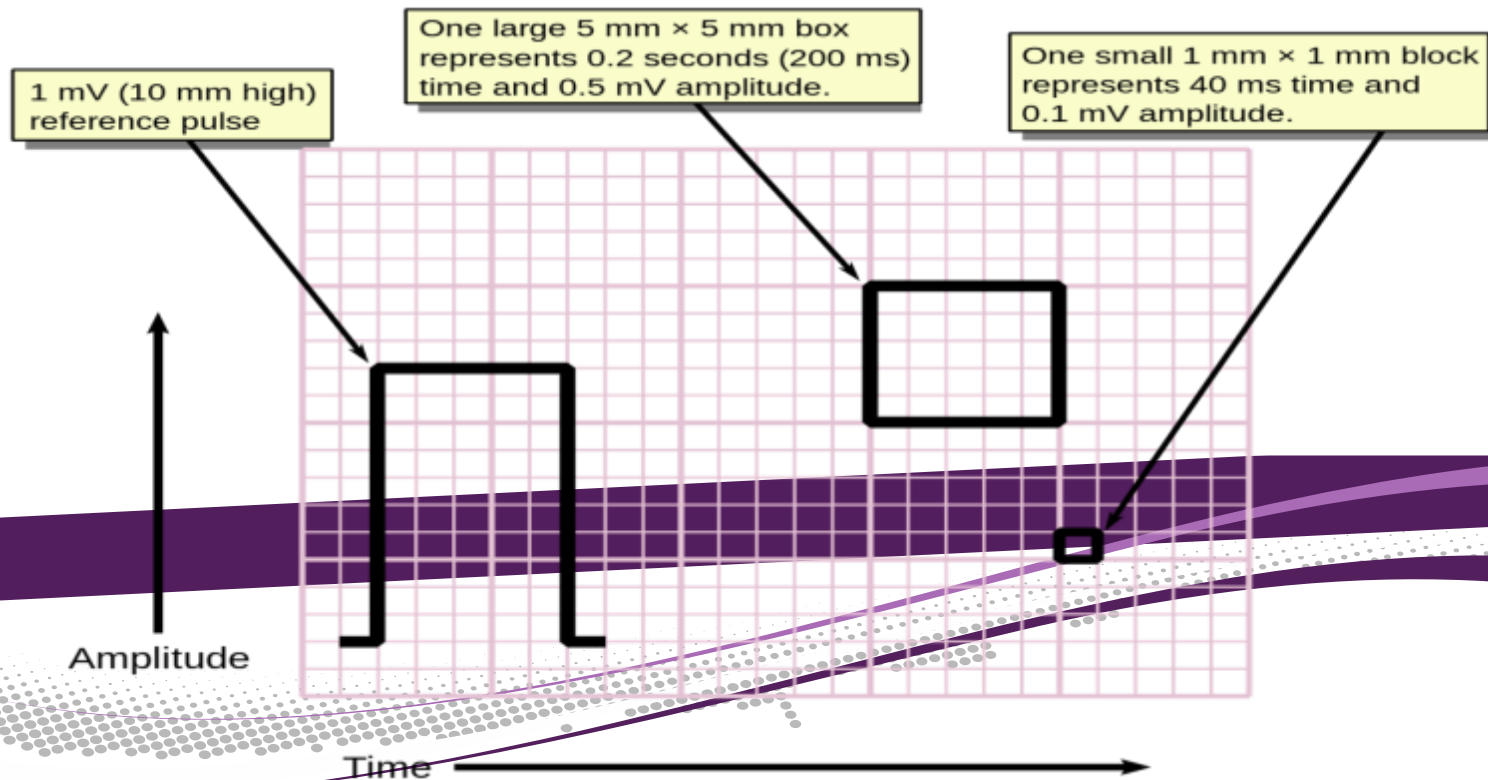
Calibration of the ECG

The electrical activity detected by the ECG machine is measured in millivolts (gain) – amplitude of the waveform & should be set at 1mv / 10mm high.

