Recognition and management of critically ill patient

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Emergency physician

Introduction

- Many patients demonstrate concerning historical symptoms or physiologic signs hours before cardiopulmonary arrest.
- The objective of this lecture is to organize the approach of such patients.

introduction

- Approach to the critically ill Patient by "ABC, MOVIE" stands for:

Airway, Breathing, Circulation , Monitor, Oxygen, Vital Signs, IV, Exposure

- Should be first words to be remembered .
- THIS COMES BEFORE YOUR HISTORY and Complete physical exam. DESPITE WHAT THE BOOK SAYS

Airway

- is the patient protecting their away

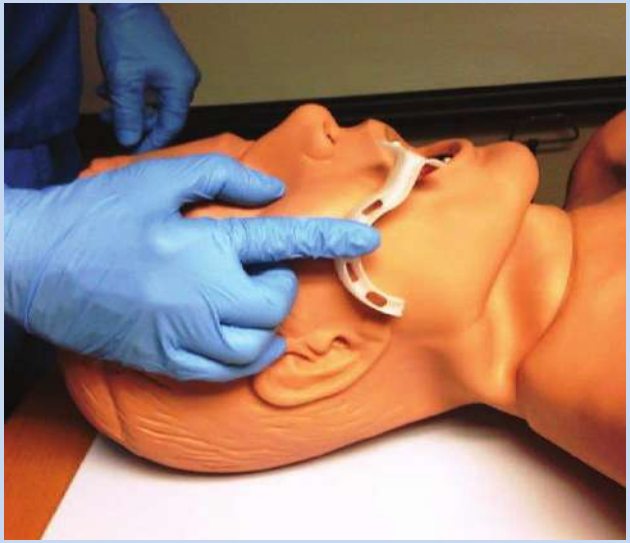
Hint: if they can talk to you, they are protecting and you can move on

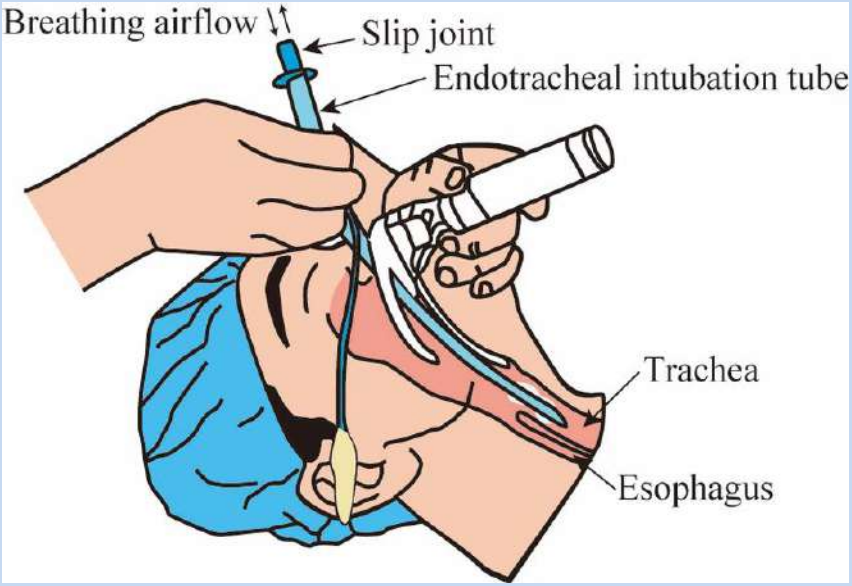
- If unsure, ask a question
- If no response : Ask for help, assess for airway obstruction (foreign body, signs of stridor), noisy breathing, grunting, cyanosis remove foreign body
- Perform maneuvers as head tilt and chin lift or jaw thrust , use adjunct as oropharyngeal airway , LMA
- level of consciousness (GCS – “less than 8=intubate)

Glasgow coma scale

	Score
Eye opening	
Spontaneous	4
Response to verbal command	3
Response to pain	2
No eye opening	1
Best verbal response	
Oriented	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1
Best motor response	
Obeys commands	6
Localizing response to pain	5
Withdrawal response to pain	4
Flexion to pain	3
Extension to pain	2
No motor response	1
Total	

The GCS is scored between 3 and 15, 3 being the worst, and 15 the best. It is composed of three parameters: best eye response (E), best verbal response (V), and best motor response (M). The components of the GCS should be recorded individually; for example, E2V3M4 results in a GCS score of 9. A score of 13 or higher correlates with mild brain injury; a score of 9 to 12 correlates with moderate injury; and a score of 8 or less represents severe brain injury.




Breathing airflow
Slip joint
Endotracheal intubation tube
Trachea
Esophagus

Breathing

- (not your complete respiratory exam!)
- look, listen, feel . Use stethoscope .
- If they are talking, probably not a huge problem
- Look at symmetry, pattern, rate, use of accessory muscle of respiration.

Breathing Patterns

- Apnea – no breathing needs intubation and ambu-baging then may need ventilator.

- Bradypnea: sedative-hypnotics.
- Tachypnea: acidosis, sepsis.
- Cheyne-Stokes: apneas followed by hypernpneas that then decrease to apnea bihemispheric brain injury or brainstem injury.
- Kussmaul: rapid deep, breaths that typically seen in severe acidosis .
- For all give the appropriate oxygen support and treat the primary cause.

AMBU BAG

OXYGEN DELIVERY SYSTEMS

Device: Nasal Cannula
Flow: 1 - 6 L/min
FiO2: 25 - 40%
(~4%/L of flow)

Device: Face Mask
Flow: 5 - 10 L/min
FiO2: 40 - 60%

Device: Face Tent
Flow: 10 - 15 L/min
FiO2: ~40%

Device: Venturi Mask
Flow: 2 - 15 L/min
(based on valve)
FiO2: 24 - 60%
(precisely controlled)

Device: Non-Rebreather
Flow: 10 - 15 L/min
FiO2: 80 - 95%

Device: High Flow Nasal Cannula
Flow: up to 60 L/min
FiO2: 21 - 100%

Circulation

- Check pulse and blood pressure.
- skin warmth, mottling
- Assess pulses for rate, volume, regularity, symmetry
- May relate to primary cardiovascular problem or secondary to metabolic issues, sepsis, hypoxemia, drugs

circulation

- If no pulse then --- CPR
- Check the rhythm on monitor and behave accordingly.
- IF there is pulse but in shock then 2 gauge 16 or 14 intravenous cannulae , start IV. fluild resuscitation and treat primary cause.

History

- Classically >90% diagnosis made on history
- In critically ill, patient may not give history!

so take it from Collateral: nurses, care aides, family, friends ,referral notes----.

History

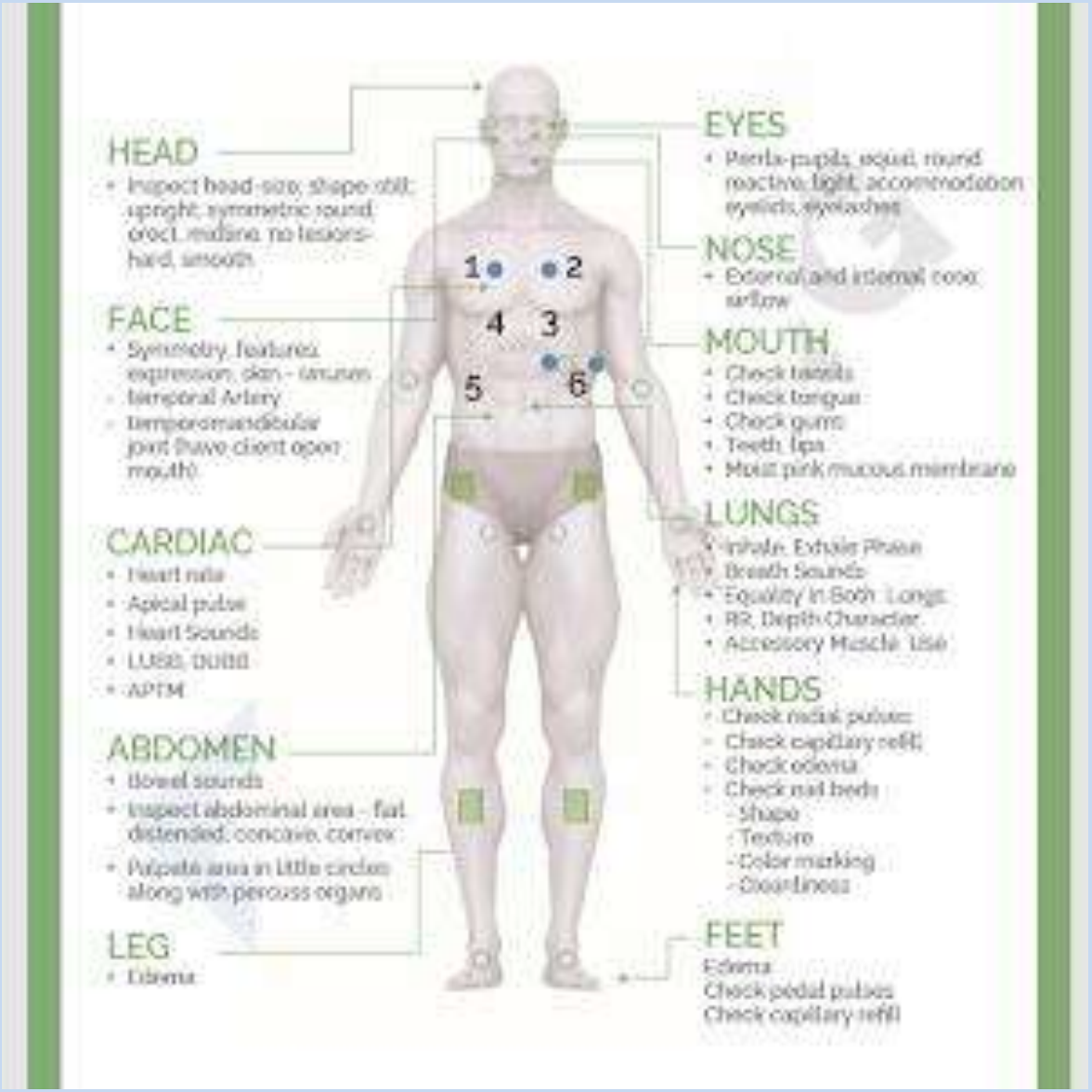
- Rapid History: (SAMPLE)
  Symptoms
  Allergies
  Medications
  Past history
  Last meal
  Events surrounding

High risk pateints

- Emergency admission- limited info
- Infants and young children
- Pregnant ladies.
- Advanced age – comorbidities, limited reserve
- Severe coexisting illnesses – mixed problems, limited reserve
- Recent major surgery
- Severe bleed, need for massive transfusion
- Deterioration on repeat assessment/fail to respond to treatment
- Immunodeficiency
- Combinations of above

Examination

- Re evaluation of vitals before examination.
- Head to toe examination
- Don’t forget the back


HEAD
• Inspect head -size, shape -tilt, upright, symmetric round, erect, midline, no lesions- hard, smooth
FACE
• Symmetry, features, expression, skin - tenuren
- temporal Artery
- temporomandibular joint (have client open mouth)
CARDIAC
• Heart rate
• Apical pulse
• Heart Sounds
• LUBB, DUBB
• APTM
ABDOMEN
• Bowel sounds
• Inspect abdominal area - flat, distended, concave, convex
• Palpate area in little circles along with percuss organs
LEG
• Edema
EYES
• Perrla-pupils, equal, round reactive light, accommodation eyelids, eyelashes
NOSE
• External and internal nose airflow
MOUTH
• Check tonsils
• Check tongue
• Check gums
• Teeth, lips
• Moist pink mucous membrane
LUNGS
• Inhale, Exhale Phase
• Breath Sounds
• Equality in Both Lungs
• RR, Depth Character
• Accessory Muscle Use
HANDS
• Check radial pulses
• Check capillary refill
• Check edema
• Check nail beds
- Shape
- Texture
- Color marking
- Cleanliness
FEET
Edema
Check pedal pulses
Check capillary refill
1
2
3
4
5
6

Basic Investigations

- CBC
- Blood sugar , electrolytes ,urea , creatinine
- Cardiac markers
- Coagulation profile
- LACTATE
- CXR
- ECG
- OTHER INVESTIGATIONS ARE GUIDED BY HISTORY AND PHYSICAL EXAM

Put it all together
AND GIVE GOOD CARE TO YOUR PATEINT

LAB. CASE

- You are called to see a65 year old male WHO is disoriented , and has history of passage of Fresh bloody stool , his pulse is 130 bts / min, blood pressure 90/60mmHg , O2 sat is 88%, respiratory rate is 20 br/min. GCS is 12/15

He has history of diabetes and hyper tension .

1-Is this patient is critically ill and why?

2- How you will manage him?

DEFIBRILLATORS

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Emergency physician


LIFEPAK CR Plus
DEFIBRILLATOR
PULL
AED

Objective

- To provide basic understanding about the Defibrillator Machine.
- understand the concept of the Defibrillator applications.
- perform and identify basic problems, errors and basic troubleshooting solutions.

Introduction

- Cardiac arrest occurs in more than 500,000 people annually in the United States
- Defibrillation is an important part of resuscitation that can change the outcome of this condition

https://www.electronicsandcommunications.com/2018/08/different-types-of-defibrillators.html

Introduction

- Defibrillation: Defibrillation is a process in which an electronic device sends an electric shock to the heart to stop an extremely rapid, irregular heartbeat, and restore the normal heart rhythm.
- Defibrillator : A device that corrects an abnormal heart rhythm by delivering electrical shocks to restore a normal heartbeat.

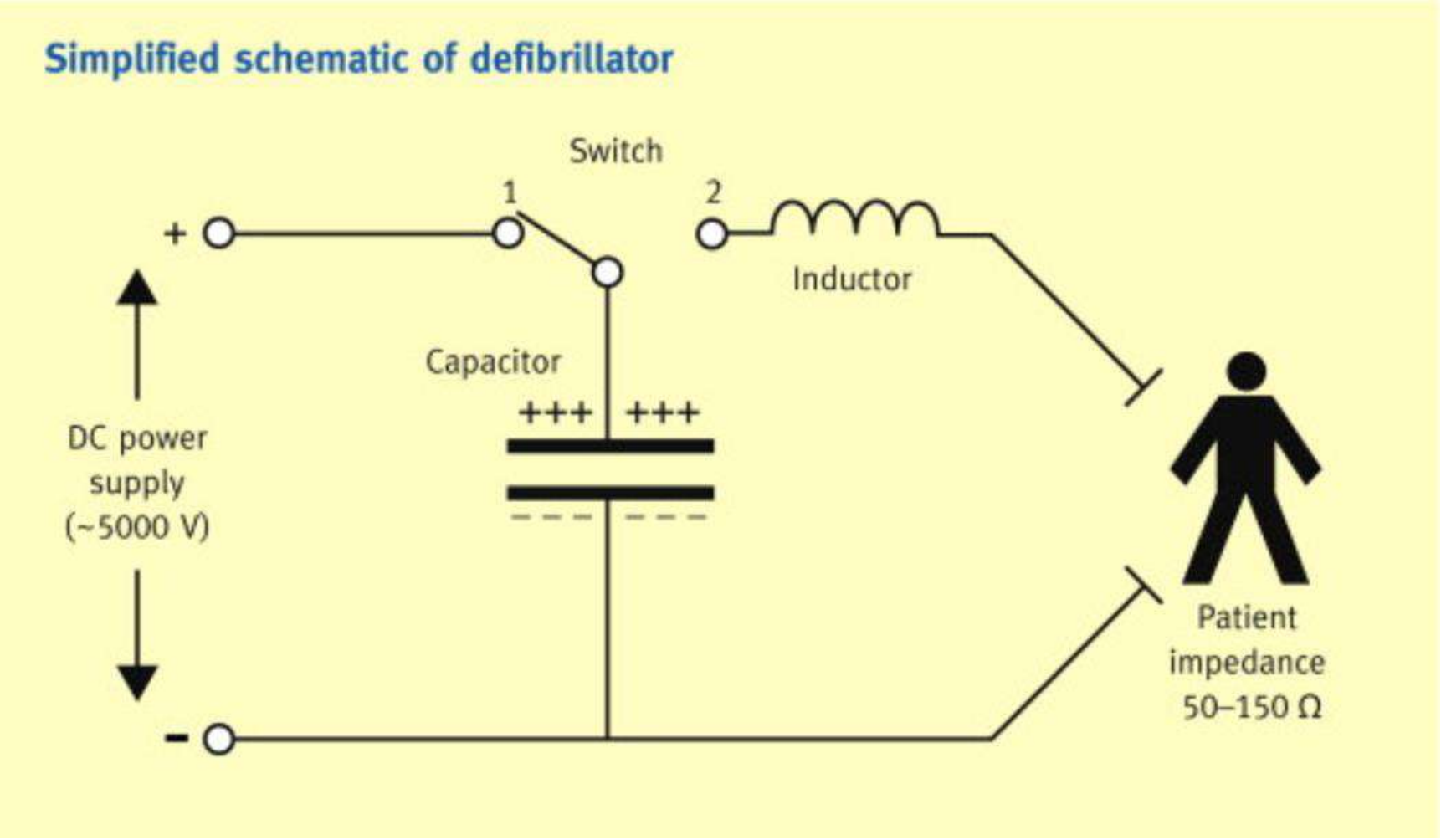
History

1899	**Prevost and Batelli first introduced the concept of electrical fibrillation after noticing that large voltages applied across the animal's heart could convert ventricular fibrillation into a sinus rhythm.**
1933	**Hooker, Kouwenhoven and Langworthy published an account of successful alternating current (AC) internal animal defibrillation**
1950s	**Kouwenhoven was able to defibrillate dogs by applying the electrodes to the chest wall, that was the external electric defibrillator.**
1956	**Zoll defibrillated a human subject in the same manner .**

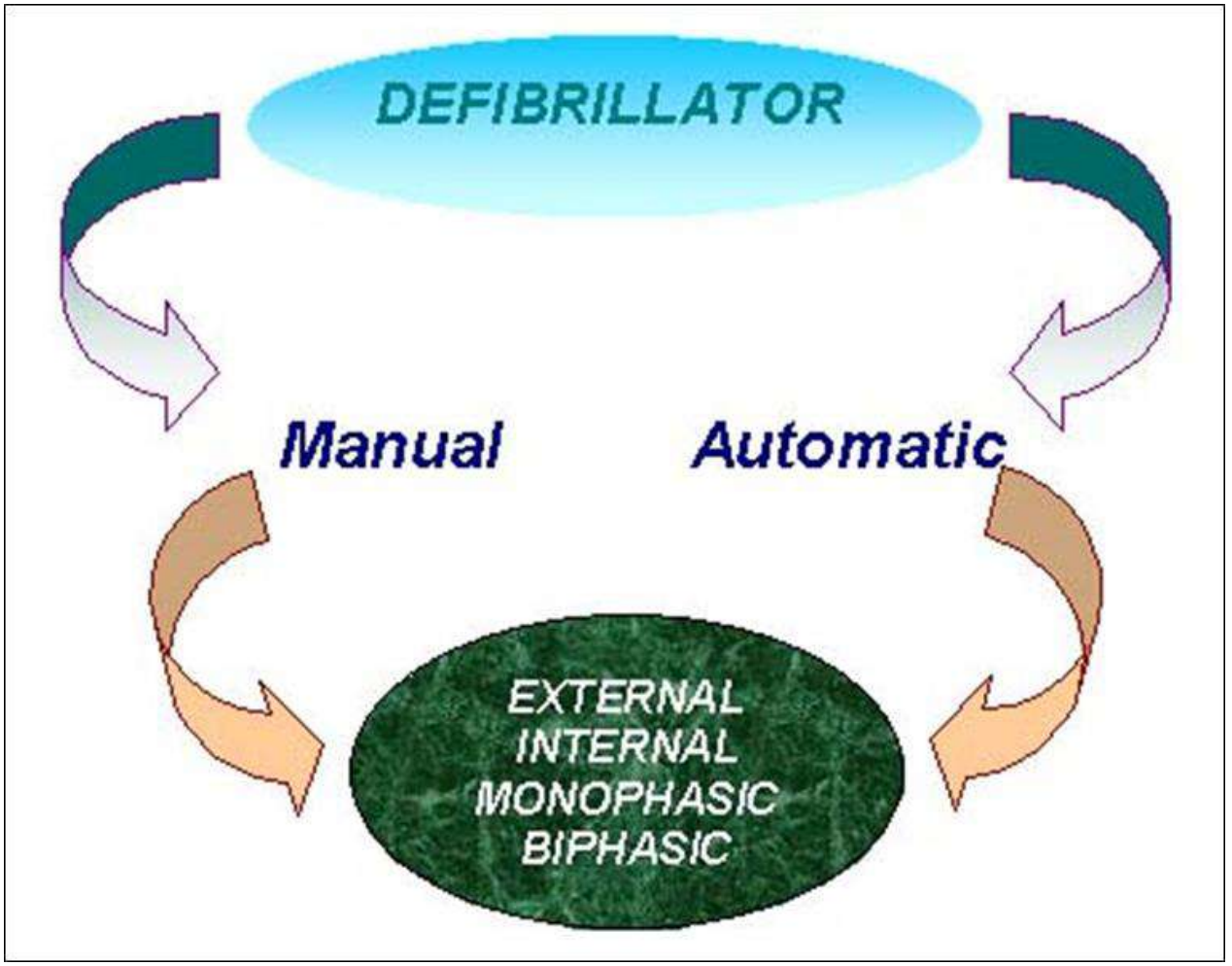
History

1960s	**Edmark and Lown et al found that direct current (DC) or pulse defibrillators were more effective and produced fewer side effects than AC defibrillator. The DC pulse waveform was further improved.**
1970s	**Experimental internal and external devices were designed to automatically detect ventricular fibrillation.**
1980s	**The first automatic internal defibrillator was implanted in human**
Present times	**A lot of improvements were introduced to the defibrillator with the aim of improving the survival rate of the cardiac arrested patient**

Basics


Simplified schematic of defibrillator
Switch
1
2
+
Inductor
Capacitor
+++ +++
DC power
supply
(~5000 V)
Patient
impedance
50–150 Ω
-

Types


DEFIBRILLATOR
Manual
Automatic
EXTERNAL
INTERNAL
MONOPHASIC
BIPHASIC

CLASSIFICATION

- According to operation

1- Manual Defibrillator: Clinical expertise is needed to interpret the heart rhythm and decide whether to charge the defibrillator and deliver the shock to patient. Energy selection and delivery is given to the patient manually.

Manual defibrillator

2- Automated Defibrillator : These defibrillators are small, safe, simple and lightweight with two pads that can be applied to the patient. The defibrillator guides the operator step-by-step through a programmed protocol. It records and analyses the rhythm and instructs the user to deliver the shock using clear voice prompts, reinforced by displayed messages.