The paper is divided horizontally into: 1 small square = 1 mm wide = 0.04 s

Each large square contains five small squares in width

1 large square = 5 mm wide = 0.2 s Standard ECG Calibration



26/11/2012 16:42:22

University Hospital Southampton

NIC ECG Department

Rate 71

PR 173

QRSD 95

QT 391

QTc 425

--AXIS--

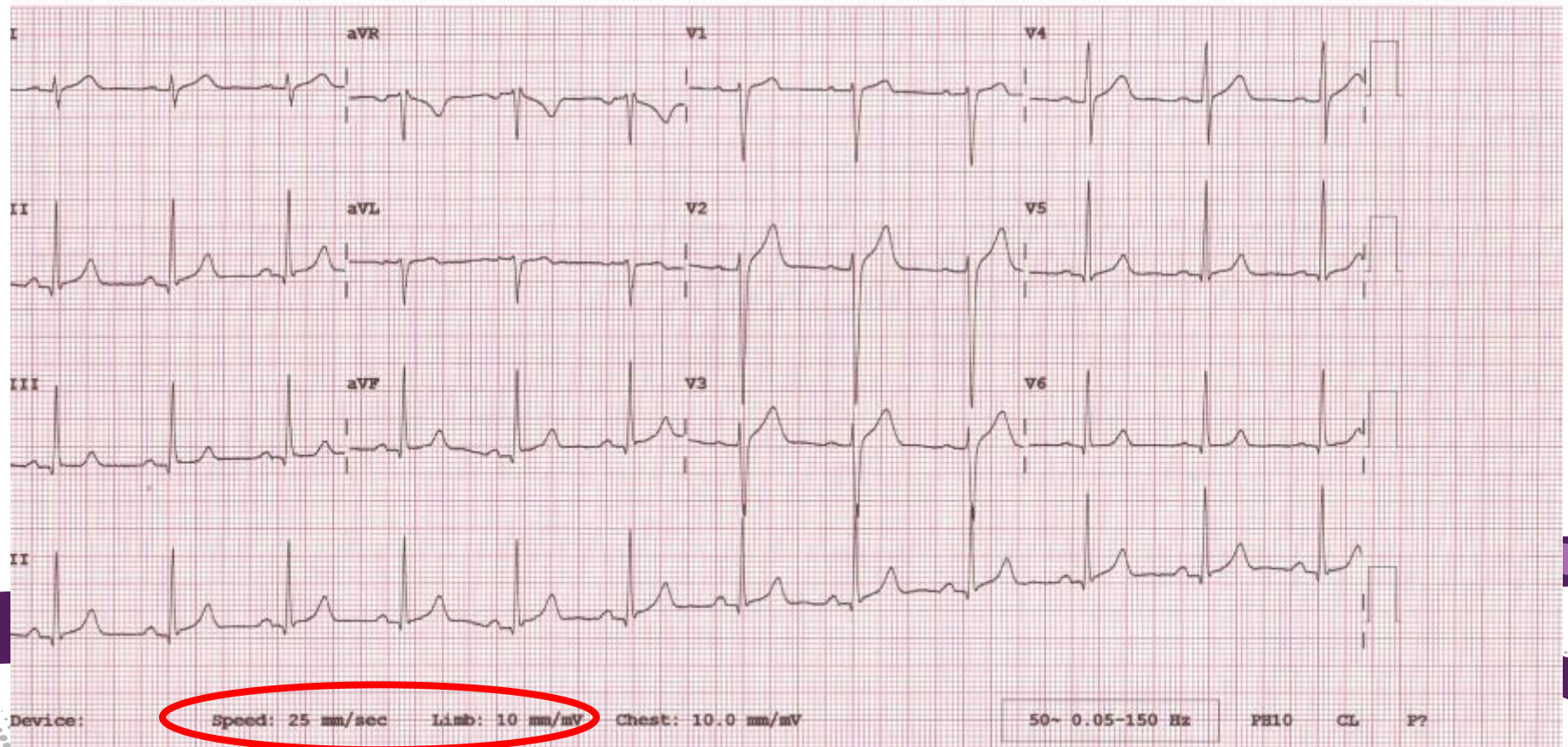
P 69

QRS 93

T 52

12 Lead; Standard Placement

lwn

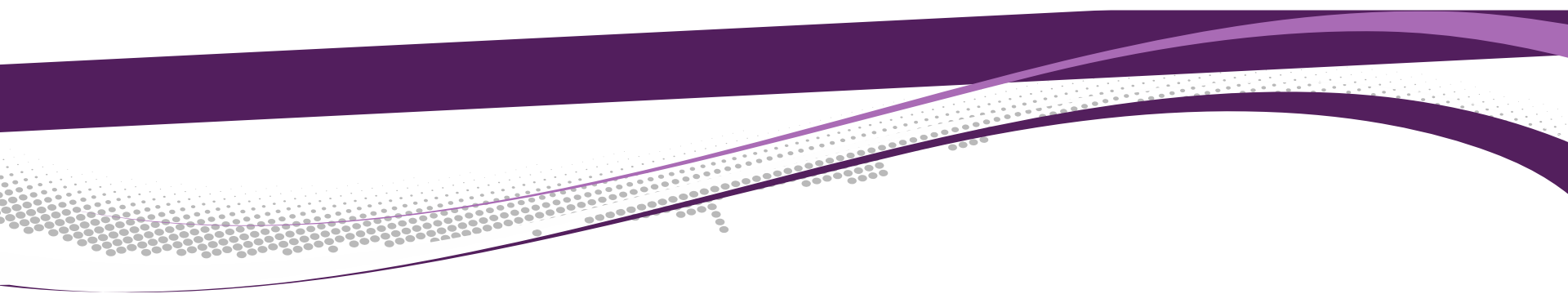


What is the correct paper speed of the ECG?

A. 20mm / second

→ B. 25mm / second

C. 10mm / second

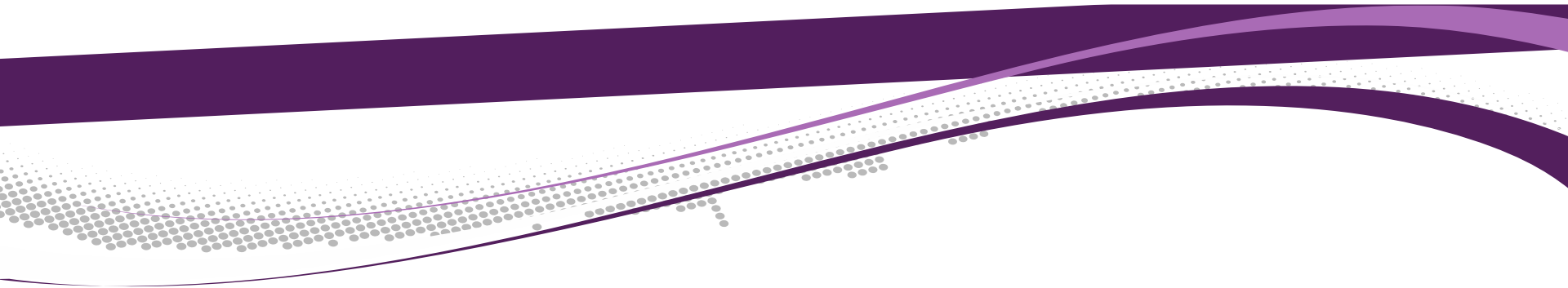


How high should the reference calibration pulse be?

A. 5mm

→ B. 10mm

C. 15mm

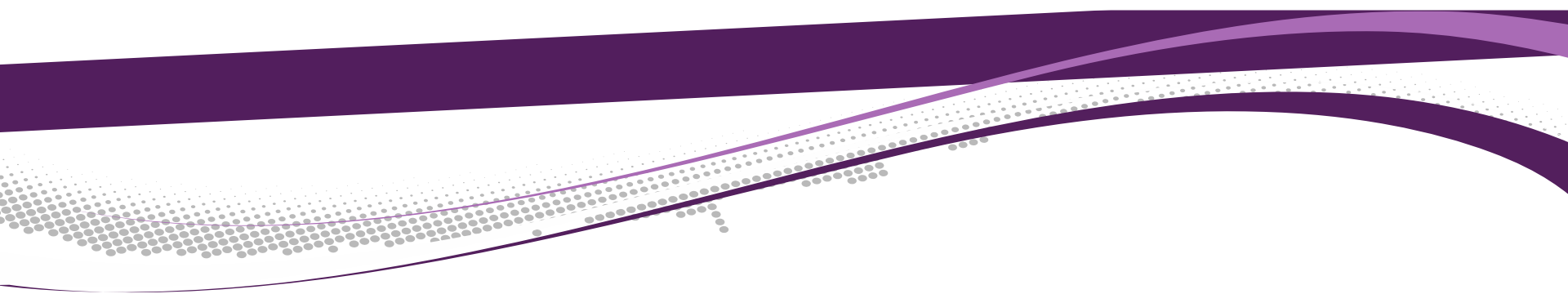


If a large square is equal in time to 0.2 seconds, how many large squares in a 10 second trace?