Automated defibrillator

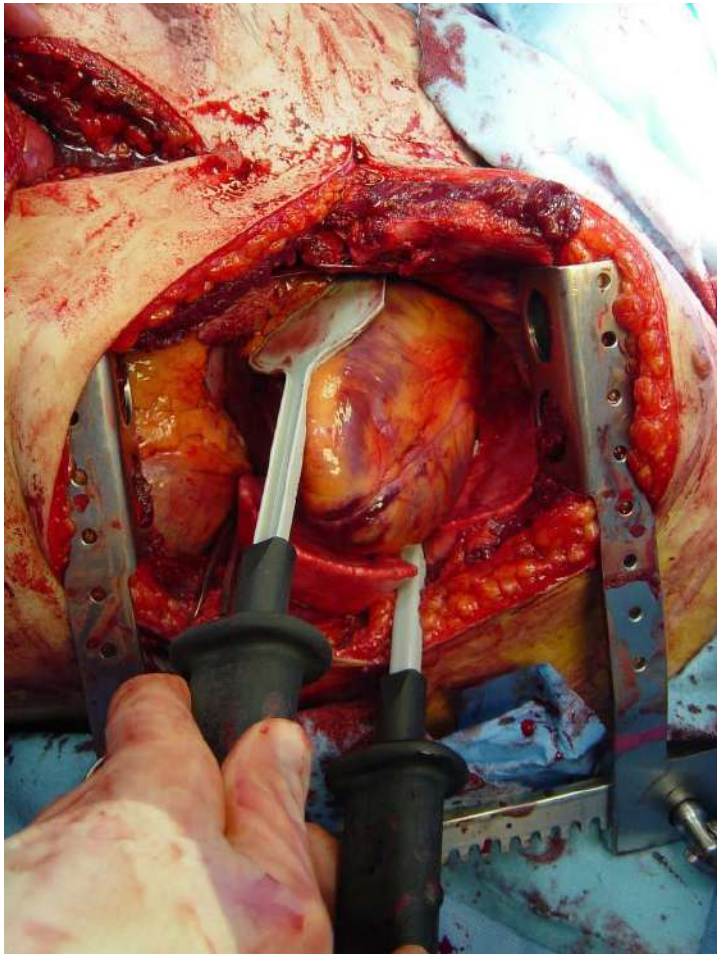
- According to site of application :

1- External Defibrillator is the device which delivers the high energy shock to patients Heart externally on patient's chest by using a Defibrillator Paddle. The maximum energy deliver to the patient is about 360 Joules in Monophasic & 200 Joules in Biphasic Defibrillator.

External defibrillator

2- Internal defibrillator consist of sterilized internal Handle/Paddle through which shock is delivered directly to the heart.

Internal defibrillator

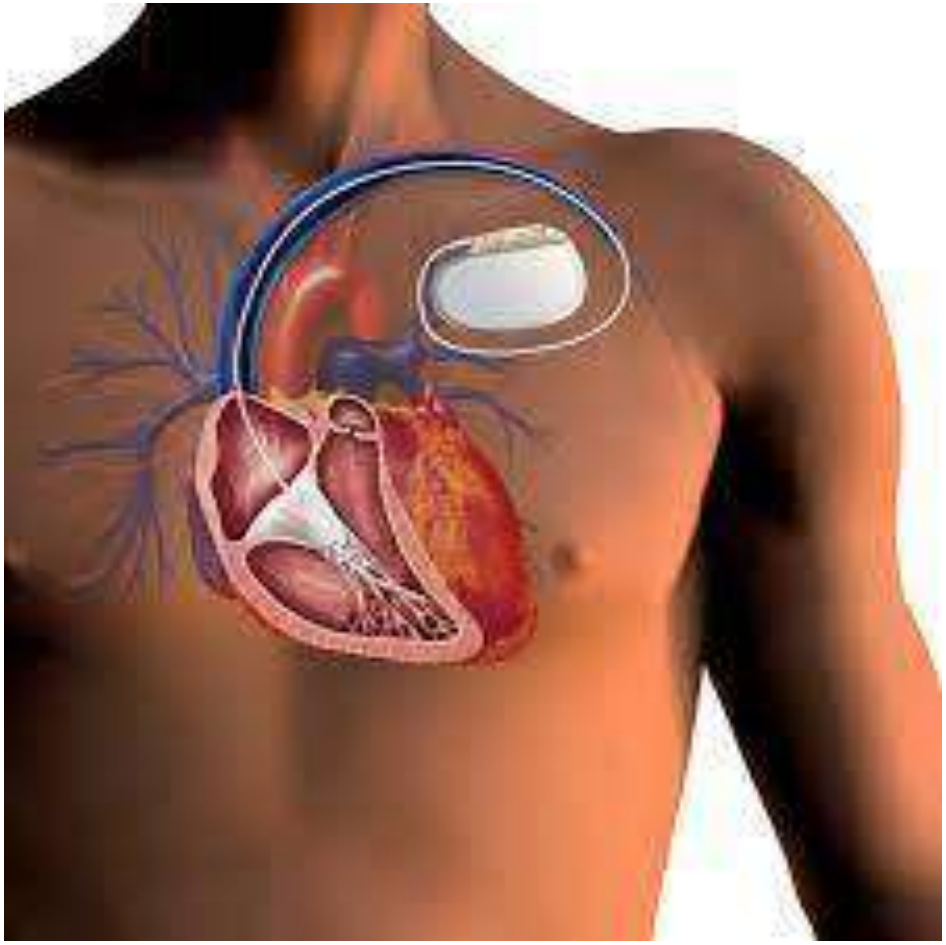


https://www.researchgate.net/publication/7024530_Emergency_department_thoracotomy_for_the_critically_injured_patient_Objectives_indications_and_outcomes

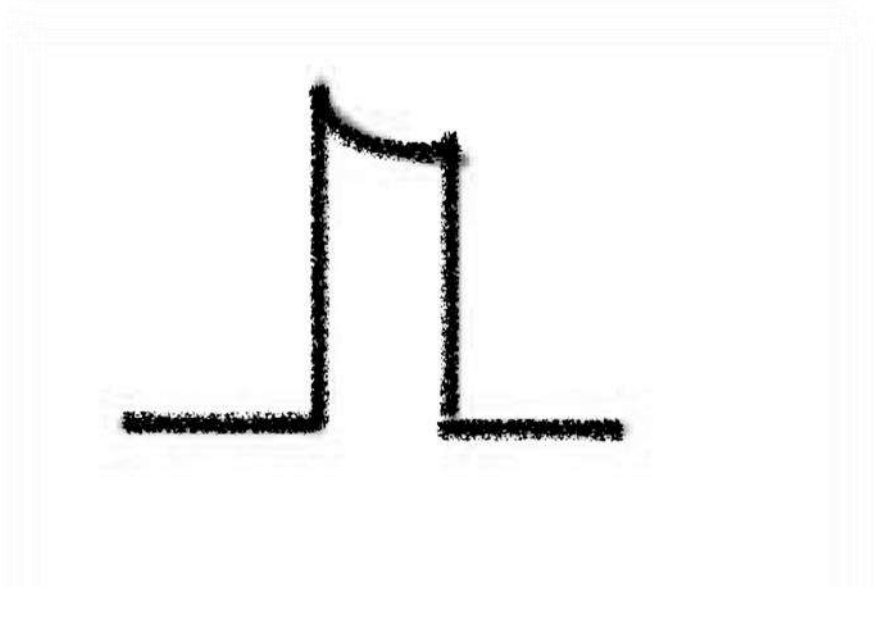
3-Implantable Cardioverter Defibrillator (ICD)

If it detects an abnormally fast heart rhythm, it delivers a small electrical shock to the heart to convert the heart rhythm back to normal.

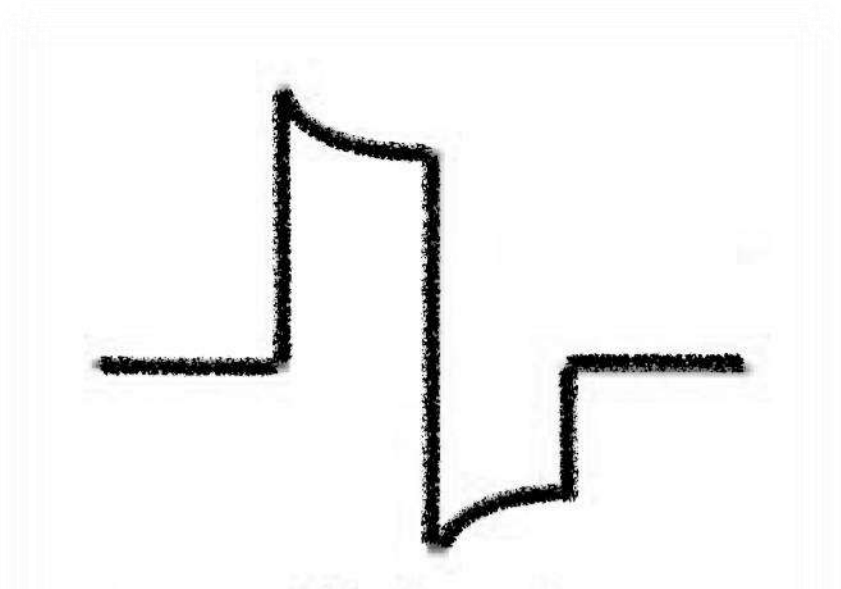
ICD



Out put wave form



Monophasic out put wave



biphasic out put wave

Joule

- It is the unit of energy delivered by the Defibrillator
- It means - “The energy released in one second by a current of one ampere through a resistance of one ohm”
- Also called as watt-second

The delivered energy is in the range of 50-360 joules and depends on:

- characteristics of patient
- patient’s disease
- duration of arrhythmia
- type of arrhythmia (more energy required for VF)
- type of the machine used

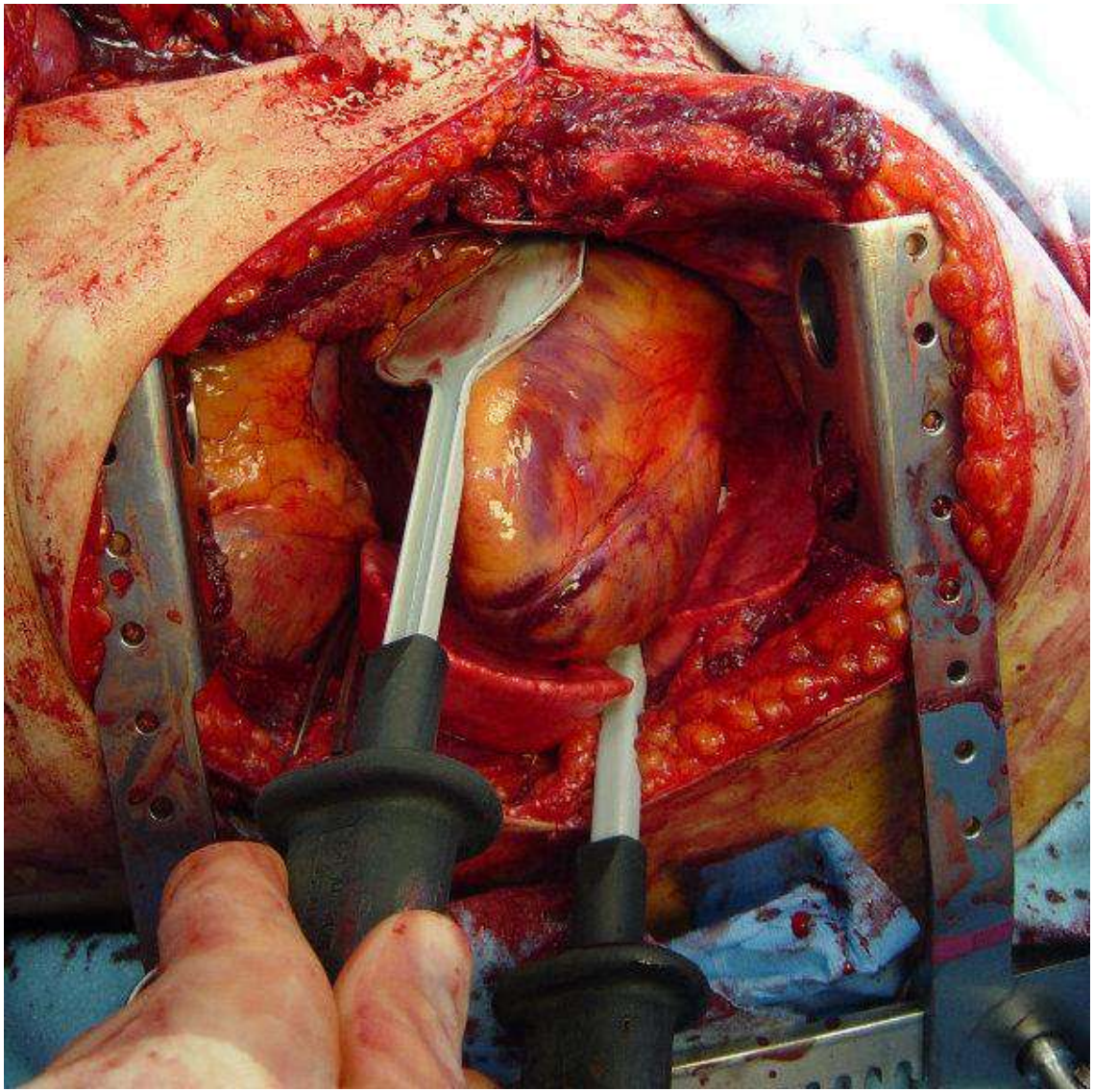
Lab 2

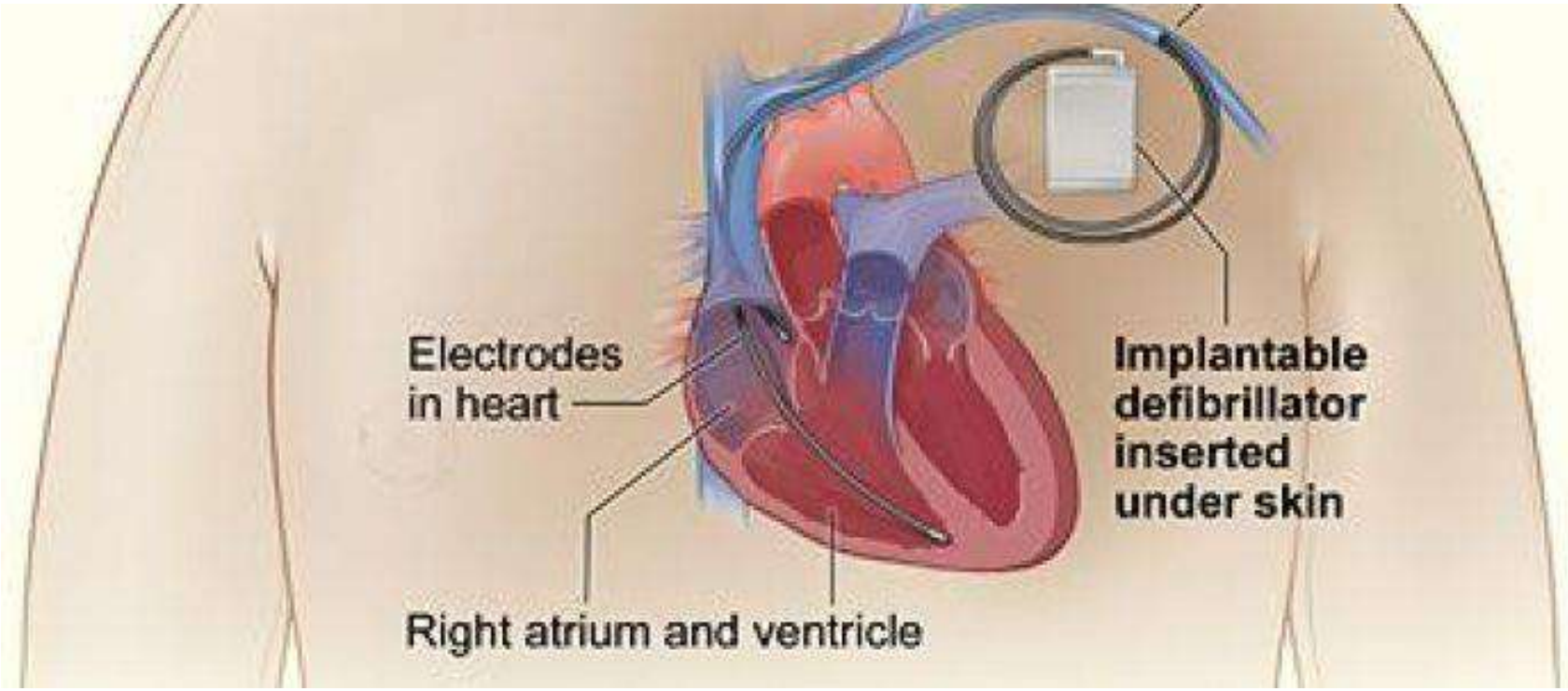

Energy Select
LEAD SELECT
CHARGE
SYNC ON/OFF
Manual Op
Off
AED Op
gettyimages
Stockbyte
skd157947sdc


NIBP
mmHg
SpO2 %
ECG
x1 0
PADDLES
ECG
DEFIB 150J SEL
BIPHASIC
Sync
On/Off
Param | Wave 2 | ID s | Alarms |


MONITOR
Size
Lead
Freeze
CAUTION
Low Battery
AED Mode
HR
68
BPM
ECG
x1
pads
150j
Shock:1
00:15:02
SpO2
99
Signal OK
SpO2
Energy Select
2
Charge
3
Analyze
Shock
Enter
Print
Summary
Event
Home
Options
Alarm


ON/OFF
1
2
3
AED
TRAINER




Electrodes
in heart
Implantable
defibrillator
inserted
under skin
Right atrium and ventricle

Defibrillator lect.2

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Emergency physician

Areas of frequent defibrillator application

- Emergency department
- Anesthesiology
- Cardiology
- Operation theater
- Intensive care areas
- Ambulance services

STEPS OF USE AND APPLICATION

1. Manual Defibrillation (incase of shockable cardiac arrest rhythm)

- Switch 'ON' the Machine
- Wait for initialization and self test
- Make sure it is **NOT** in SYNC Mode
- Apply gel to the paddles
- Place them properly on the chest

...Cont

- Select 'ENERGY' to be delivered(energy in Joules)
- Press 'CHARGE' button
- Wait for Charging to complete. This is usually denoted by a continuous /long beep sound.
- Apply pressure to the paddles

...Cont

- Make sure that you and all the personnel are away from the patient
- Press both 'DISCHARGE' button simultaneously
- Observe patient and monitor ECG
- Resume CPR
- When finished, turn off and clean the paddles

2. Synchronization Mode (manual cardioversion for unstable tachyarrhythmia but with pulse)

- Wait for initialization and self test
- Connect ECG leads
- Select 'SYNC / CARDIOVERSION' mode.
- Check for sync marker on the QRS waveform
- If possible sedate the patient and maintain airway

Cont…

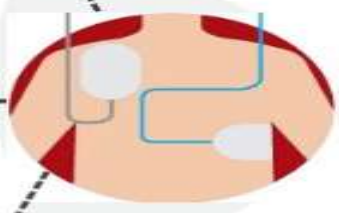
- Apply gel on the paddles and place it properly on chest
- Select 'ENERGY' to be delivered(energy in Joules)
- Press 'CHARGE' button
- Wait for the Charge to be completed. This is usually denoted by a continuous /long beep sound.
- Check that everybody and you is away from the patient.
- Press both 'DISCHARGE' button simultaneously and hold till energy is delivered.

...Cont

- Check patient condition and Heart rhythm
- If required, cardiovert again
- Monitor the patient
- Switch off and clean the paddles

Steps in using AED

Step 1: Turn on the AED



Step 2: Attach electrodes

Attach defibrillation pads to the chest

1. Wipe the chest dry
2. Right side upper chest and left side lower chest

Step 3: Analyse rhythm

Push the analyse button

Step 4: Deliver the shock

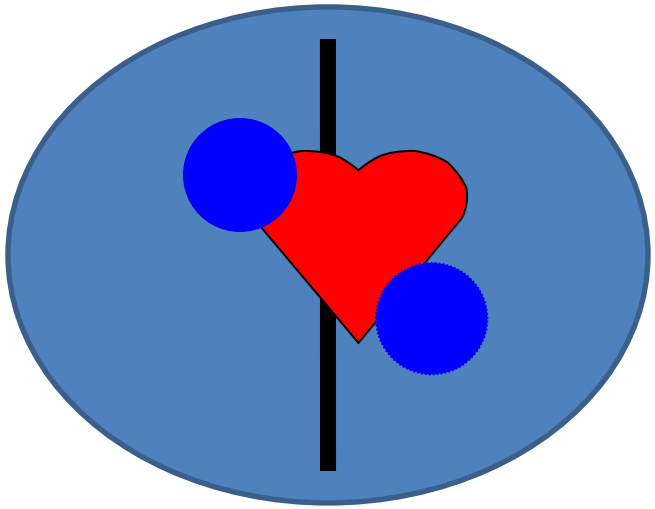
If AED advises you to shock the person:

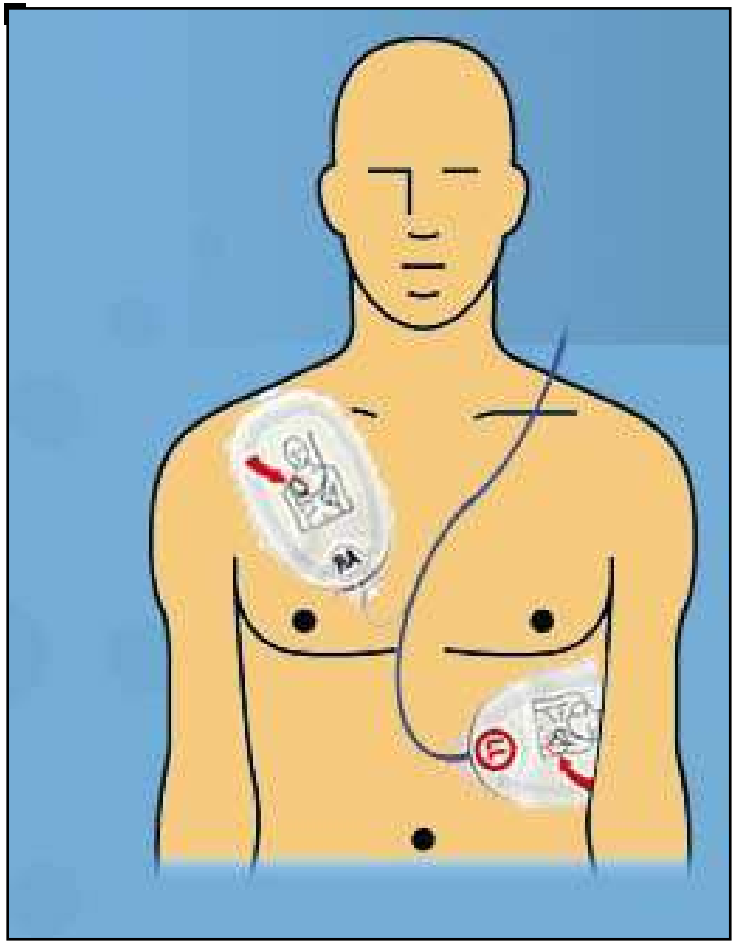
1. Make sure no one is touching the person
2. Tell everyone to stand clear
3. Push the 'shock' button

Paddle Placement

Anterior- Anterior

Place one paddle near the second or the third right sternal border and the other on the cardiac apex.

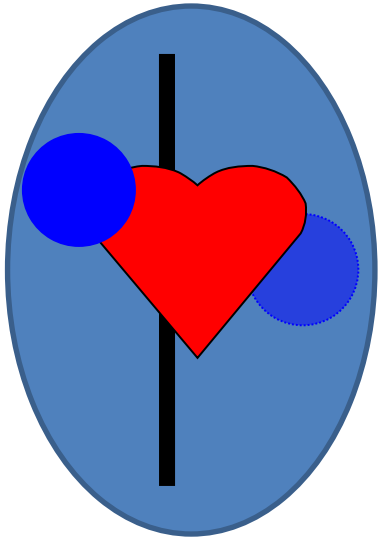


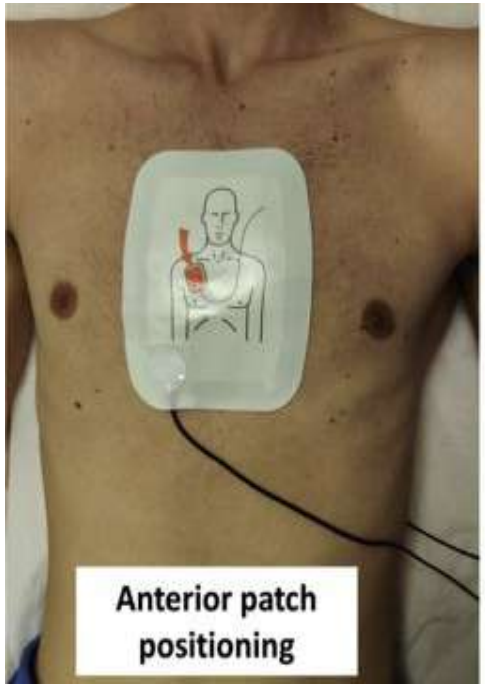


Paddle Placement

Anterior-Posterior

- One paddle on sternum and the other on the left infra-scapular region





Safety - General

- The Defibrillator generates High voltage. It must be operated by trained, professional and qualified personnel only.
- Never use defibrillator with improper grounding or electrical leak socket.
- Keep away the Defibrillator from any x-ray, Ultrasonic or other electronic instruments.

Cont.

- Check the patient lead wire, cable and paddles for any damage or mishandling, otherwise replace it immediately.

- Recommend using proper size and placement of recording paper.

- Clean the print head regularly for clear printout

Cont.

- Don't use damaged patient cable.
- Confirm there is no ECG waveform because of electrical interference or defective patient cable. This may misinterpreted as QRS in synchronize mode.

Safety - Defibrillation

- Excessive Gel can cause arcing of the current along the chest wall
- Defibrillation in the absence of an ECG rhythm to be avoided ('blind defibrillation')

Cont.

- A shock can be accidentally delivered to other rescuers if no clear protocol followed.

- If transthoracic impedance is high, a low energy shock (< 100 J) may fail to generate enough current to achieve successful defibrillation.

Cont.

- Alcohol should never be used as conducting material for paddles because serious burns can result.
- Never discharge the Defibrillator in Air to check its performance
- Never discharge with paddles shorted
- Always clean the paddles after use

PRECAUTIONS

- The paddles used in the procedure should not be placed:-
  - on a woman's breasts
  - over an internal pacemaker patients.

- Before the paddle is used, a gel must be applied to the patient's skin

RISKS IN DEFIBRILLATION

- Skin burns from the defibrillator paddles are the most common complication of defibrillation.

- Other risks include injury to the heart muscle, abnormal heart rhythms, and blood clots.

Cleaning the manual defibrillator

- Wash your hands and wear gloves
- Check the defibrillator for any damage .
- Clean and Disinfect all outside surfaces using isopropyl alcohol and be sure not to allow fluid into ports or battery connections.
- Remove gloves and wash hands.
- Check that the readiness indicator (battery charge) is showing green Keep it in a clean, dry area.

TROUBLESHOOTING

- Attach the paddles if the monitor reads, "No paddles."

- Check to ensure that the leads are securely attached if the monitor reads, "No leads.“

- Connect the unit to AC power if the message reads, "Low battery."

.Cont

- Verify that the Energy Select control settings are correct if the defibrillator does not charge.

- Close the recorder door and the paper roll if the monitor message reads, "Check recorder".

Defibrillator Analyzer

Basic Functions

- Measures output energy
- Measures cardioversion delay time
- Simulates range of ECG waveforms
- Provides clinical training


QUESTIONS

E.C.G monitors attached to patient

Lect. I

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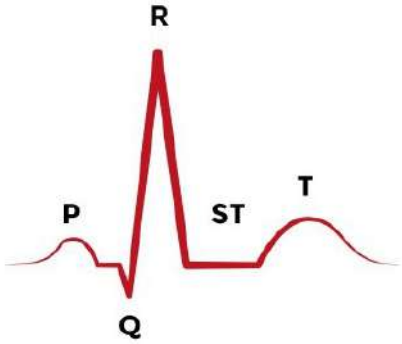
Emergency physician

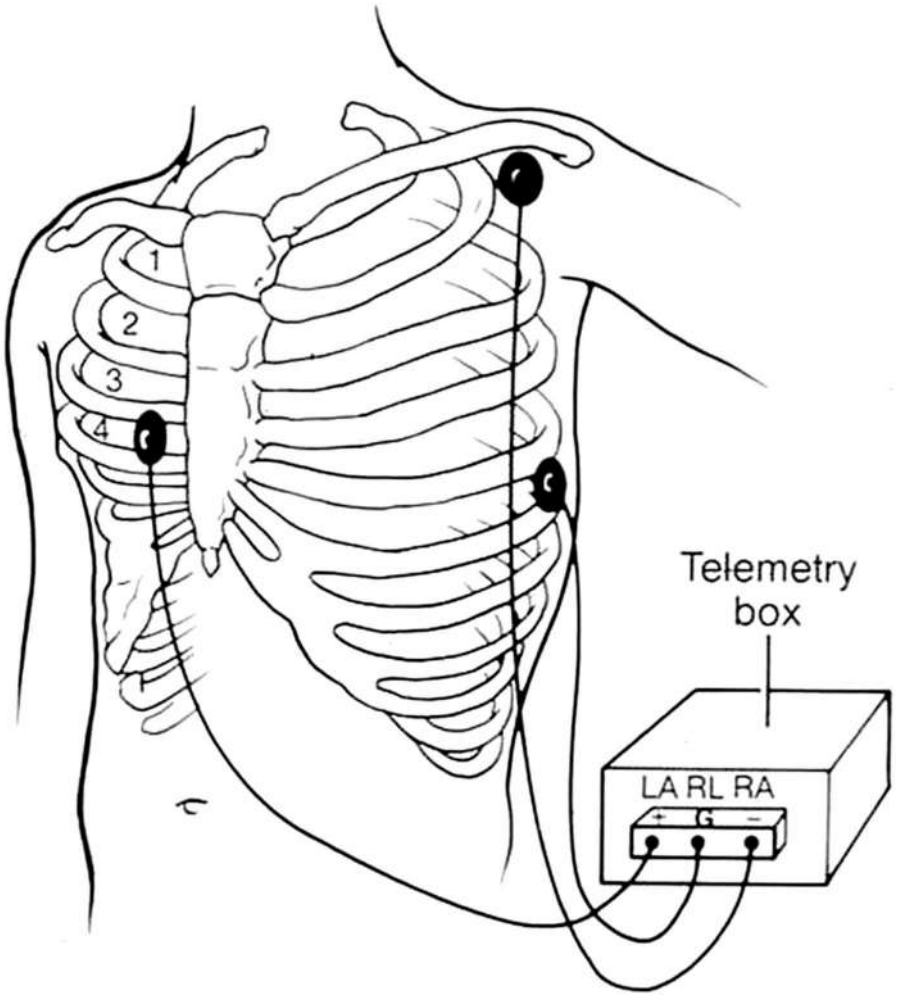


.Introduction to the E.C.G

- **1924 - Noble prize – Einthoven for discovery of EKG**
- **It can provide evidence to support a diagnosis, but remember…..LOOK AT THE PATIENT NOT JUST THE PAPER or Monitor**
- **Is essential in the diagnosis of chest pain and abnormal heart rhythms**

Principles of Electrocardiograph

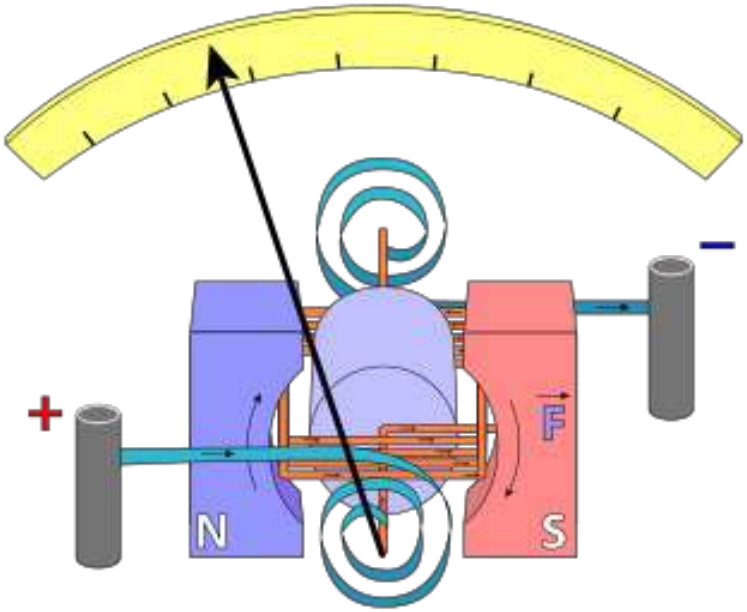
- **Electrocardiograph – is the instrument that records the electrical activity of the heart**
- **It works on the principle of Galvanometer**



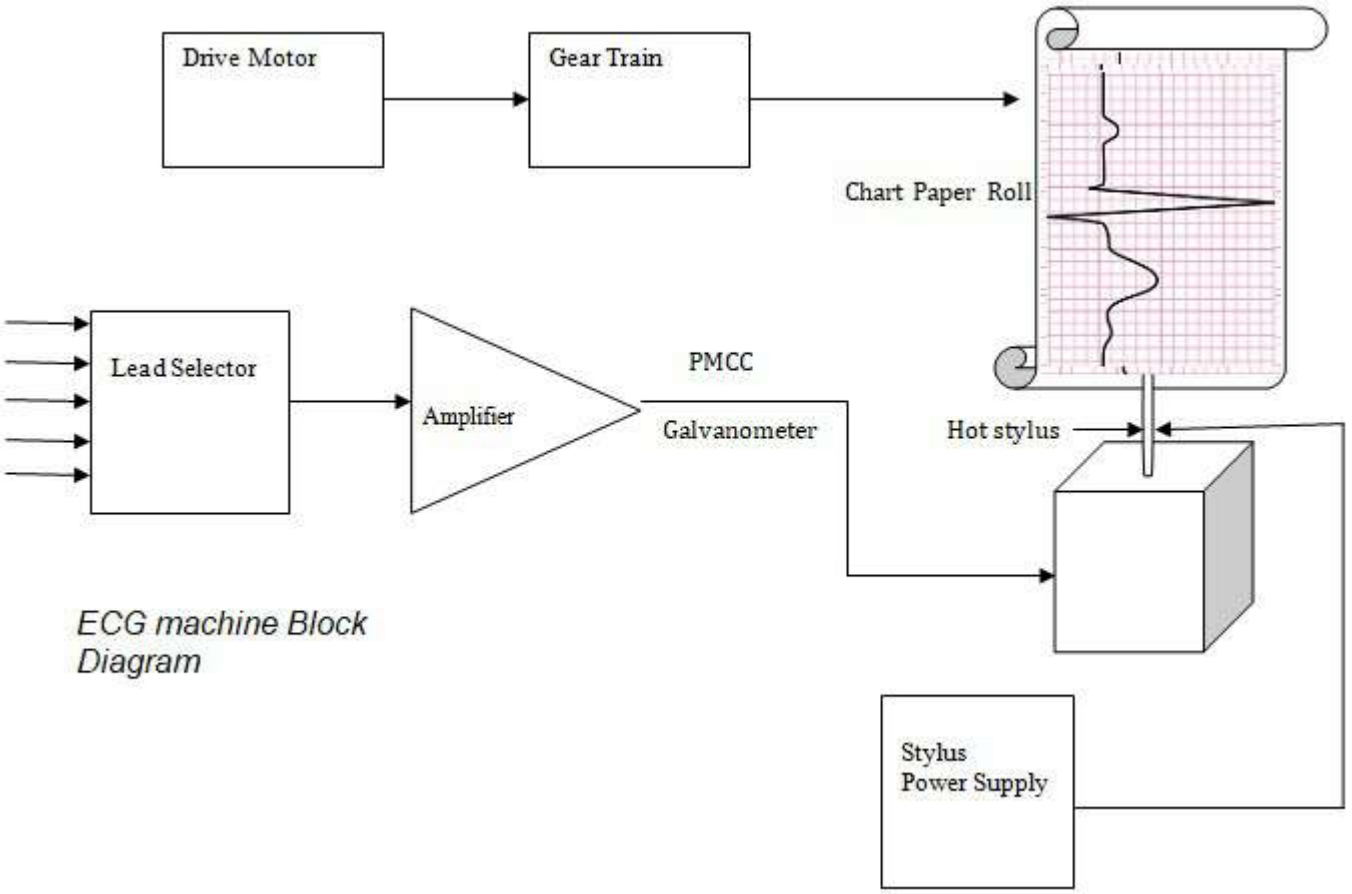
ECG MONITORING SYSTEMS

1. Three electrode monitoring system
2. Five electrode monitoring system
3. Ten electrode,twelve lead monitoring system.

Galvanometer



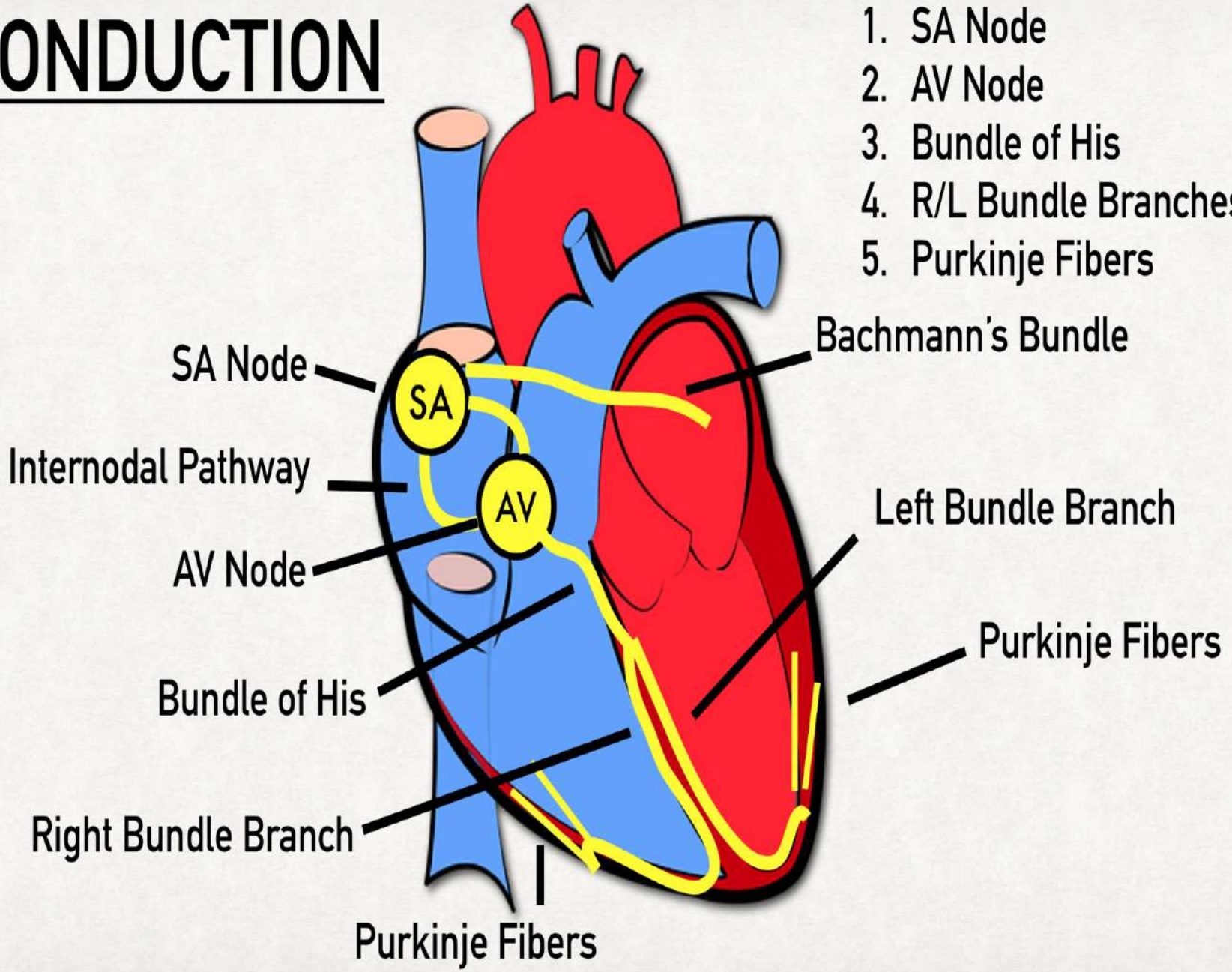
Basics of ECG Machine



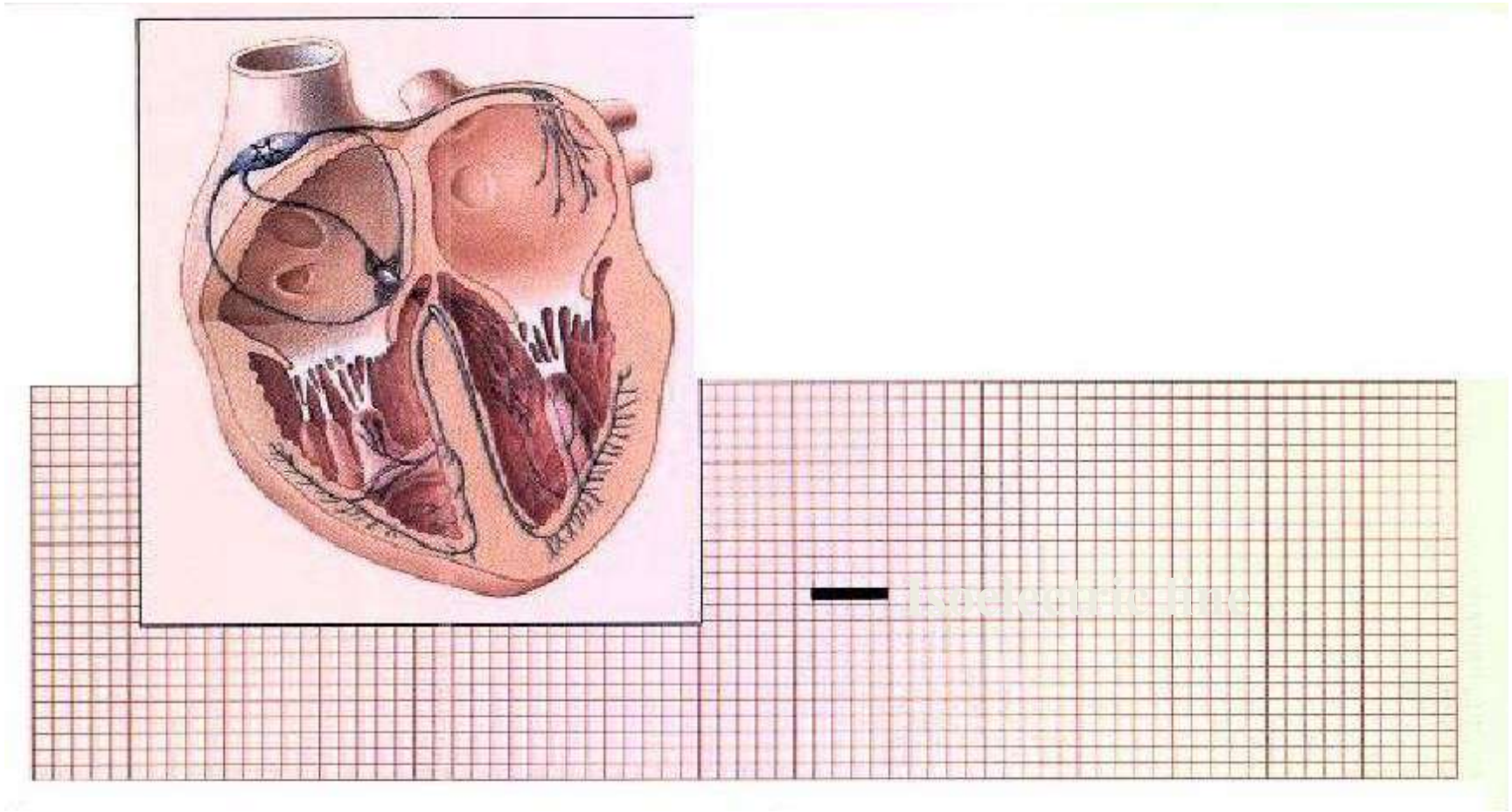
ECG machine Block Diagram

CONDUCTION

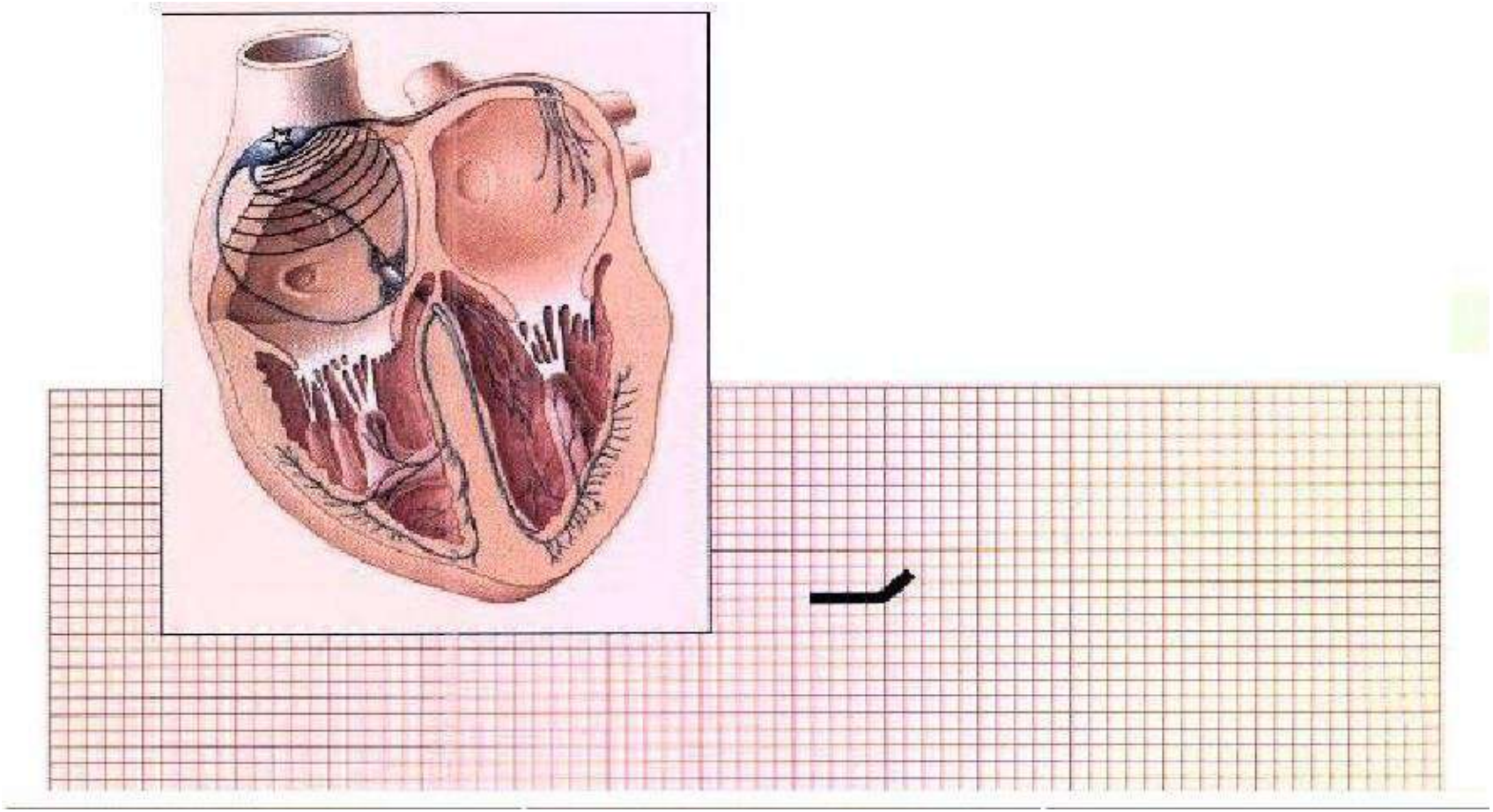
1. SA Node
2. AV Node
3. Bundle of His
4. R/L Bundle Branches
5. Purkinje Fibers