A. 15

B. 25

→ C. 50

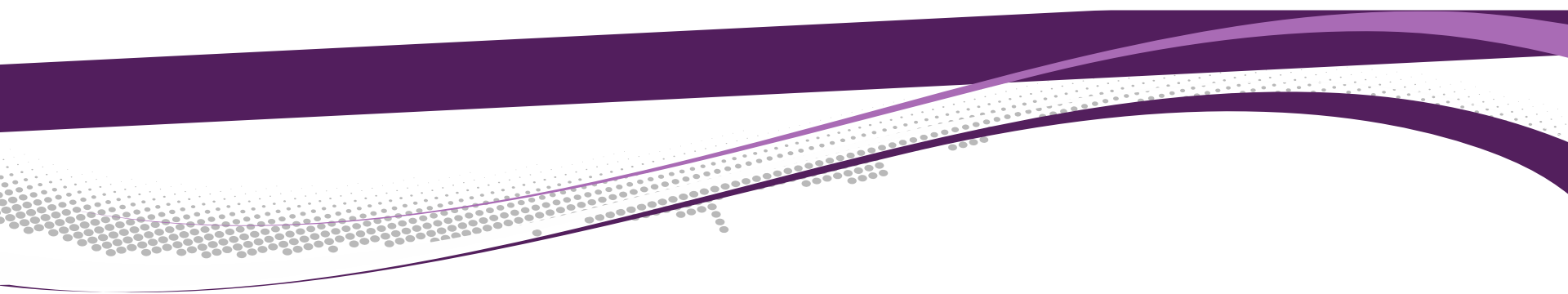


Worldwide what percentage of ECG recordings are incorrect?

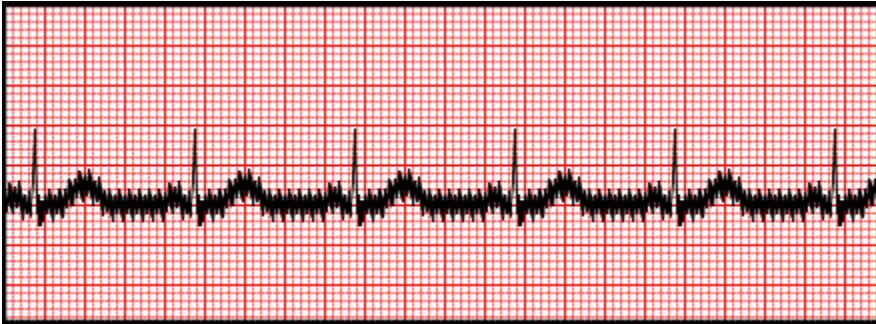
A. 40%

B. 63 %

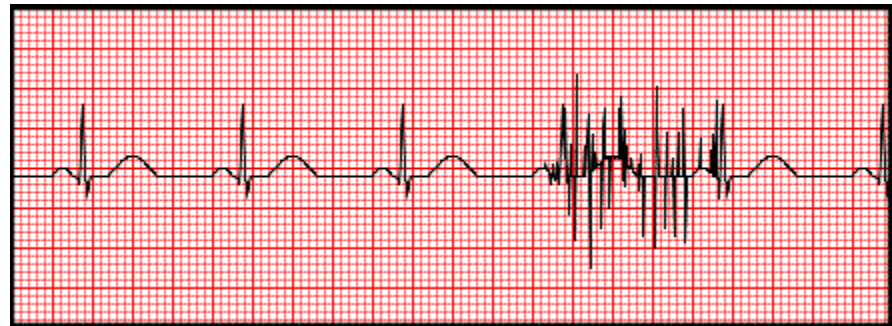
→ C. 84%



Why do these rhythms look like this?



Rhythm 1



Rhythm 2



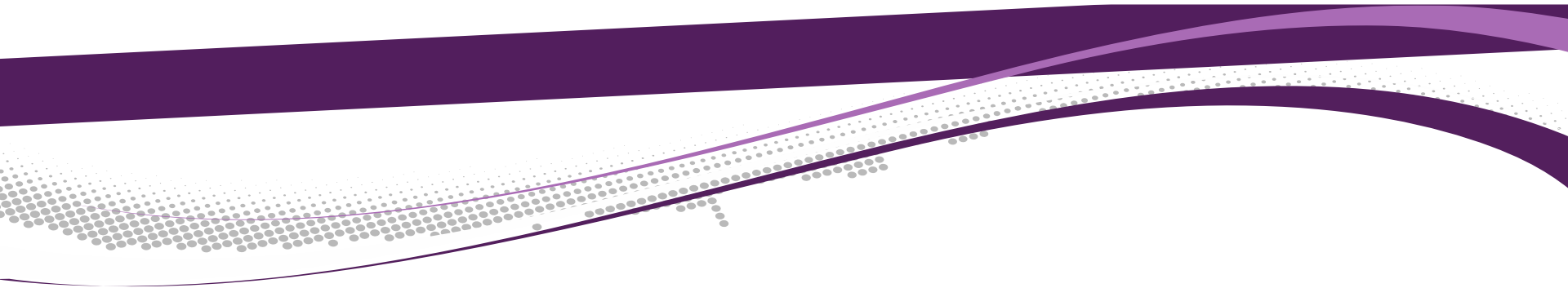
Rhythm 3

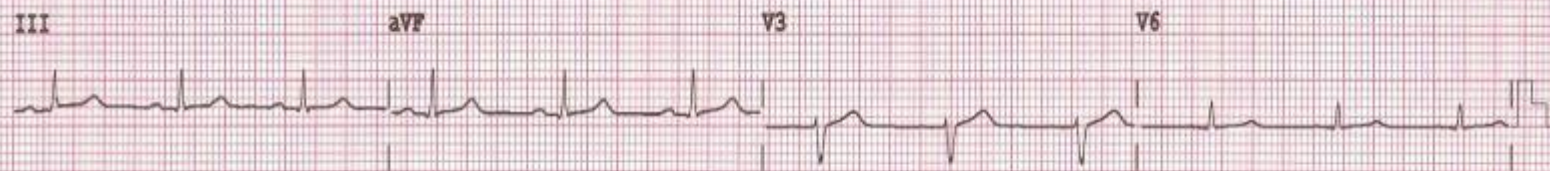
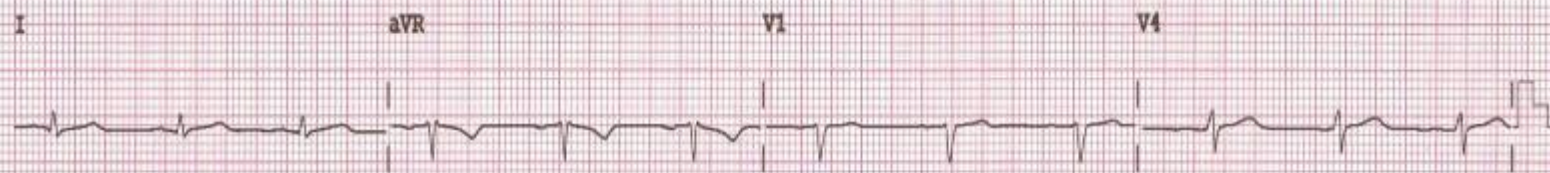
What health condition is making this recording look like this?



Can you identify from these ECGs what they are showing?