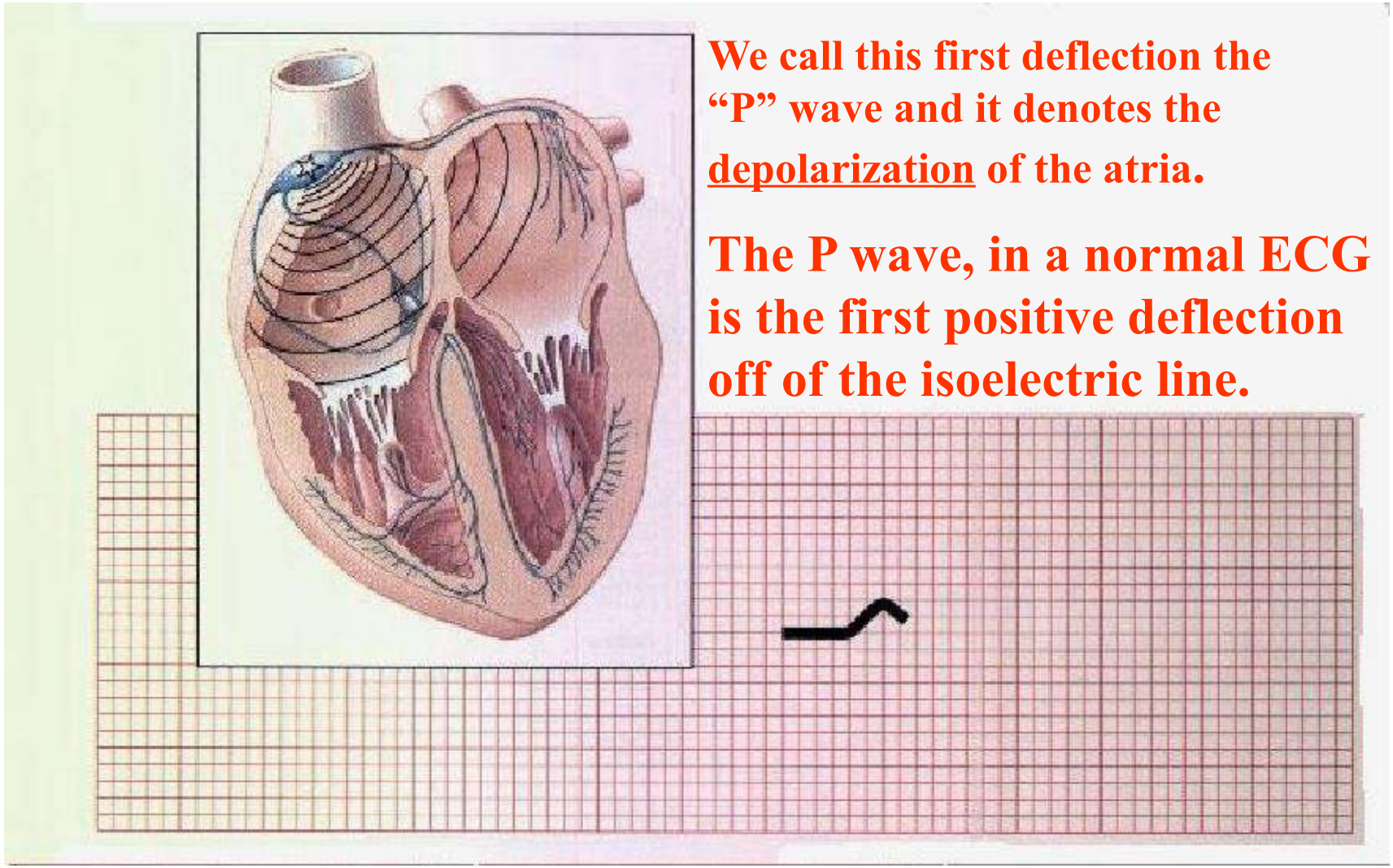
ECG
in relation to the
conduction system



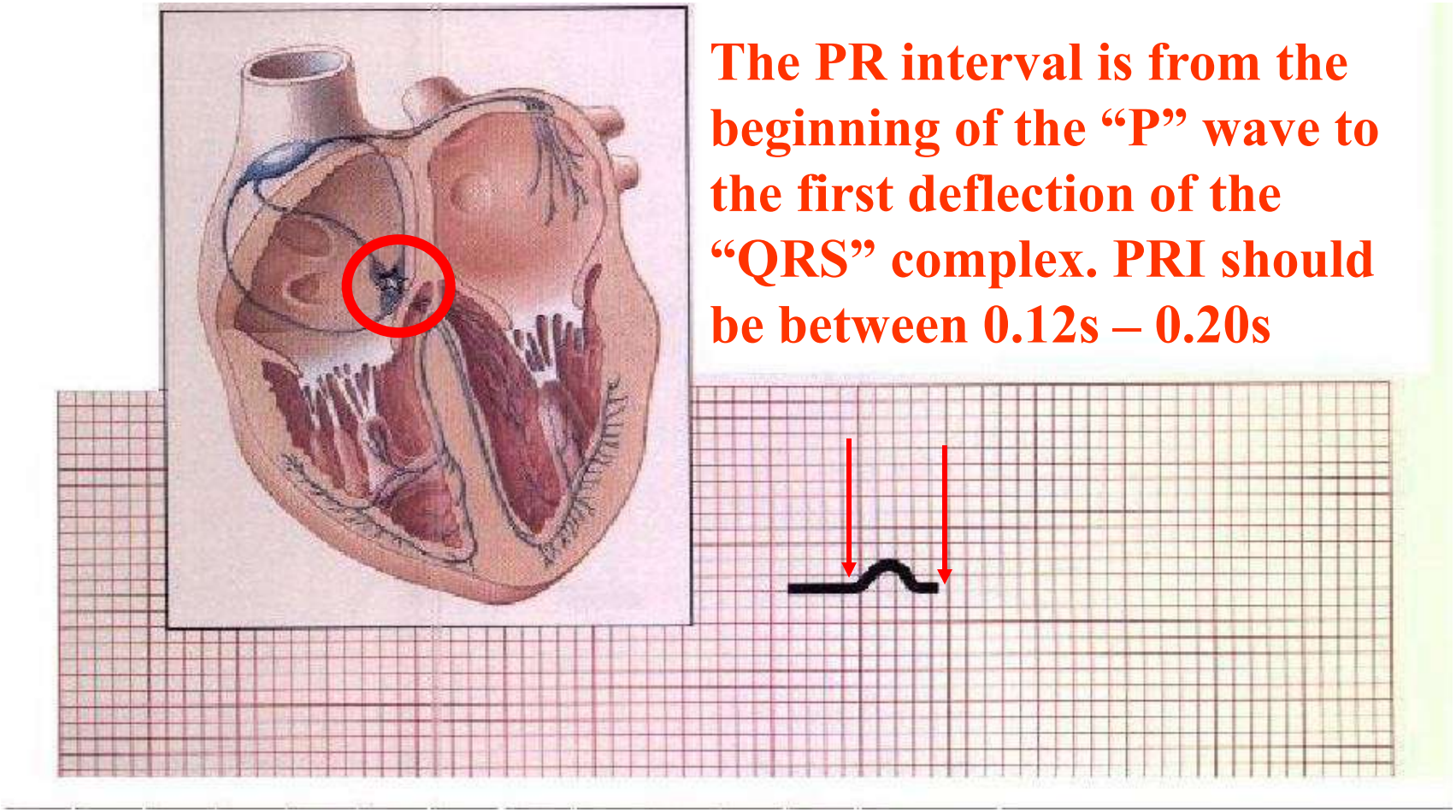
The heart at rest, no electrical activity, therefore no deflections from the isoelectric line. The SA node is building up to depolarize.



Threshold is reached and depolarization conducted through the atria. This produces a positive deflection.

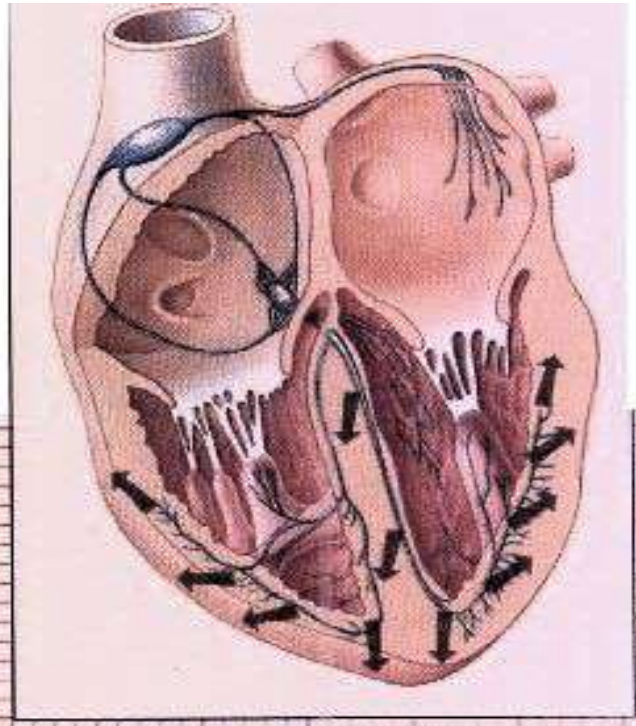


As the atrium finishes depolarizing, the electrical impulse is channeled back to the AV node.

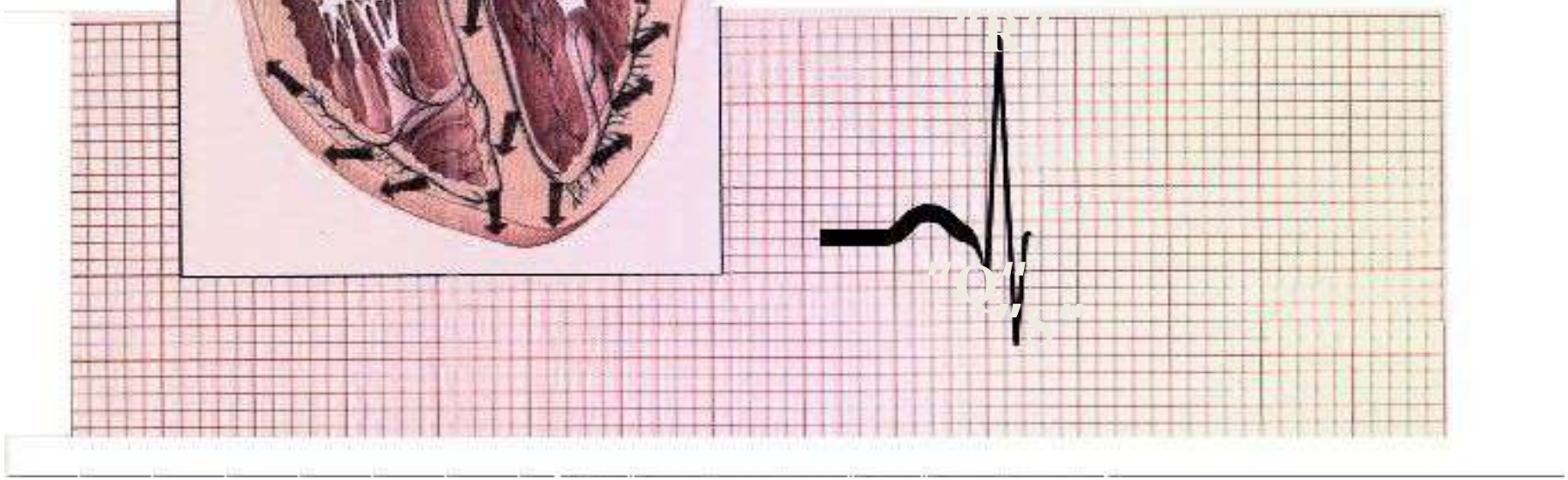


As the electrical charge travels through the AV node, there is no measurable electrical movement. Therefore the ECG tracing stays on the isoelectric line

QRS Complex

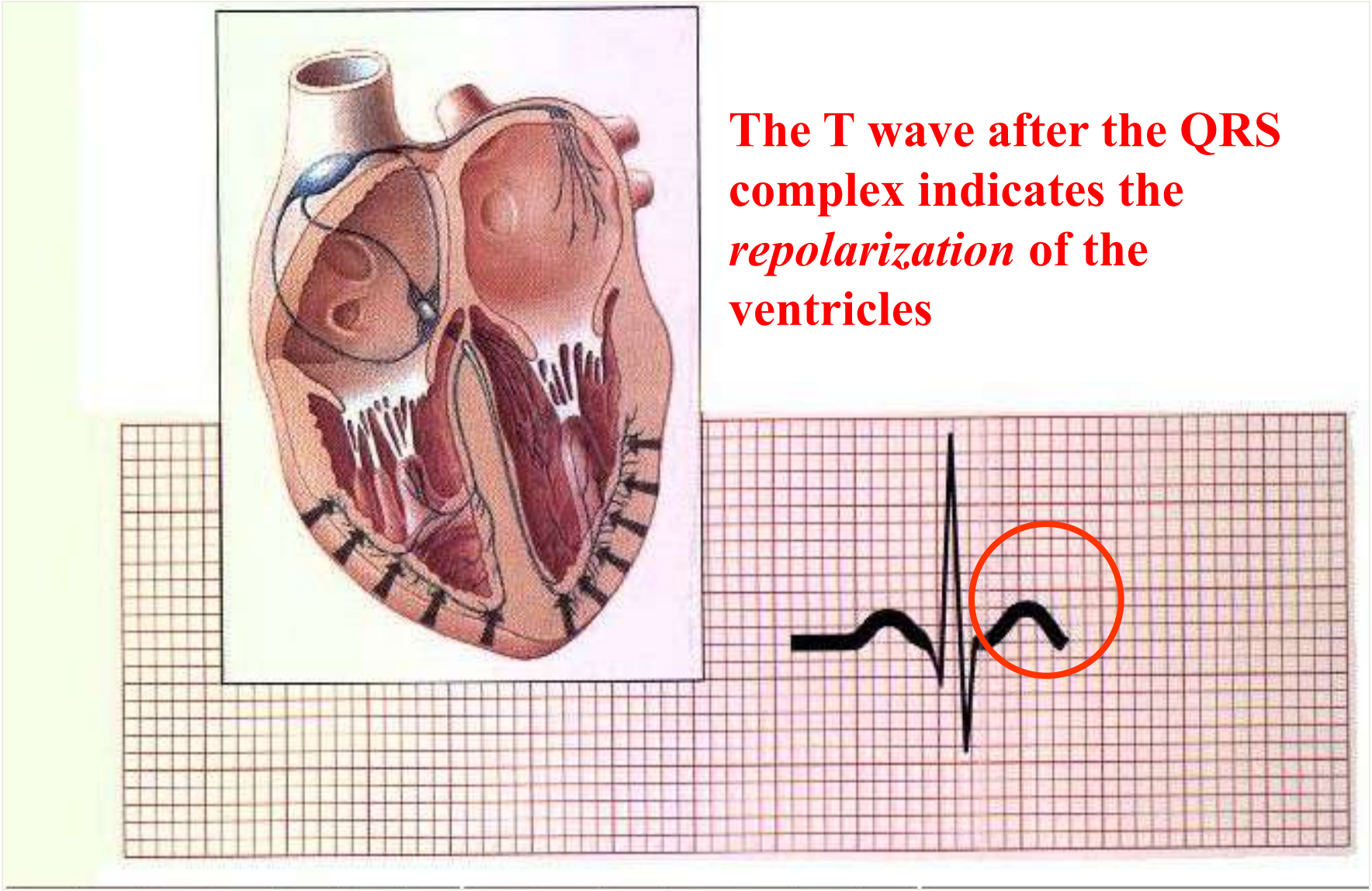


This complex is called the "QRS" complex and denotes the *depolarization* of the ventricles



QRS complex - we see the depolarization travel through the ventricles.

T- Wave

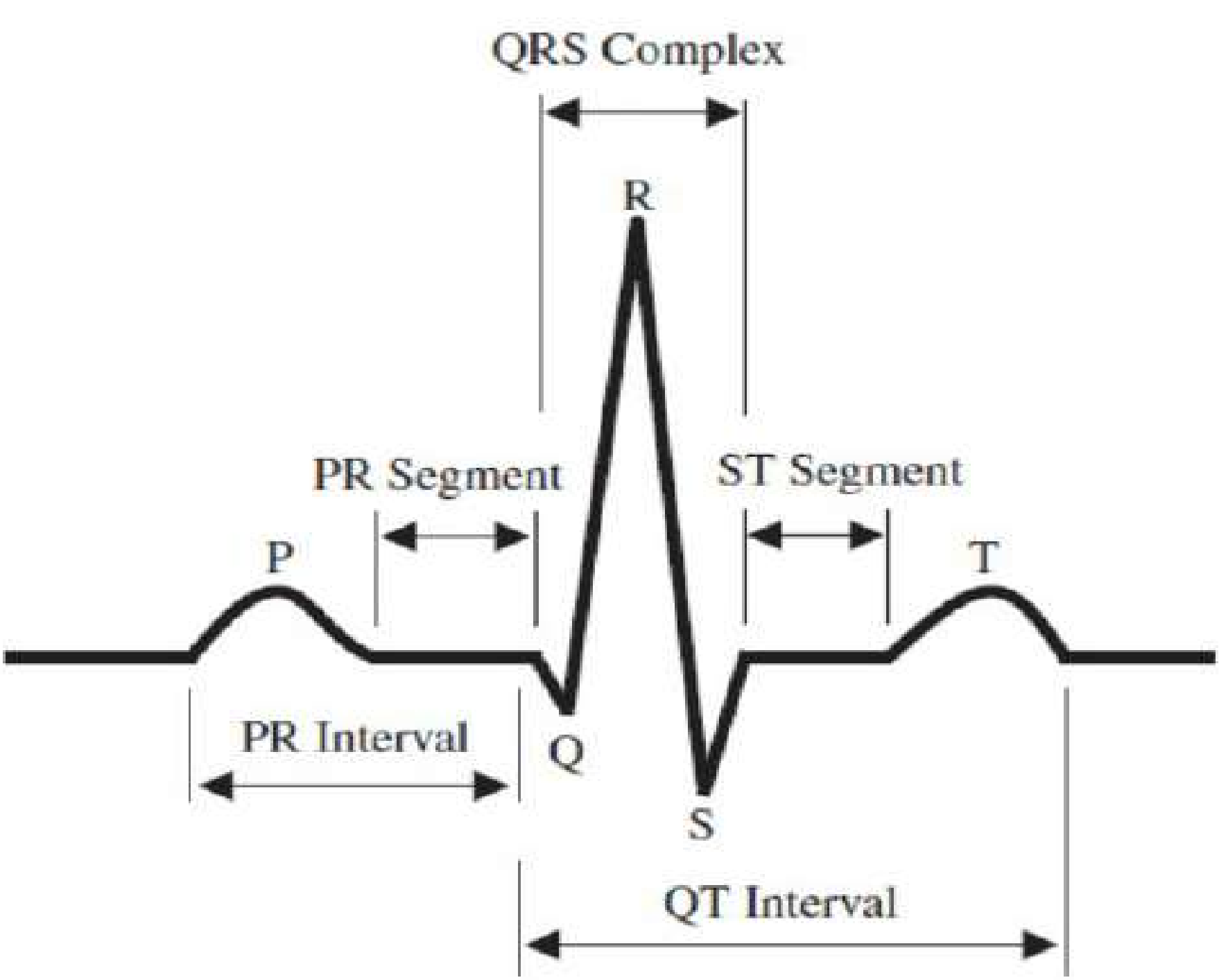


The T wave after the QRS complex indicates the *repolarization* of the ventricles

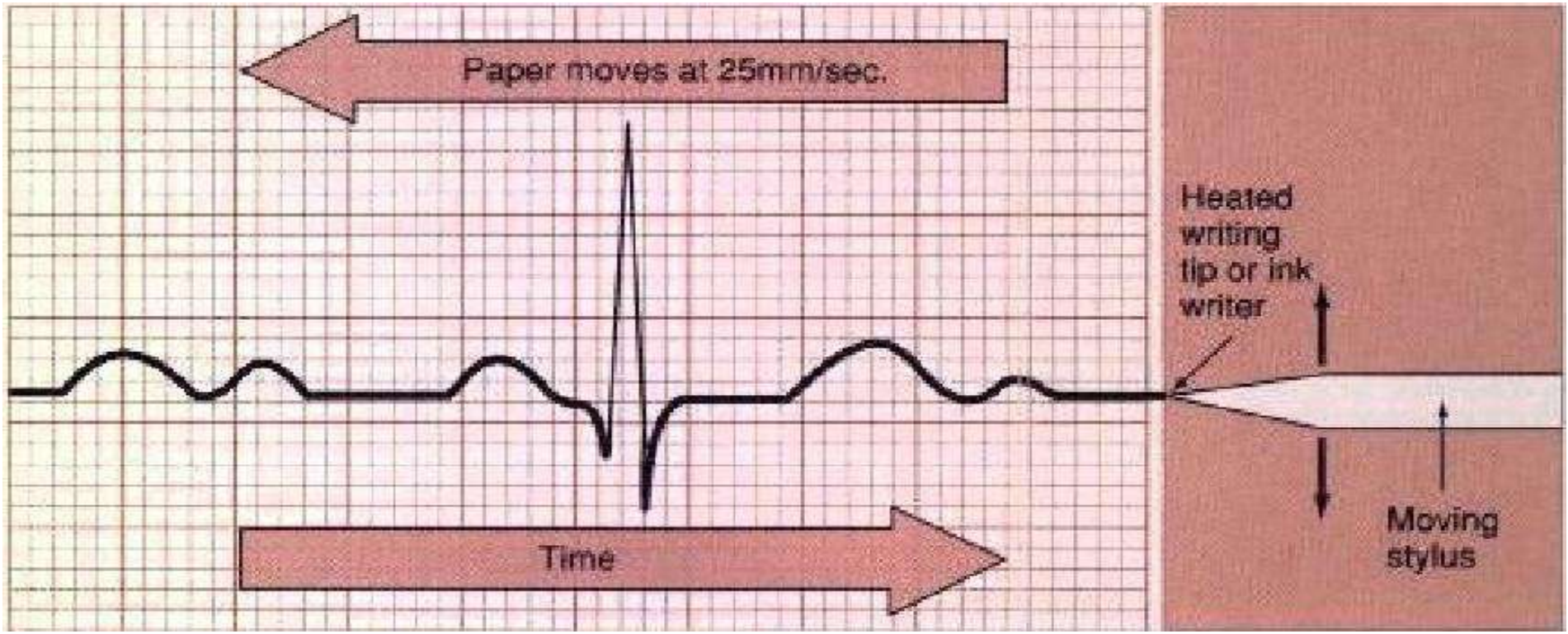
Segments and Intervals

- ***Segment*** **– Straight line between waves**

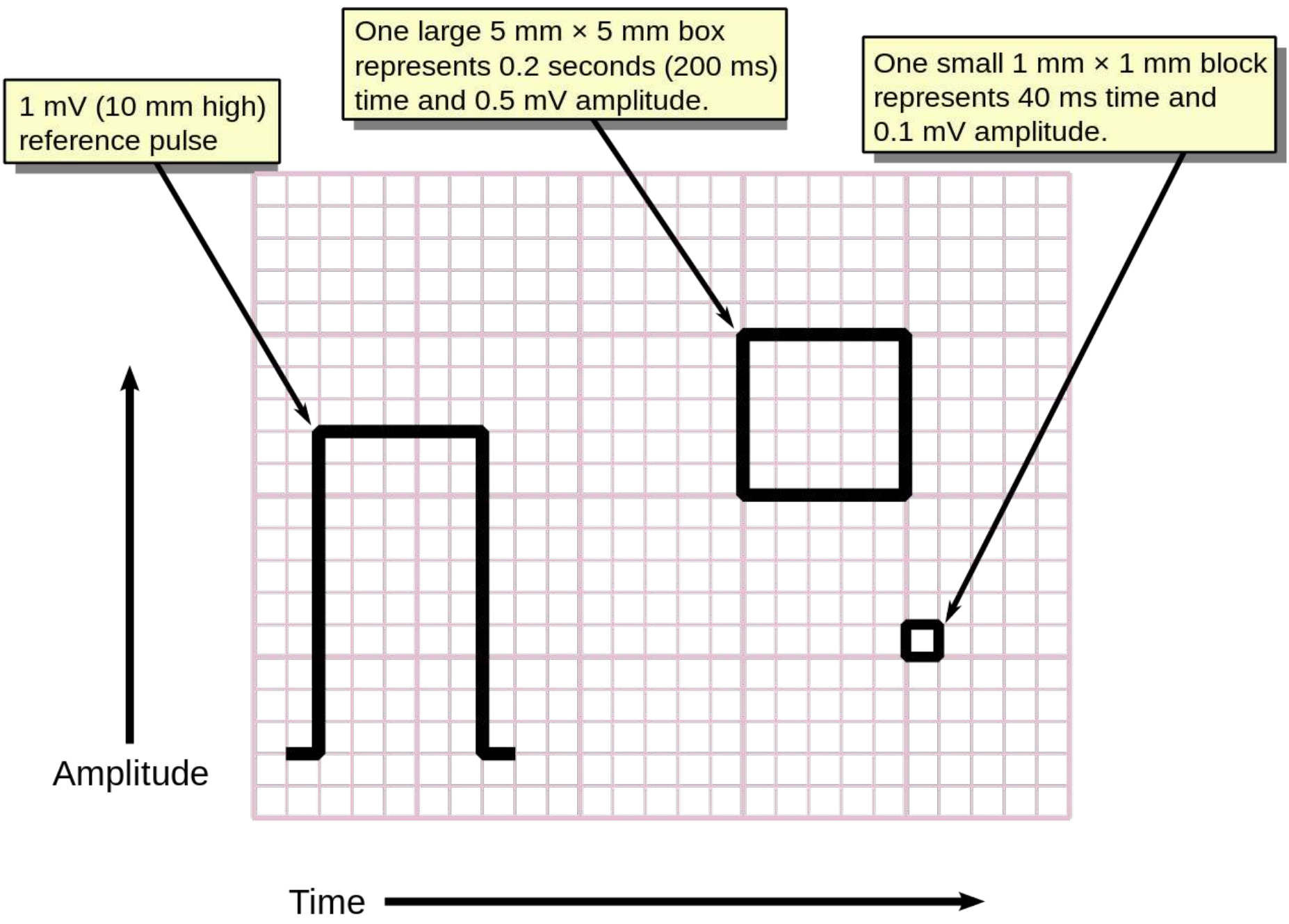
- ***Interval*** **– wave + segment**

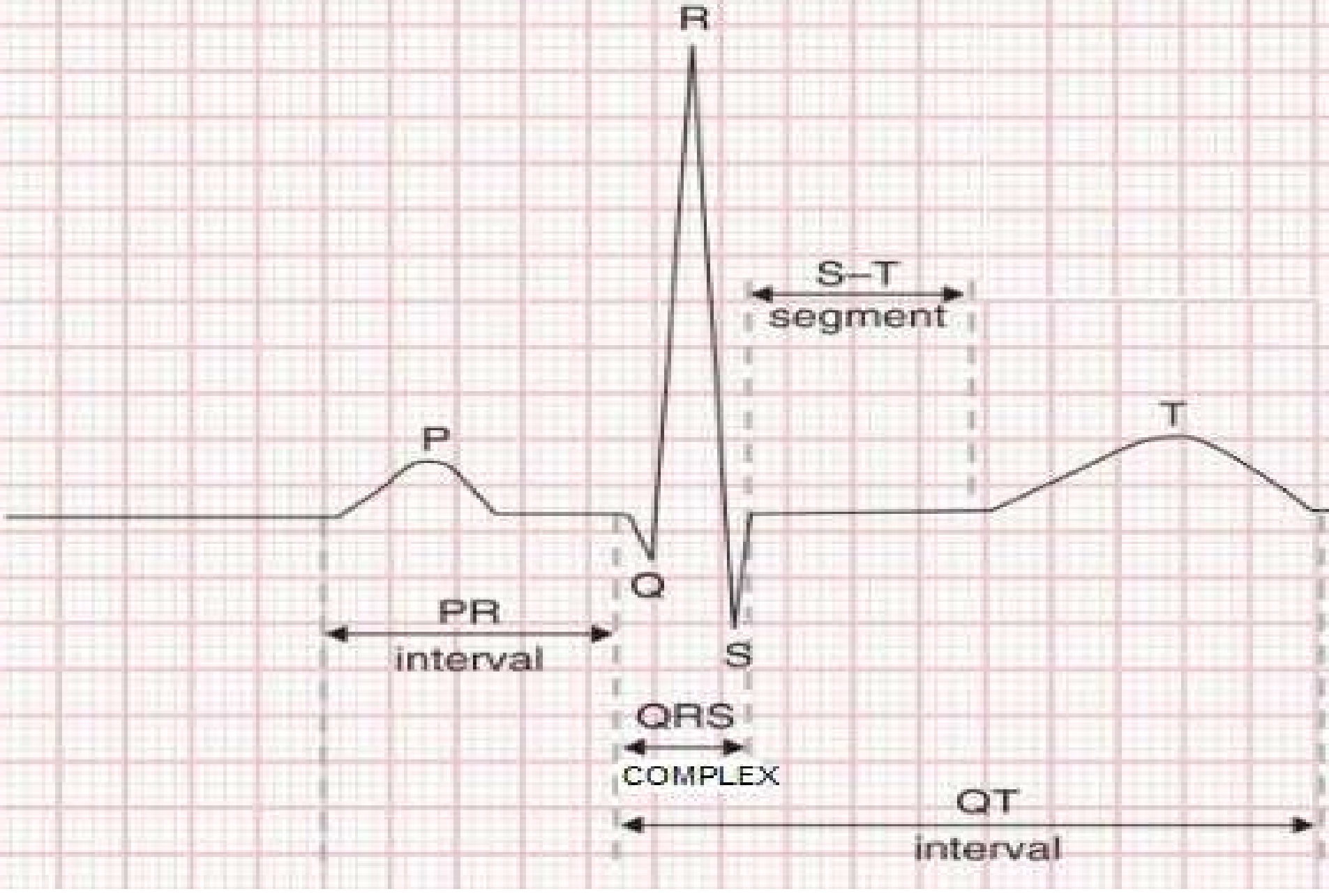

QRS Complex
R
PR Segment
ST Segment
P
T
PR Interval
Q
S
QT Interval

ECG paper



- **Specialty paper which imprints lines via a heated stylus**
- **Records at 25 mm/sec. (universal speed)**
- **Each manufacturer usually has it's own style of paper**


1 mV (10 mm high) reference pulse
One large 5 mm × 5 mm box represents 0.2 seconds (200 ms) time and 0.5 mV amplitude.
One small 1 mm × 1 mm block represents 40 ms time and 0.1 mV amplitude.
Amplitude
Time


R
S–T
segment
T
P
Q
PR
interval
S
QRS
COMPLEX
QT
interval

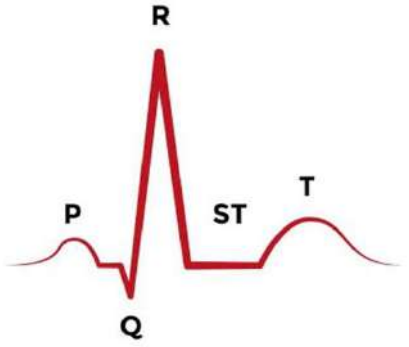
QUESTIONS

E.C.G monitors attached to patient

Lect. II

Dr. Muddather A. Mohammed

Emergency physician

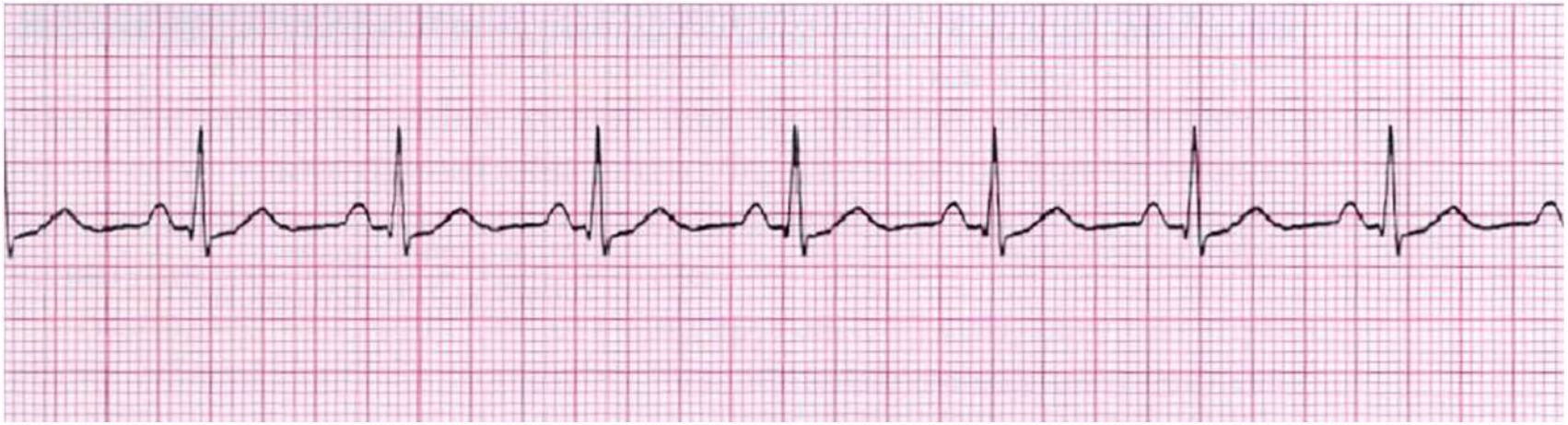


ECG interpretation :step-by-step

- Rhythm
- Rate
- P – wave
- PR - interval
- QRS Complex
- ST Segment
- T wave
- Other ECG signs

RHYTHM

Normal Sinus Rhythm



1. **ECG rhythm -usual rate between 60-100 bpm,**
2. **Every P wave must be followed by a QRS & every QRS is preceded by P wave.**
3. **P wave is upright in leads I and II**

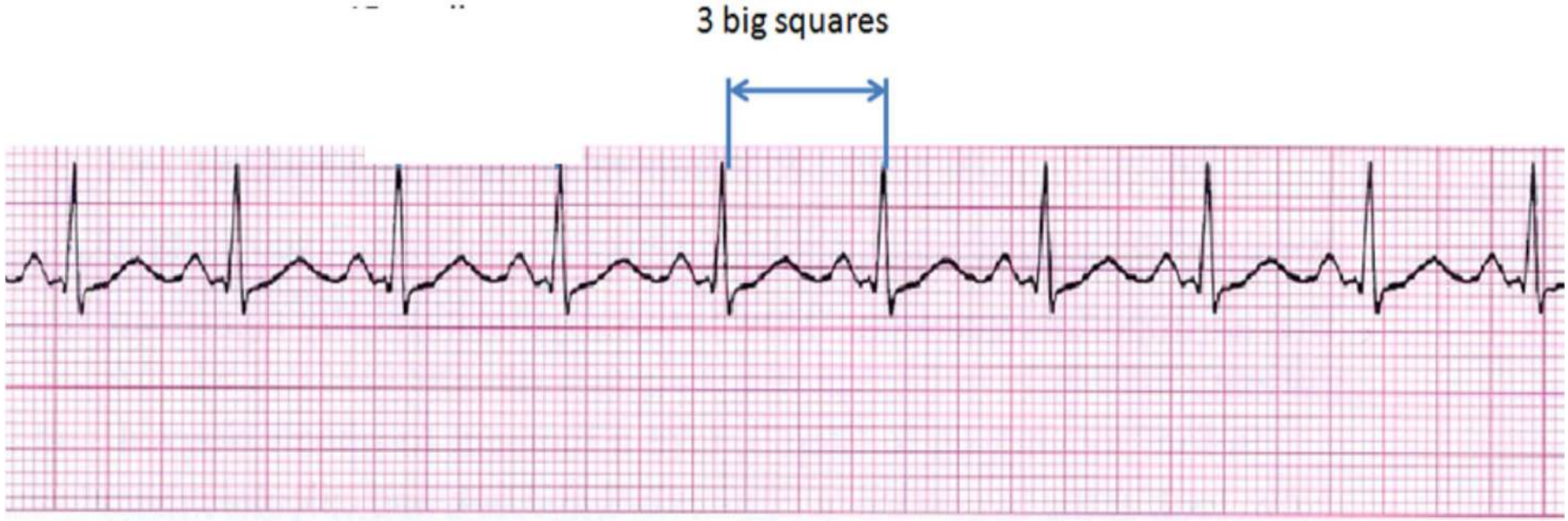
Irregular rhyhtm

Rate

lead II - **rhythm strip**. Look at number of large(squares) between 2 R waves

$$\text{Rate} = \frac{\mathbf{300}}{\text{number of } \mathbf{BIG\ SQUARE} \text{ between R-R}}$$

This applied if the rhythm is regular



$$\text{Rate} = \frac{\mathbf{300}}{\mathbf{3}}$$

Rate = **100** beats/minute

If irregular

- Count the number of R waves in a 6-second strip and multiply by 10. Not very accurate, used for a quick estimate.

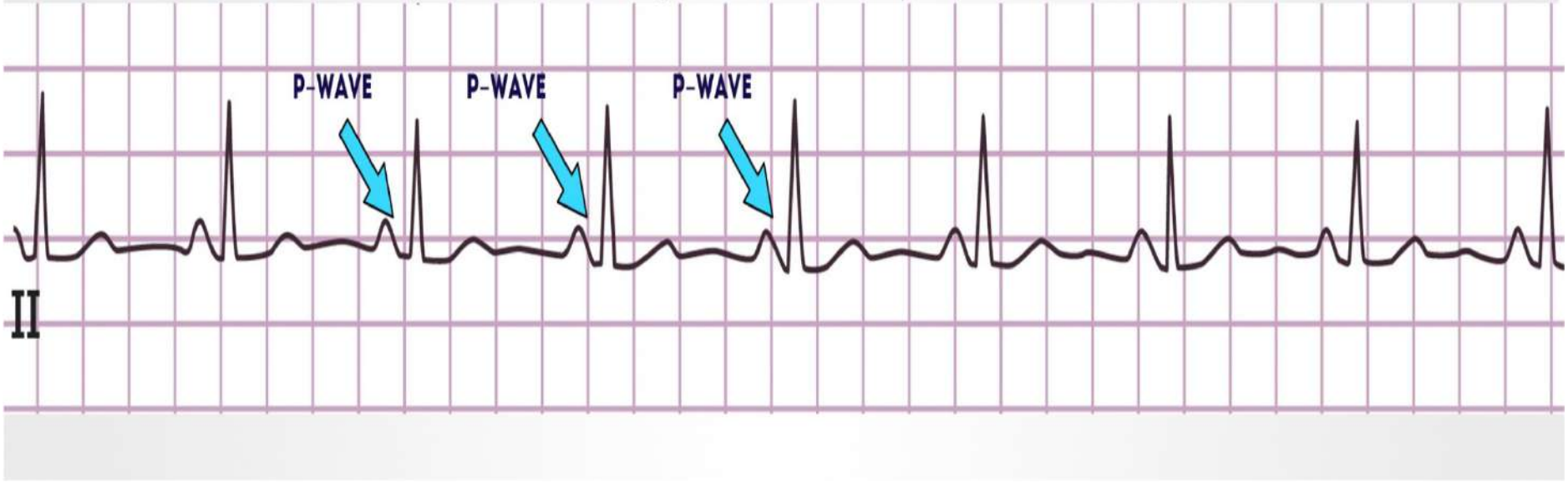
P Wave

Depolarization of both atria

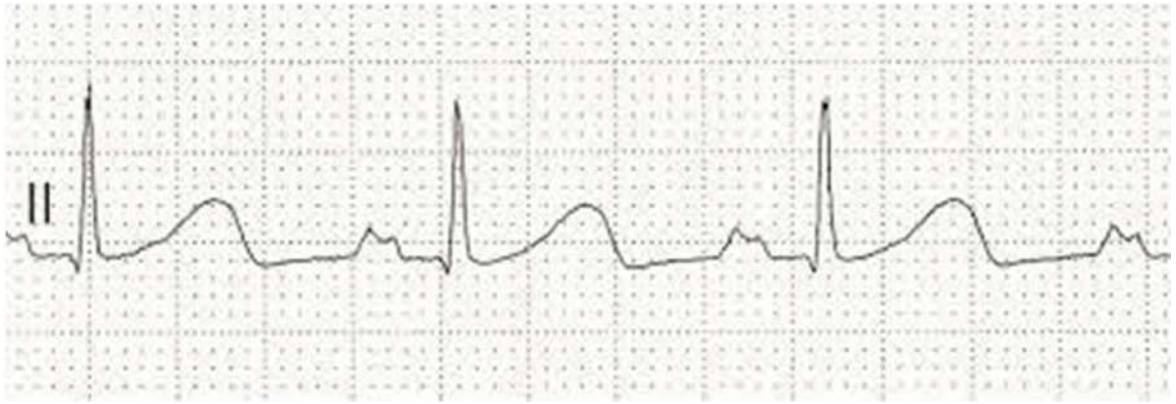
- Relationship b/w P & QRS - distinguish various arrhythmias
- Shape & duration of P - indicate atrial disease

P-WAVES PRESENT

(SINUS RHYTHM)



Abnormal p wave



PR INTERVAL

Onset of P wave to onset of QRS

- Normal = 0.12 - 2.0 sec
- Represents Atria to Ventricles conduction time

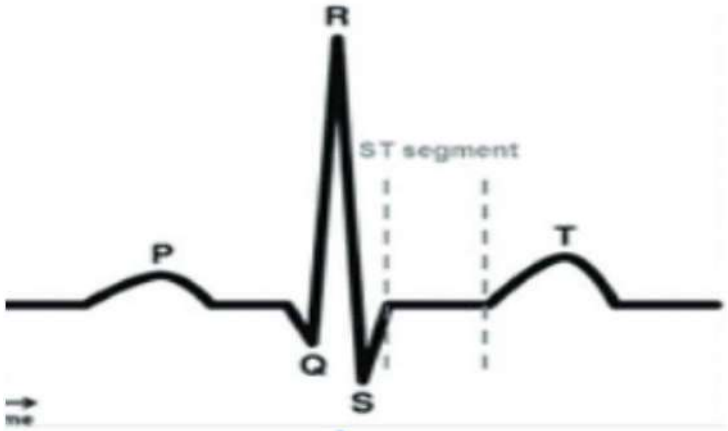
Prolonged PR interval indicate AV block

QRS COMPLEX

- Ventricular depolarization
- Normal duration = 0.08 - 0.12 sec
- ABNORMALITY Indicate ventricular disease

ST Segment

- Connects QRS complex & T wave
- should be on the iso - electrical line



Normal ST-segment

A

T Wave

- “small to moderate” size +ve deflection wave after QRS complexIt
- It is 1/3rd - 2/3rd that of corresponding R wave

ECG Interpretation

Normal Sinus Rhythm

1. Heart rate 300/4=75 bpm ✓
2. Heart Rhythm regular ✓
3. P waves Present, upright, smooth, rounded, similar ✓

   P:QRS ratio 1:1 ✓
4. QRS complex 1.5 small boxes ✓
5. P-R interval 4 small boxes ✓
6. Normal ST segment
7. Normal T WAVE