N.B. the ECGs are all taken from the same patient





Device:

Speed: 25 mm/s

Limb: 5 mm/mV

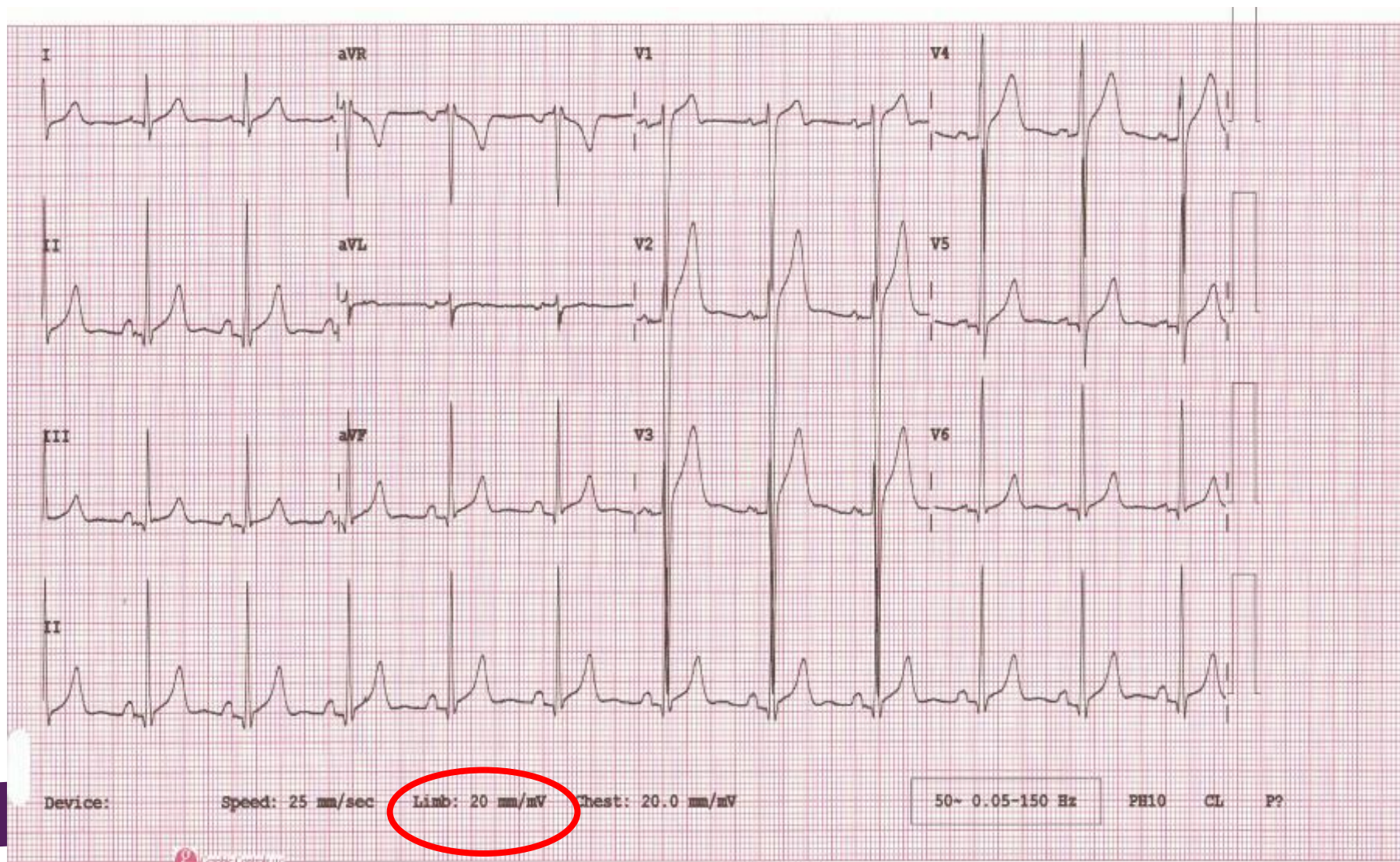