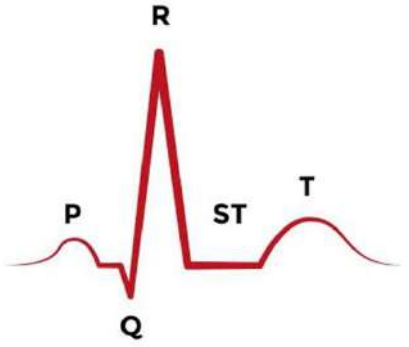

ECG
1 mV
81
89
60
87
117
100
II
Normal
Direct
Auto
On
170
110
50
Auto
Infl
QUESTIONS

E.C.G monitors attached to patient

Lect. III

Dr. Muddather A. Mohammed

Emergency physician



Normal Sinus Rhythm

Sinus node is the pacemaker, firing at a regular rate of 60 - 100 bpm. Each beat is conducted normally through to the ventricles

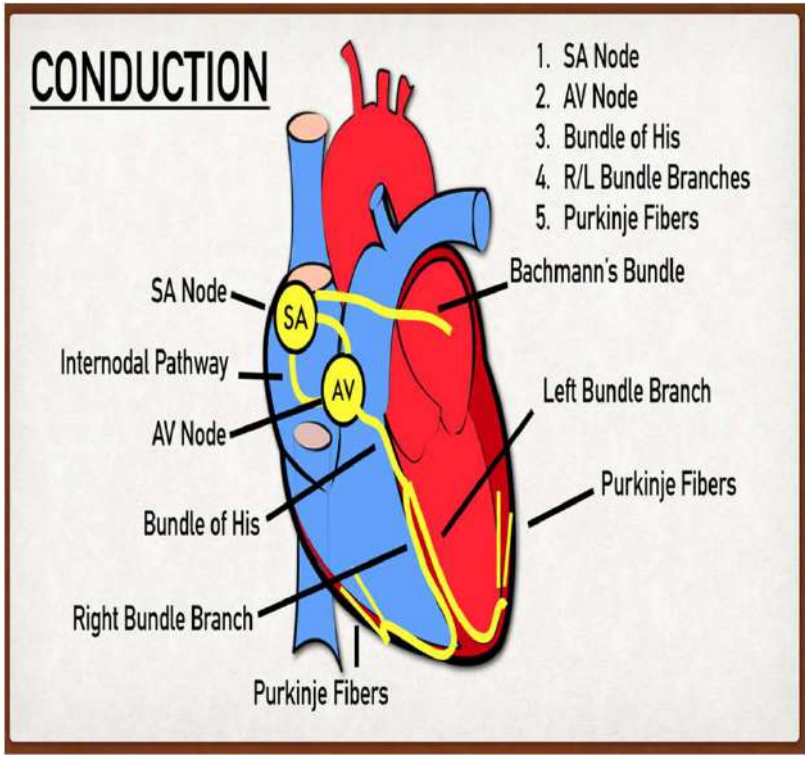
Regularity: **regular**

Rate: **60-100 beats per minute**

P Wave: **uniform shape; one P wave for each QRS**

PRI: **.12-.20 seconds and constant**

QRS: **.08 to .12 seconds**



Normal sinus rhythm

Sinus Bradycardia

Sinus node is the pacemaker, firing regularly at a rate of less than 60 times per minute. Each impulse is conducted normally through to the ventricles

Regularity: **The R-R intervals are constant; Rhythm is regular**

Rate: **Atrial and Ventricular rates are equal; heart rate less than 60**

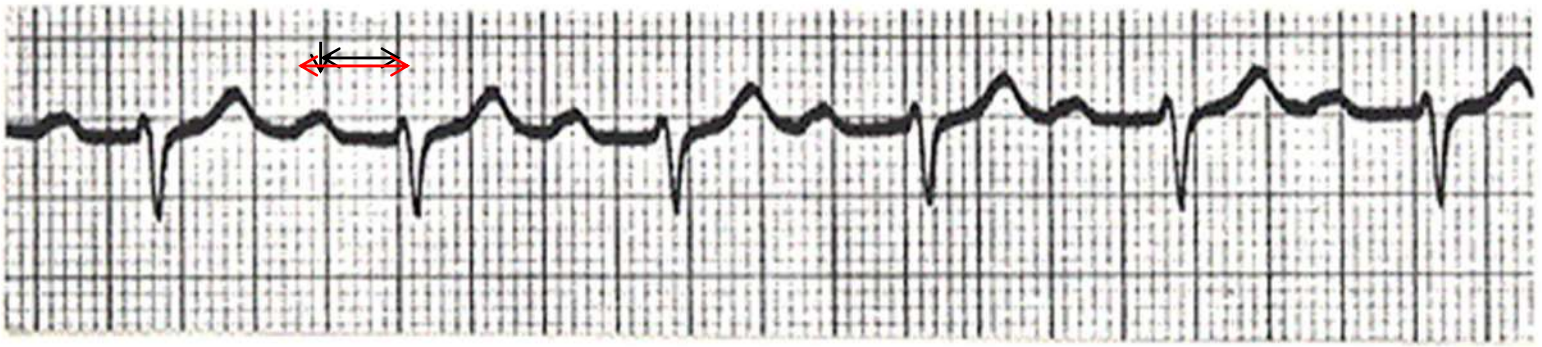
P Wave: **Uniform P wave in front of every QRS**

PRI: **PRI is between .12 -.20 and constant**

QRS: **QRS is less than .12**

AV block

First Degree AV block



1st degree AV block (PR = 280 ms)

The only ABNORMAL finding is PR interval prolongation

SECOND DEGREE HEART BLOCK

AV Block 2nd Degree Type 1

Regularity: **Irregular; the R-R interval gets shorter as the PRI gets longer.**

Rate: **Usually slower than normal**

P Wave: **Upright and uniform; some P waves are followed by QRS complexes.**
PRI: **Progressively lengthens until one P wave is blocked**
QRS: **QRS is less than .12**

AV Block 2nd Degree Type 2

Regularity: **If the conduction ratio is consistent, the R-R interval will be constant, and the rhythm will be regular. If the conduction ratio varies, the R-R will be irregular.**

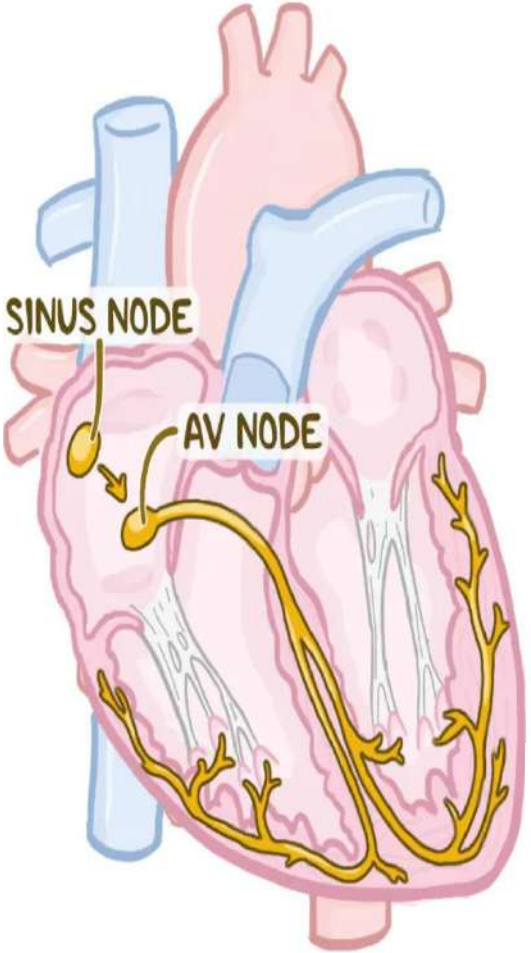
Rate: **bradycardia range**

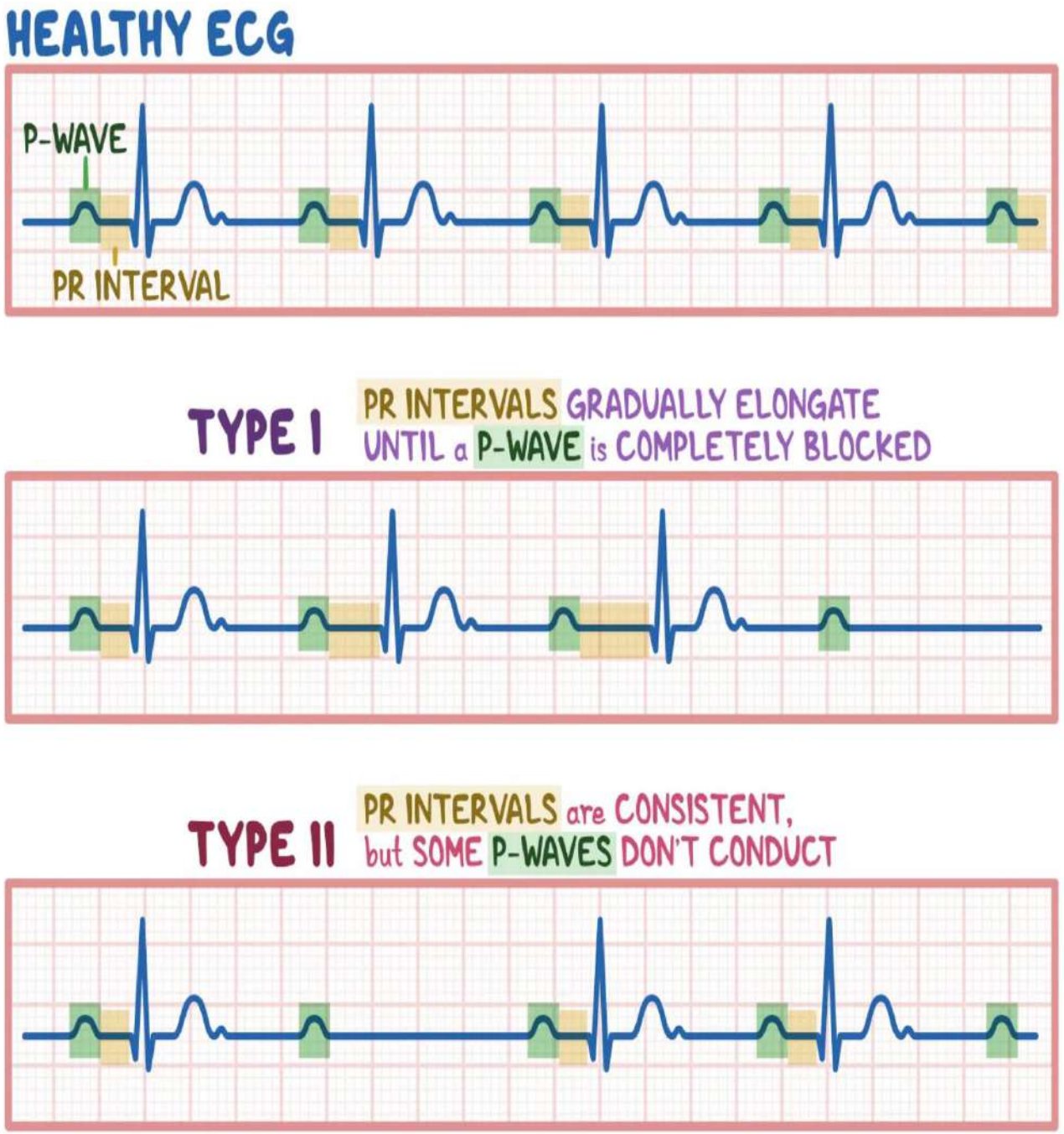
P Wave: **Upright and uniform; there are always more P waves than QRS complexes.**

PRI: **PRI CONSTANT IN CONDUCTED BEATS**

QRS: **QRS is less than .12**

2ND DGREEE HEART BLOCK





Third Degree Heart Block

COMPLETE BLOCK BETWEEN ATRIA AND VENTRICLES

Regularity: **Regular**

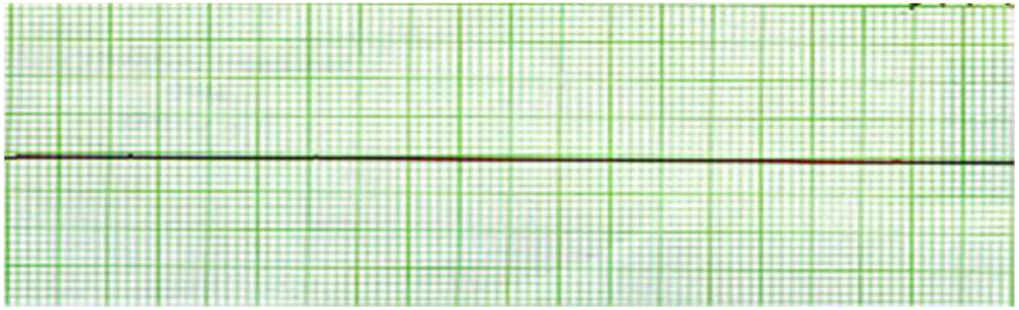
Rate: **Atrial rate is usually normal (60-100bpm); ventricular rate: 40-60 if the focus**

P Wave: **Upright and uniform; more p waves than QRS complexes.**

PRI: **No relationship between p waves and QRS complexes; p waves can occasionally be found superimposed on the QRS complex.**

QRS:**.12 seconds or greater if the focus is ventricular.**

Asystole



The heart has lost its electrical activity. There is no electrical pacemaker to initiate electrical flow.

Regularity: **Not measurable; there is no electrical activity.**

Rate: **Not measurable; there is no electrical activity.**

P Waves: **Not measurable; there is no electrical activity.**

PRI: **Not measurable; there is no electrical activity.**

QRS: **Not measurable; there is no electrical activity.**

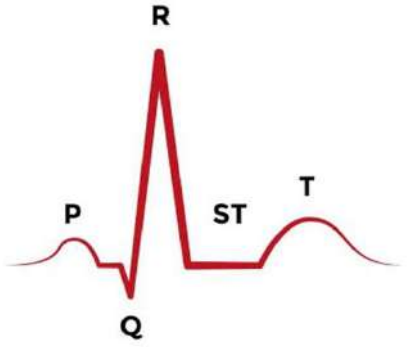

ECG
1 mV
81
89
60
87
117
100
II
Normal
Direct
Auto
On
170
110
50
Auto
Infl
QUESTIONS

E.C.G monitors attached to patient

Lect. IV

Dr. Muddather A. Mohammed

Emergency physician



Normal Sinus Rhythm

Sinus node is the pacemaker, firing at a regular rate of 60 - 100 bpm. Each beat is conducted normally through to the ventricles

Regularity: **regular**

Rate: **60-100 beats per minute**

P Wave: **uniform shape; one P wave for each QRS**

PRI: **.12-.20 seconds and constant**

QRS: **.04 to .1 seconds**

Sinus Tachycardia

Sinus node is the pacemaker, firing regularly at a rate of greater than 100 times per minute. Each impulse is conducted normally through to the ventricles .

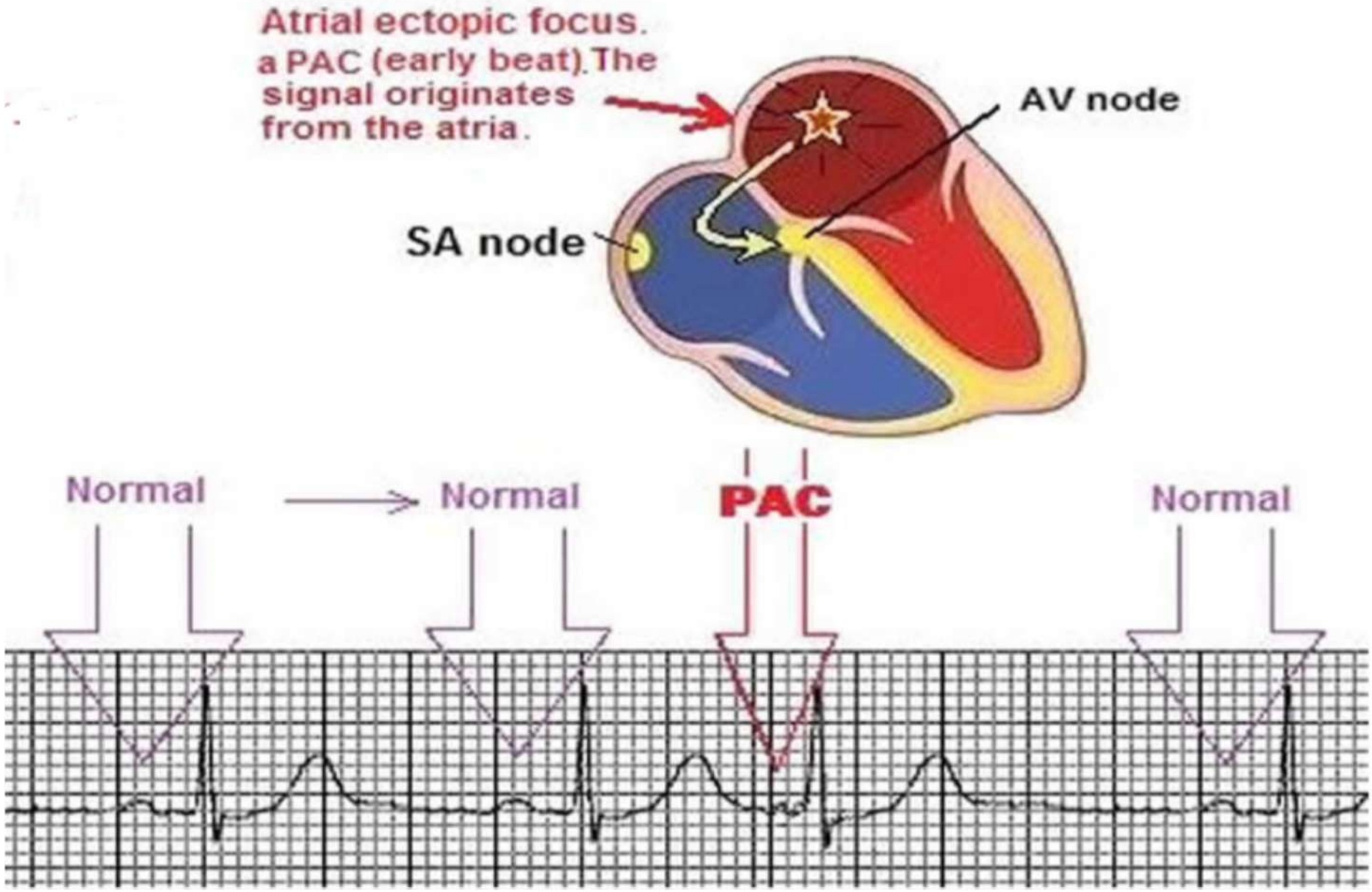
Regularity: **The R-R intervals are constant; Rhythm is regular**

Rate: **heart rate greater than 100**

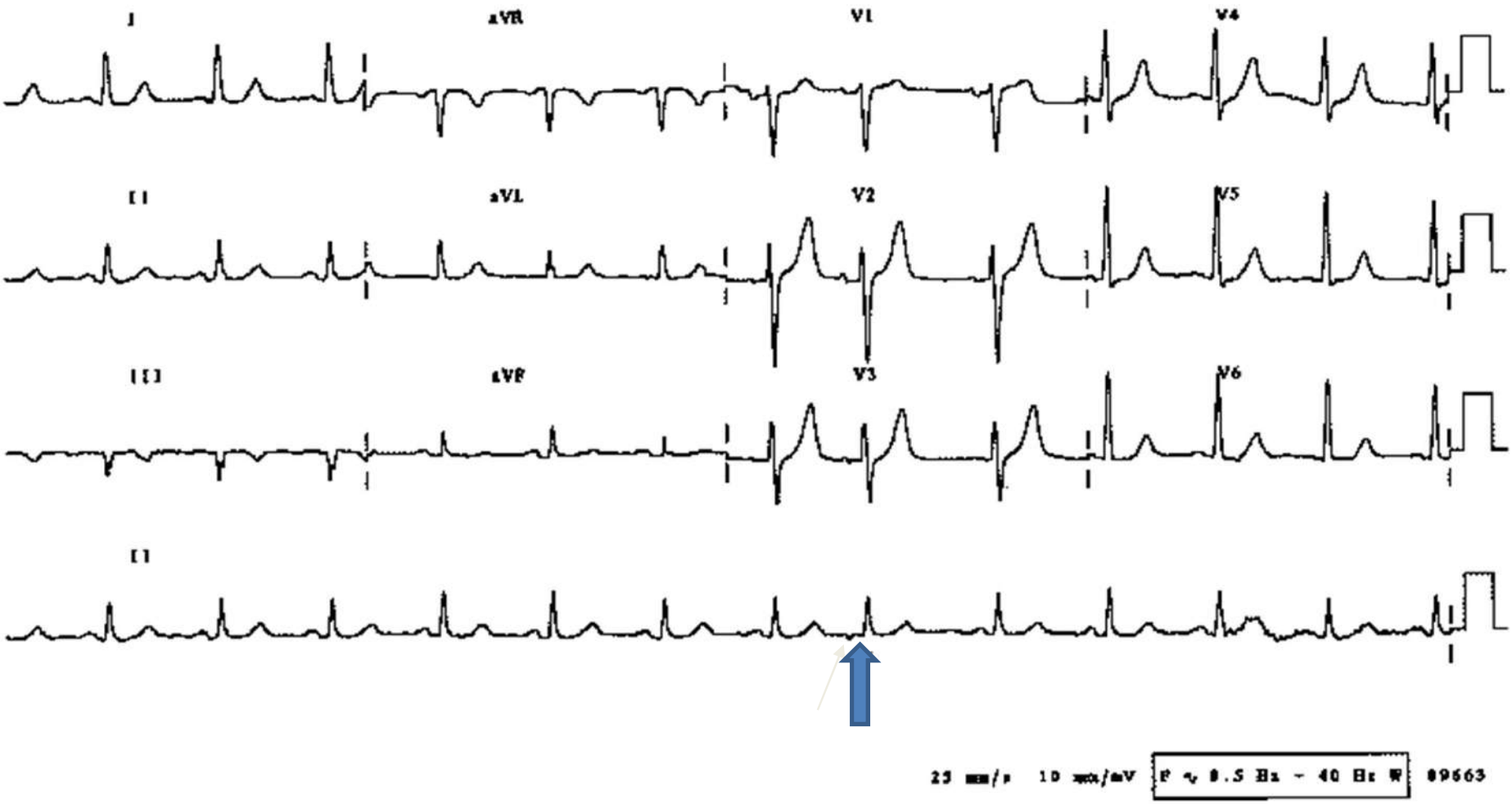
P Wave: **Uniform P wave in front of every QRS**