Chest: 2.50 mm/mV

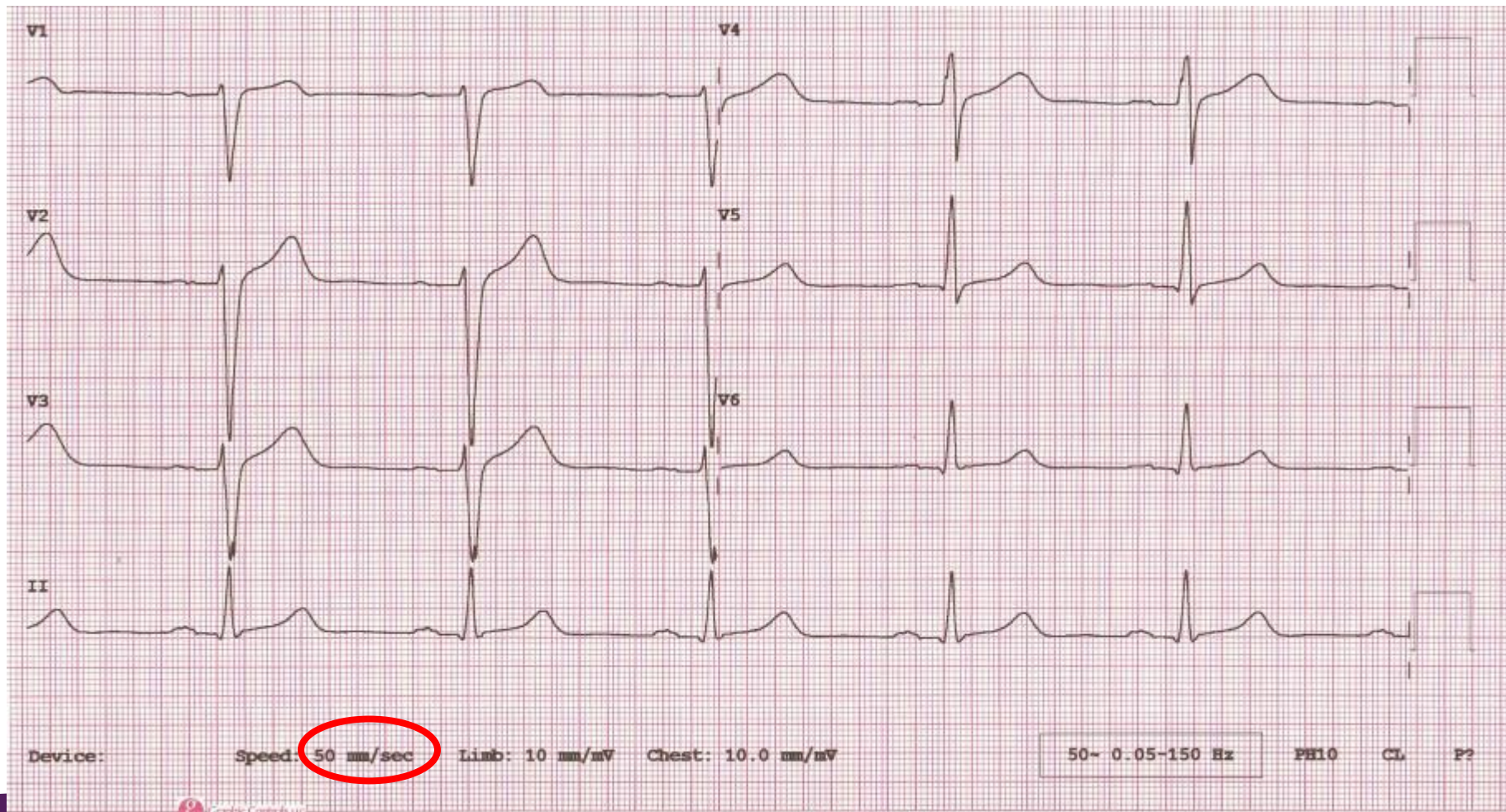
50~ 0.05-150 Hz

PH10

CL

P?