PRI: **PRI is between .12 -.20 and constant**

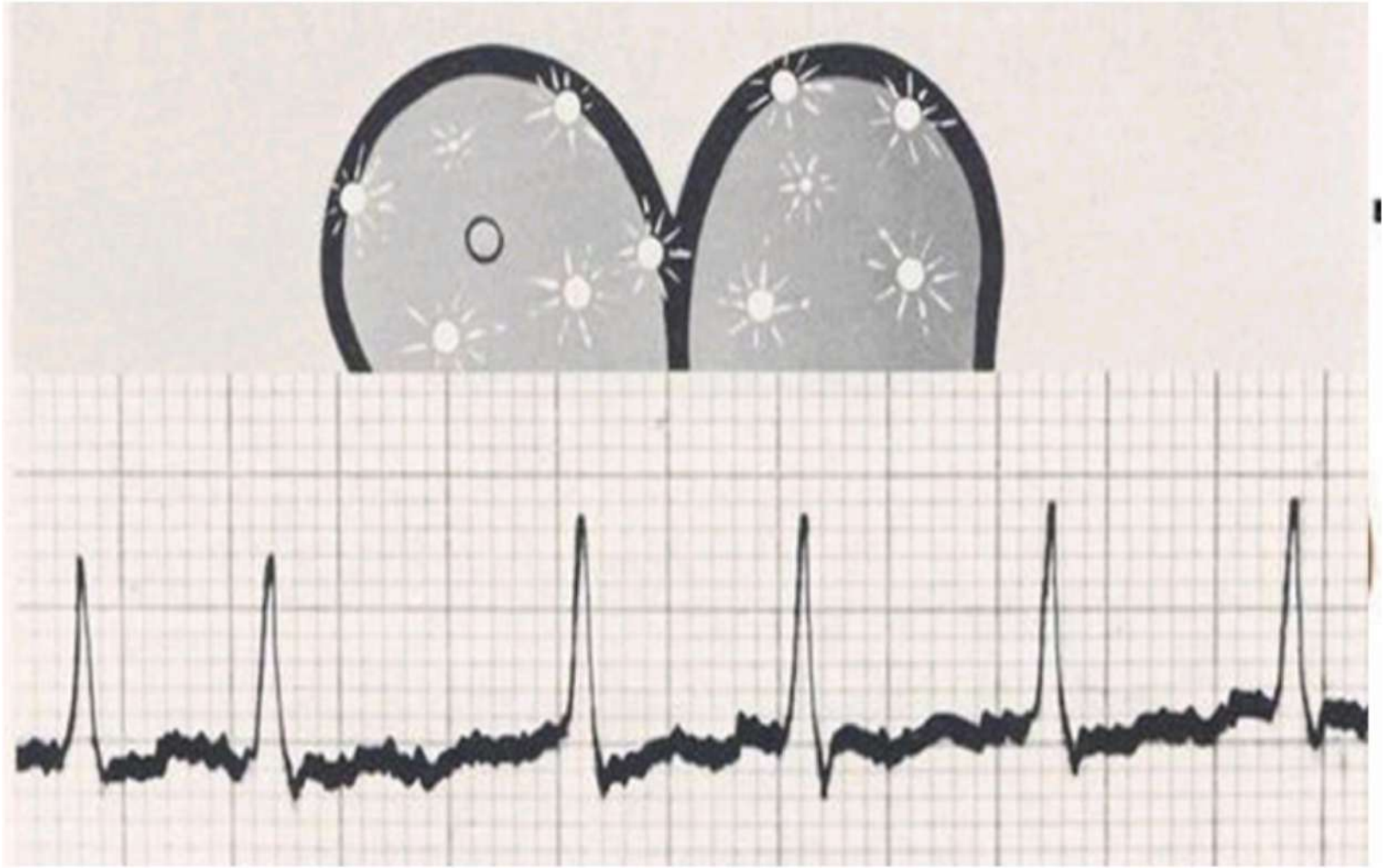
QRS: **less is than .12**


Atrial ectopic focus.
a PAC (early beat). The
signal originates
from the atria.
AV node
SA node
Normal
Normal
PAC
Normal

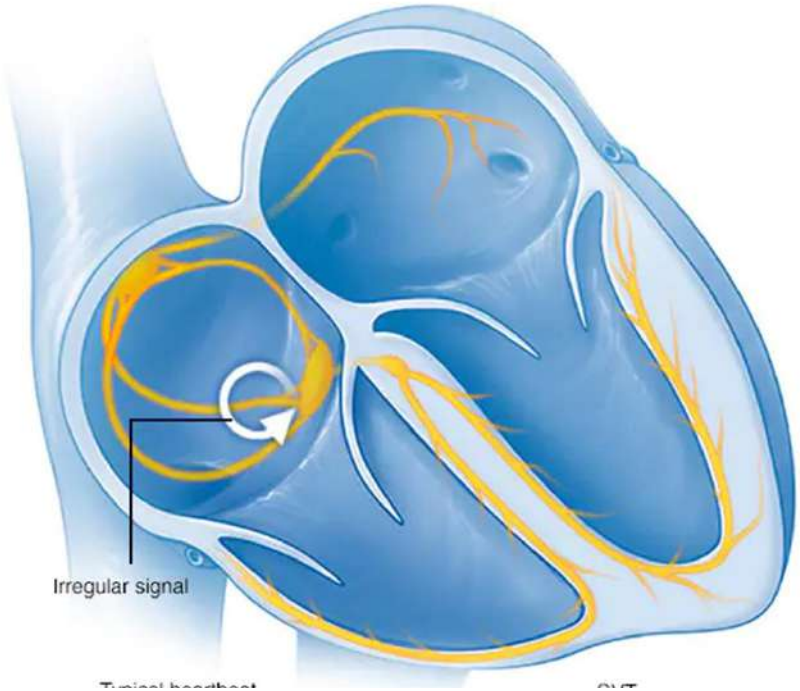
Atrial Ectopic

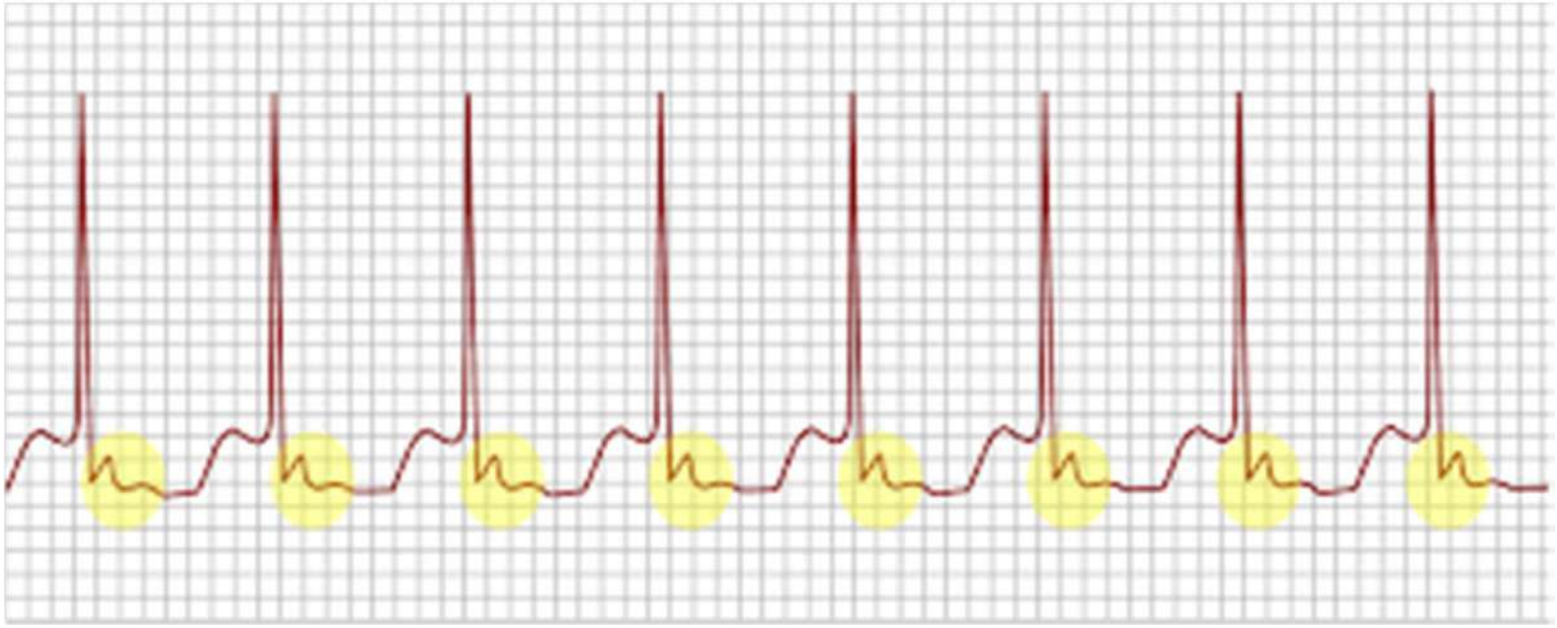


Atrial fibrillation

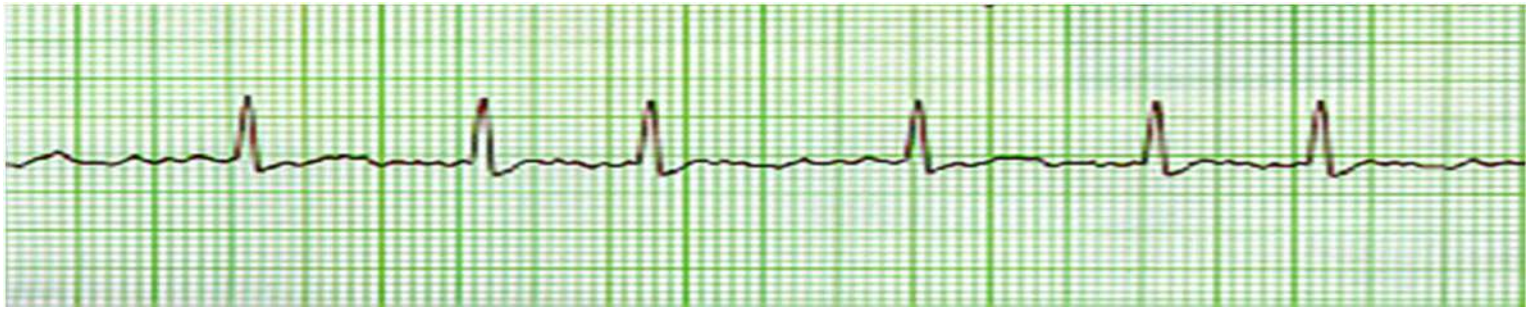


SUPRAVENTRICULAR TACHYCARDIA





Atrial Fibrillation

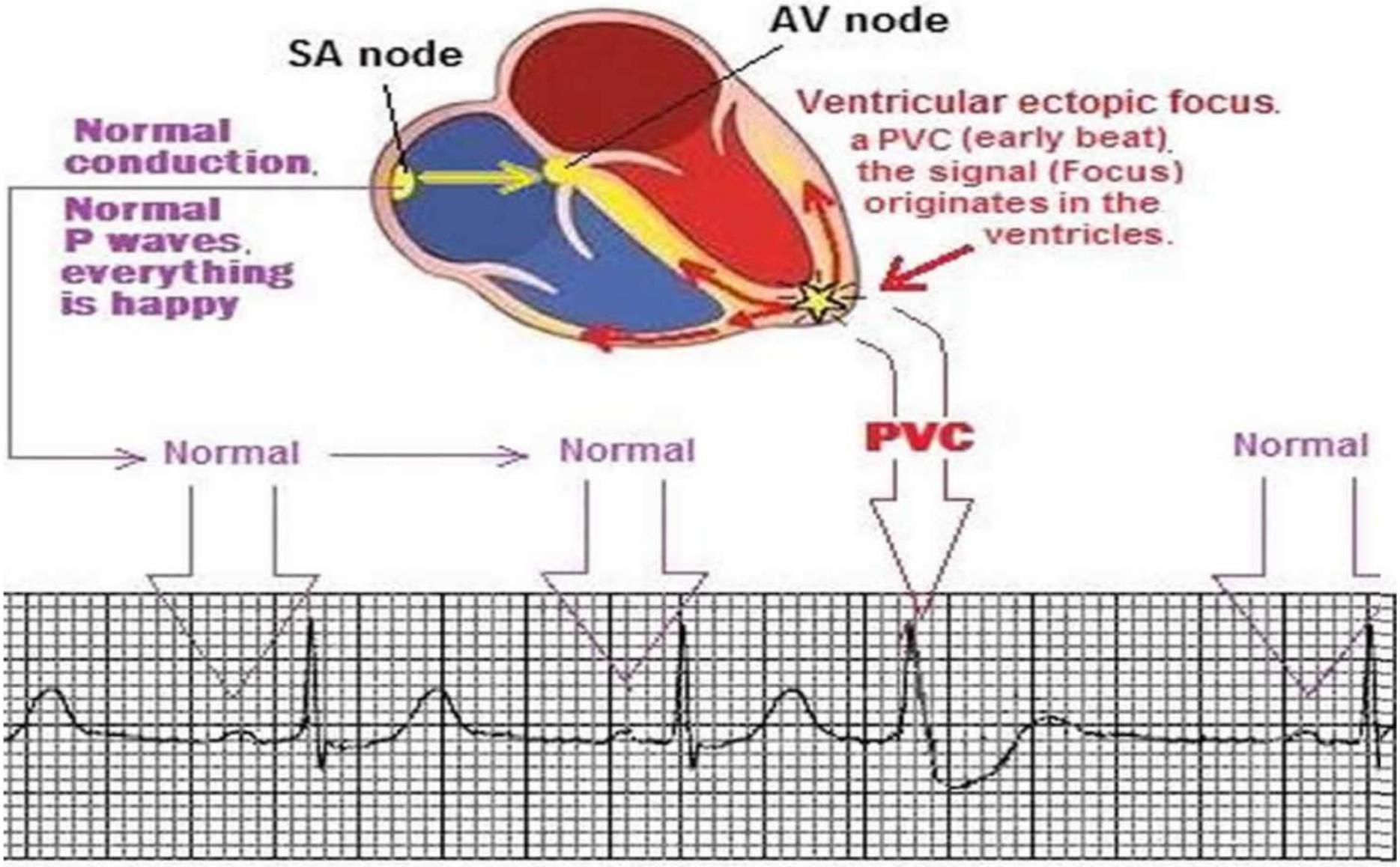


The atria are so irritable that a multitude of foci initiate impulses, causing the atria to depolarize repeatedly in a fibrillatory manner. The AV node blocks most of the impulses, allowing only a limited number through to the ventricles.

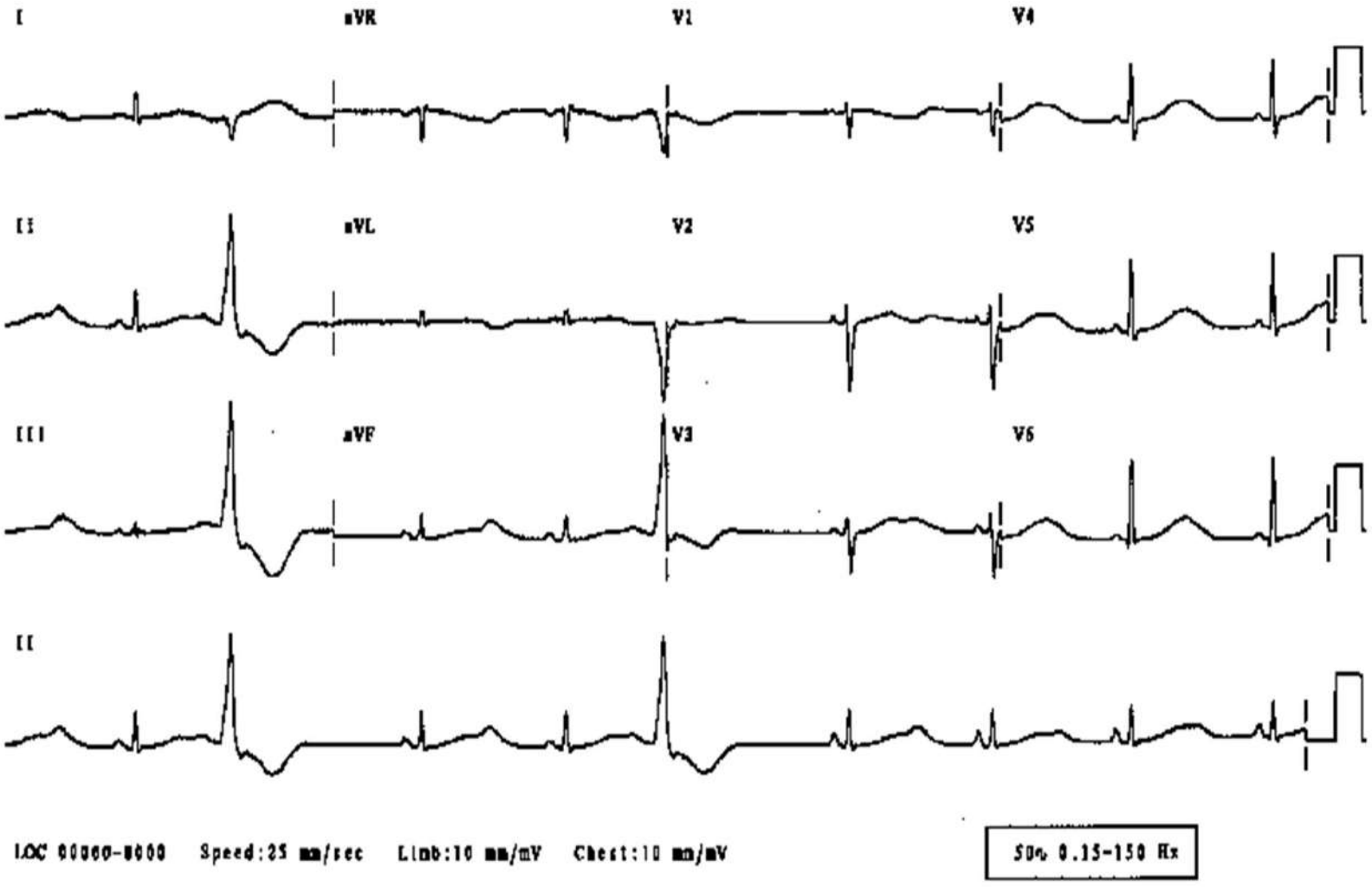
Regularity: irregular irregularity

P Wave: **In this arrhythmia the atria are not depolarizing in an effective way; instead, they are fibrillating. Thus, no P wave is produced.**

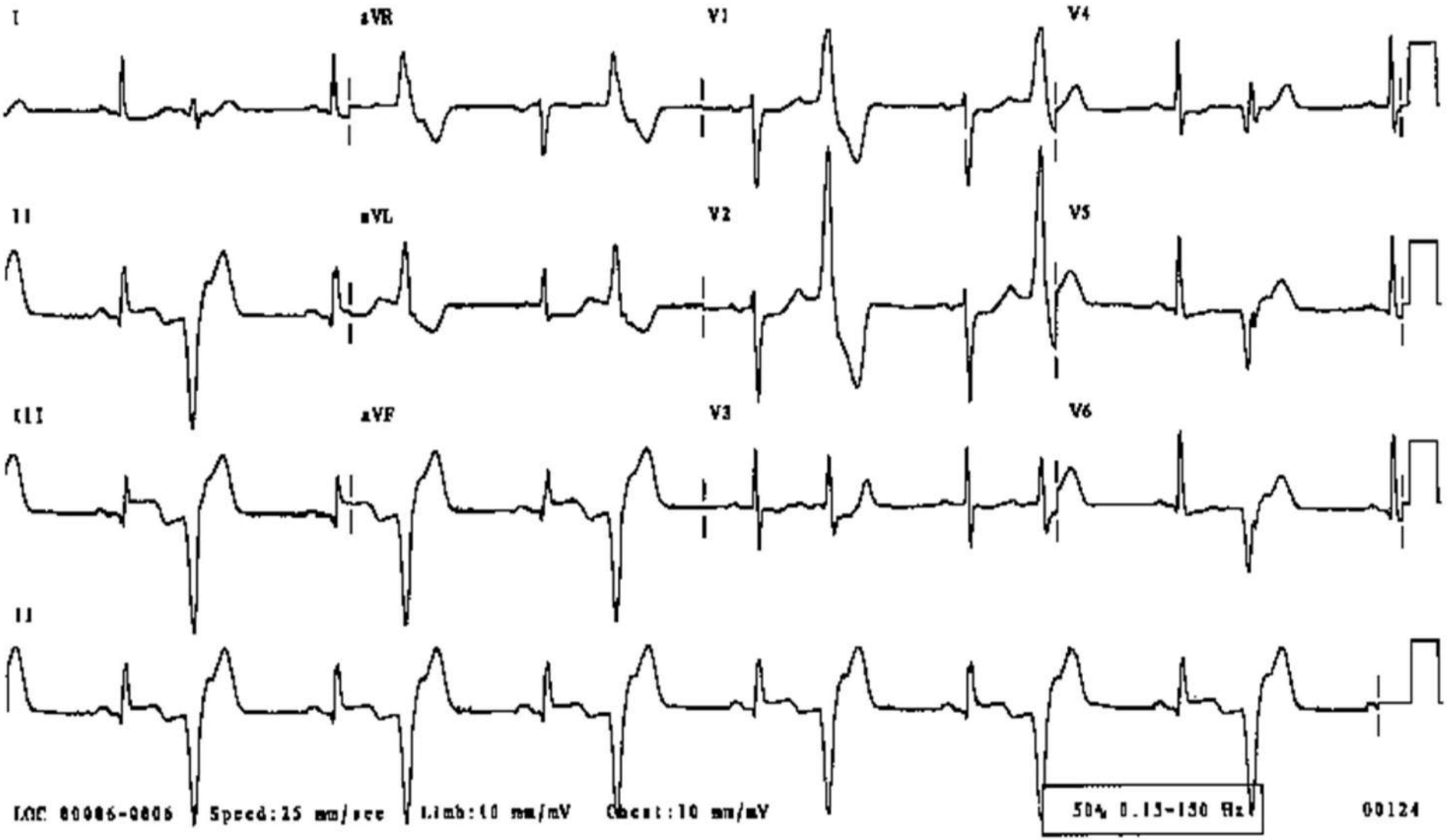
Ventricular ectopic

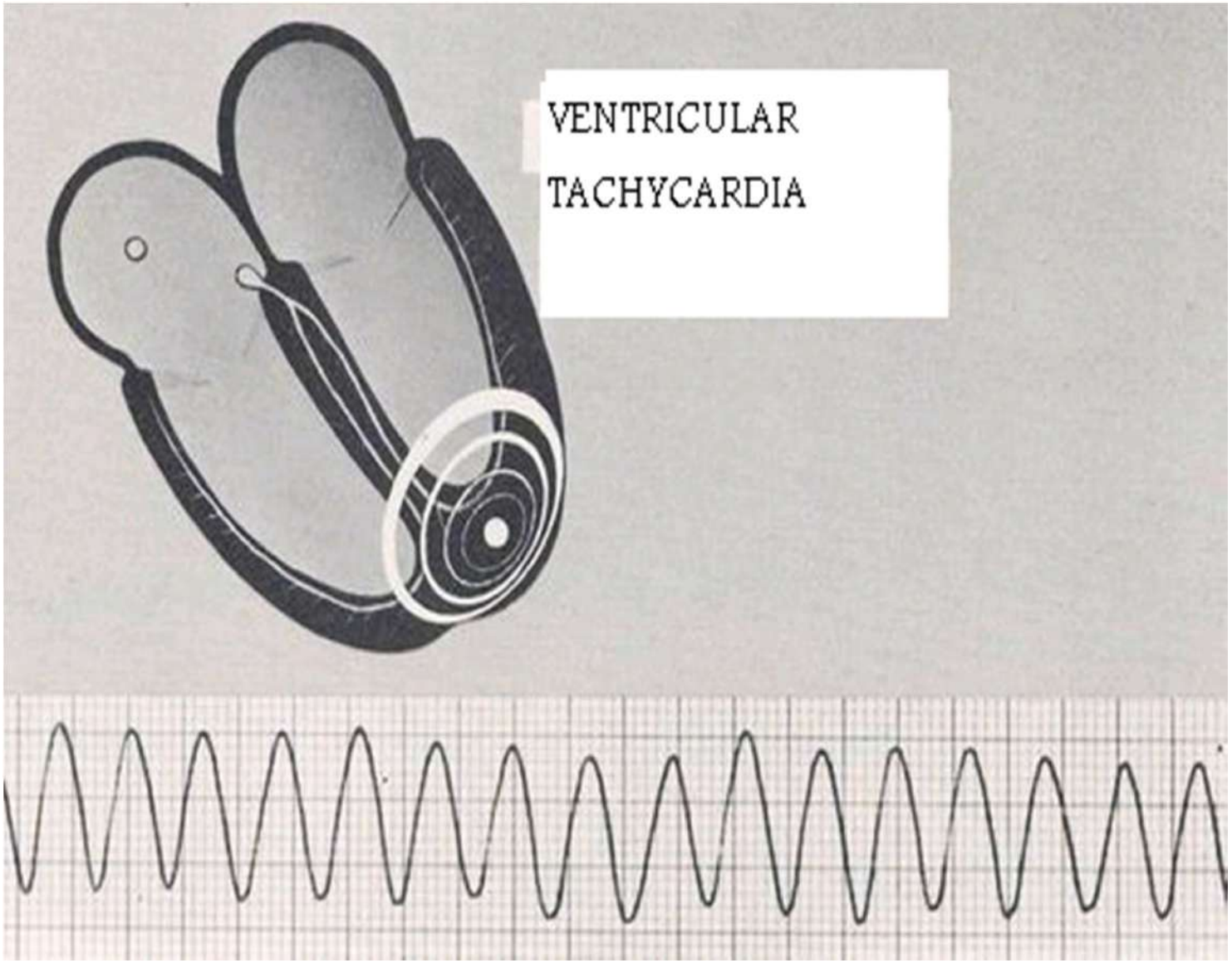


Ventricular Ectopic



bigeminy


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
Speed:25 mm/sec
Limb:10 mm/mV
Chest:10 mm/mV
50Hz 0.15-150 Hz
00124


VENTRICULAR
TACHYCARDIA

Ventricular Tachycardia

An irritable focus in the ventricles fires regularly at a rate of 150-250 beats per minute to override higher sites for control of the heart.