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--AXIS--

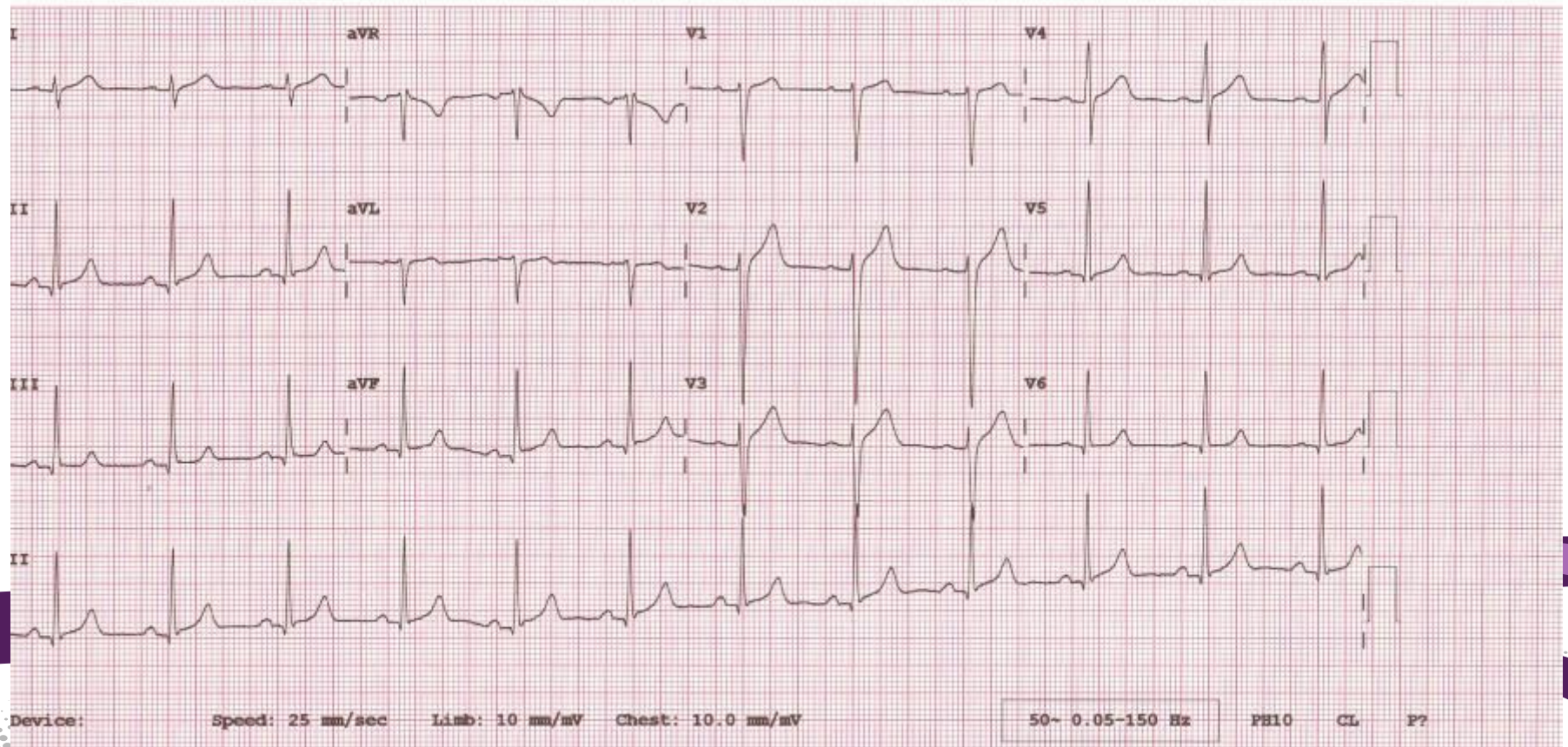
P 69

QRS 93

T 52

12 Lead; Standard Placement

lrm



Troubleshooting

No trace or poor trace

- Check wire connections to electrodes.
- Check electrodes in good contact with skin /not dried out / expiry date of electrodes. / Hair removal

Interference:

- Metal (jewellery)
- Movement ie tremor / shivering
- Noise ie electrical appliances /medical appliances: infusion pumps, CPAP or ventilator tubing

Consider use of filter

Overview of procedure

- Explanation of procedure and Introduction: Confirm Name / DOB/ Time ECG taken.
- Lay patient down <45° comfortable and relaxed.
 - Annotate if position >45° (ST segments can appear elevated)
- Expose chest / wrists / ankles (amputee?)
- Clean electrode sites with alcohol wipe
- Consider electrode contact (clip / shave hair)
- Apply electrodes & attach wires
 - Using anatomical landmarks to correctly place electrodes
- Turn on machine: (check standard settings to 10mm/mv & rate 25mm/sec)
- Record / print / label / ECG must have demographics
- Make a note on ECG for e.g.: if patient in pain / >45° position or electrodes not in usual position. ie amputee.
- Never leave electrodes in position – gel can cause reaction / electrodes migrate (12 lead ECG)

Practical application