Regularity: **This rhythm is usually regular,**

Rate: **rate range is 150-250 beats per minute.**

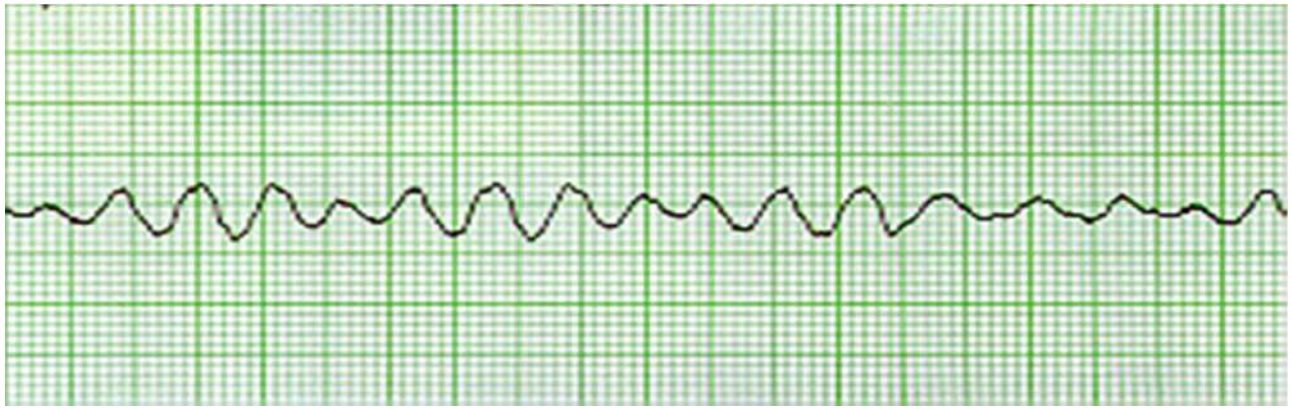
P Wave: **None of the QRS complexes will be preceded by P waves**

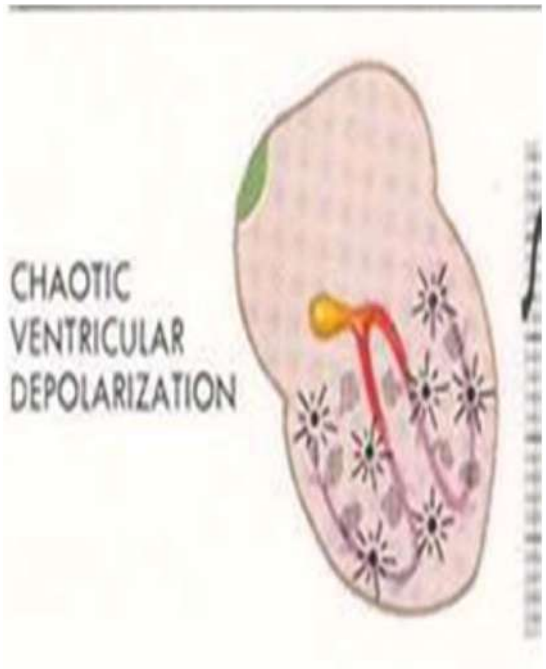
PRI: **Since the rhythm originates in the ventricles, there will be no PRI.**

QRS: **The QRS complexes will be wide, It is often difficult to differentiate between the QRS and the T wave.**

VENTRICULAR TACHYCARDIA

Ventricular Fibrillation





Multiple foci in the ventricles become irritable and generate uncoordinated, chaotic impulses that cause the heart to fibrillate rather than contract.

Regularity: **There are no waves or complexes that can be analyzed to determine regularity. The baseline is totally chaotic.**

Rate: **The rate cannot be determined since there are no discernible waves or complexes to measure.**

P Wave: **There are no discernible P waves.**

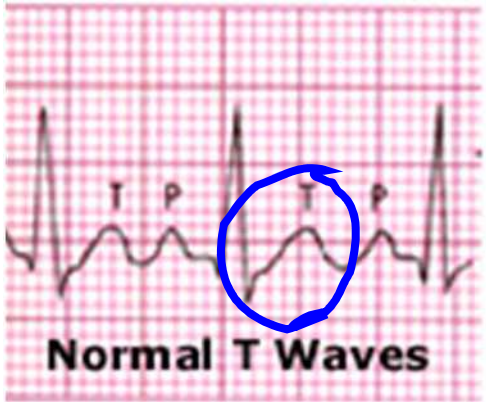
PRI: **There is no PRI.**

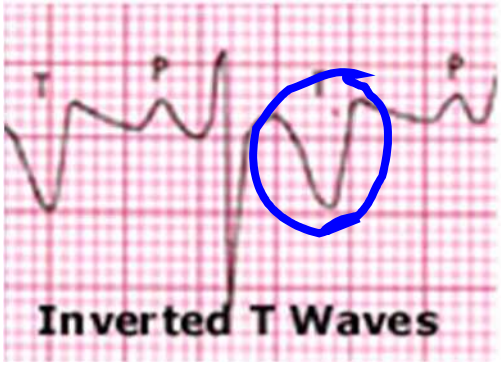
QRS: **There are no discernible QRS complexes.**

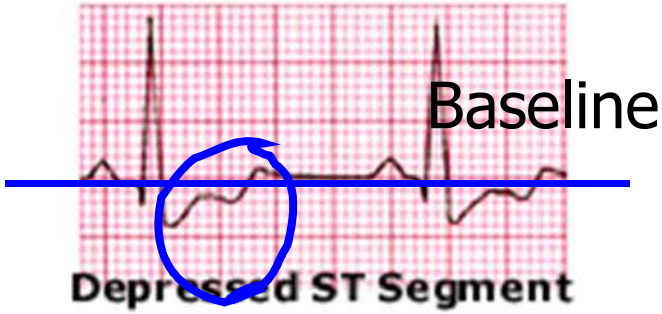
ECG Changes : Ischemia

T-wave inversion (flipped T)

ST segment depression







ECG Changes: Infraction

ST segment elevation of greater than 1mm in at least 2 contiguous leads

Heightened or peaked T waves

Deep Q-Wave

Baseline


ECG
1 mV
81
89
60
87
117
100
II
Normal
Direct
Auto
On
170
110
50
Auto
Infl
QUESTIONS

Aims and classification of patient monitoring.

Dr. Muddather A. Mohammed

Emergency physician

Introduction

- Monitor is a Latin word “monere” which means “to warn”
- monitoring is the observation of one or several medical parameters over time. It can be performed by continuously measuring certain parameters directly or by using a medical monitor.

Aim of Patient Monitoring

- The aim of patient monitoring is to give warning of early dangerous deterioration, so early treatment is given and complications are avoided.

Monitor parts

- Any monitor consists of following MAIN OR ESSENTIAL parts:

1) Sensor.
2) System for data collection and translation.
3) Display system

In addition to

1) System for interpretation.
2) Recording system
3) Alarm system
4) Wireless communication links


72
92
36

Classes of monitoring according to the level of device intervention .

Class	sensor	data collect.	interpret.
I	Human	Human	Human
II	Device	Human	Human
III	Device	Device	Human
IV	Device	Device	Device

Please check variance before scoring

		DATE	Score	DATE
		TIME		TIME
RESP RATE		≥25	3	≥25
		21-24	2	21-24
		12-20		12-20
		9-11	1	9-11
		≤8	3	≤8
SpO_2		≥94		≥94
		92-93	2	92-93
		≤91	3	≤91
Inspired O_2%		%	2	%
TEMP			2	
		≥39°	1	≥39°
		38°		38°
		37°		37°
		36°	1	36°
		≤35°	3	≤35°
NEW SCORE uses Systolic BP		≥220	3	≥220
		210		210
		200		200
		190		190
		180		180
		170		170
		160		160
		150		150
		140		140
BLOOD PRESSURE		130		130
		120		120
		110	1	110
		100	2	100
		90	3	90
		80		80
		70		70
		60		60
		50		50
HEART RATE		≥130	3	≥130
		120	2	120
		110		110
		100	1	100
		90		90
		80		80
		70		70
		60		60
		50	1	50
		40		40
		30	3	30
Level of Consciousness		Alert		Alert
		V / P / U	3	V / P / U
Urine Output <30ml/hr		Y/N	3	Urine Output
Nursing Concern		Y/N	3	Concern
TOTAL NEW SCORE				TOTAL SCORE
		Initials		Initials
Additional Parameters		Pain Score		Pain Score
Monitoring Frequency				Monitor Freq
News Escalation Plan Y/N n/a				Escal Plan
RN Review Initials				RN Initials

NEWS Clinical Response

Date	Time	NEWS Score	Individual Called		Sign Ward Staff	Response	Time	Sign NEWS Responder
			Name	Grade				

The Newcastle upon Tyne Hospitals NHS
NHS Foundation Trust

Newcastle Upon Tyne Hospitals Adult NEWS Chart

Please Affix patient identification label in box below and document date chart started

Date DDMMYYYY

Surname
Forename
Patient I.d.No.
D.O.B. DDMMYYYY

Outline Clinical Response to NEWS Triggers

NEWS SCORE	MINIMUM FREQUENCY OF MONITORING	CLINICAL RESPONSE
0	12 hourly observations	• Continue routine NEWS monitoring with every set of observations
Total: 1-4	4 hourly observations	• Inform registered nurse who must assess the patient; • Registered nurse to decide if increased frequency of monitoring and / or escalation of clinical care is required
Total: 5 or more or 3 in one parameter	1 hourly observations	• NEWS responder • Response time 30 mins
Total: 7 or more Or 3 in two parameters	Continuous monitoring	• Senior NEWS responder • AND Outreach • Response time 10 mins Outreach ☎ 48817 FH ☎ 48881 ☎ 29995 RVI ☎ 23956

Oxygen Prescription (circle target)

target saturation 94-98% (air ↔ 2L/min ↔ 4 L/min ↔ 10-15 L/min)

target saturation 88-92% (air ↔ 24% ↔ 28% ↔ 35% venturi)

other target specify ___% **delivery method** ___________

PCA continuous oxygen ☐ **use minimum O_2 to achieve target**

prescriber/ transcriber date DDMMYYYY **initial time** HHMM

Escalation Policy

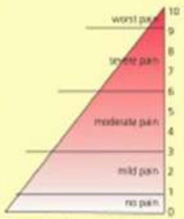
Registered nurse assessment
↓
Ward NEWS Responder
↓
Senior Ward NEWS Responder
↓
Consultant
↓
Critical Care
☎ 48483 Anaesthetic 2nd call FH
☎ 48812 GITU resident FH
☎ 48830 Cardiac ICU 2nd call FH
☎ 29999 ORANGE RVI

CALLING OUTREACH IS **NOT** A CRITICAL CARE REFERAL.

SENIOR WARD MEDICAL STAFF MUST DIRECTLY CALL ICU TEAM

STOP! THINK! Why has my Patient triggered?

Risk of Hypercapnic Respiratory Failure	
COPD	
Obesity/ Hypoventilation	
Other	
Sign & date variance box	



Scores persistently 7 or above contact Pain Team

National Early Warning Score (NEWS)

PHYSIOLOGICAL PARAMETERS	3	2	1	0	1	2	3	Variance	Date & Time	Sign	Temp Perm
Respiration Rate	≤8		9-11	12-20		21-24	≥25				T P
Oxygen Saturations	≤91	92-93		≥94							T P
	≤79	80-84	85-87	≥88	Risk of Hypercapnic Respiratory failure						T P
Any Supplemental Oxygen		Yes		No							T P
Temperature	≤35.0		35.1-35.9	36.0-38.0	38.1-38.9	≥39.0					T P
Systolic BP	≤90	91-100	101-110	111-219			≥220				T P
Heart Rate	≤40		41-50	51-90	91-110	111-129	≥130				T P
Level of Consciousness	NEW agitation or confusion score 3			A			V,P, or U				T P
Urine Output	<30ml/hr				Patients with established chronic/ anuric renal failure score 0						T P
Nursing Concern	Yes			No	Confirm with nurse in-charge						

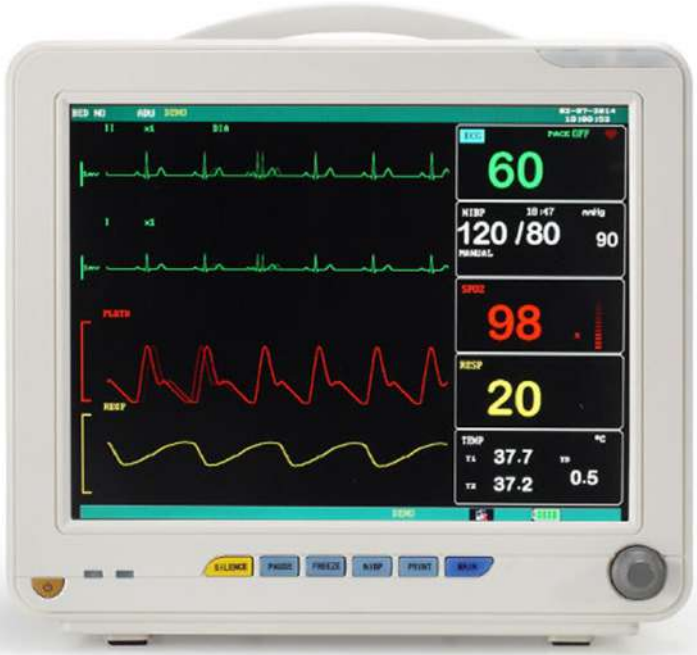
NEWS Clinical Response

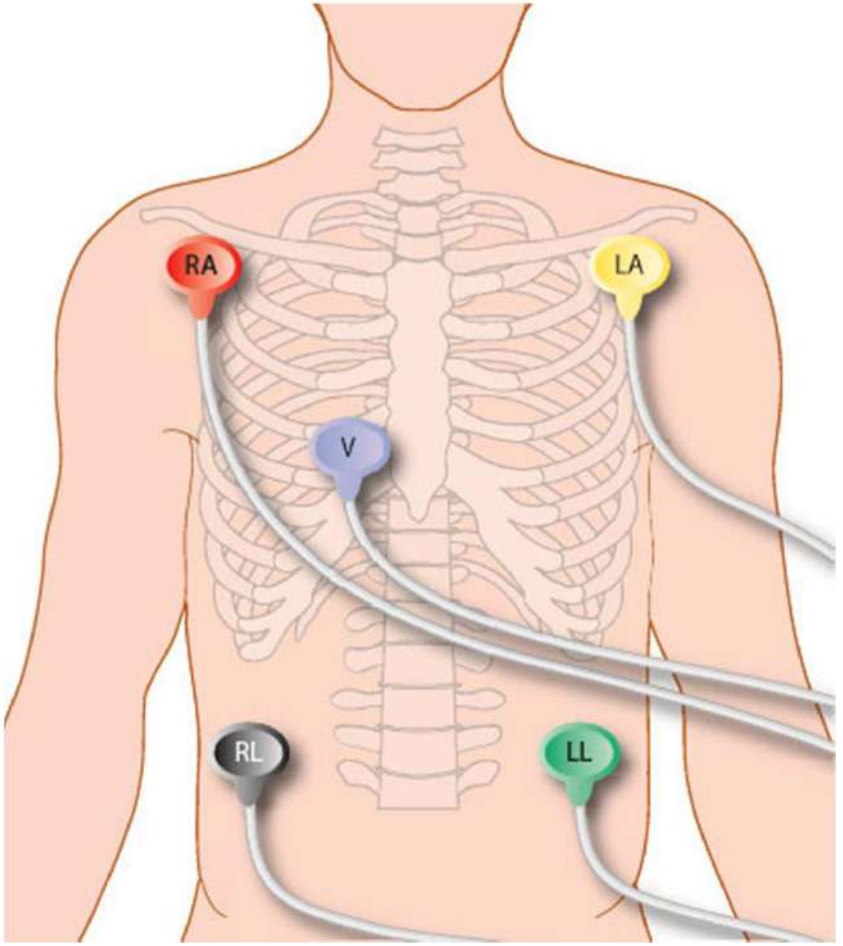
Date	Time	NEWS Score	Individual Called		Sign Ward Staff	Response	Time	Sign NEWS Responder
			Name	Grade				

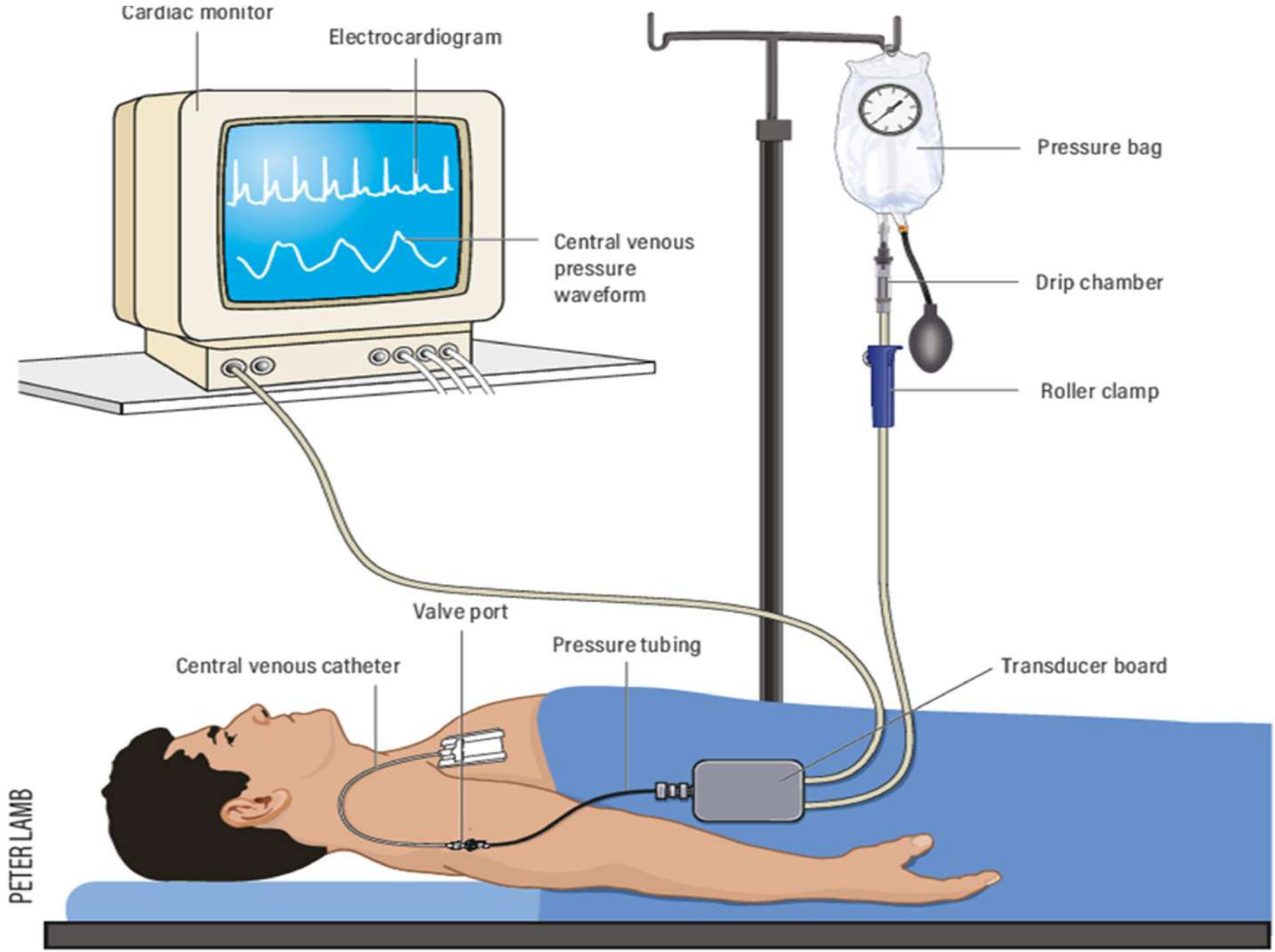

PM-2000XL Plus
Advanced
80
5.78
36.8
38
12
0
23
35
1.5
0.0
114/75

Invasiveness of monitoring devices

1. Non invasive e,g, ECG monitor , pulse oximeter
2. Invasive e,g, arterial line, centeral venous line
3. Highly invasive intracranial pressure monitoring.


60
120 /80
90
98
20
37.7
37.2
0.5

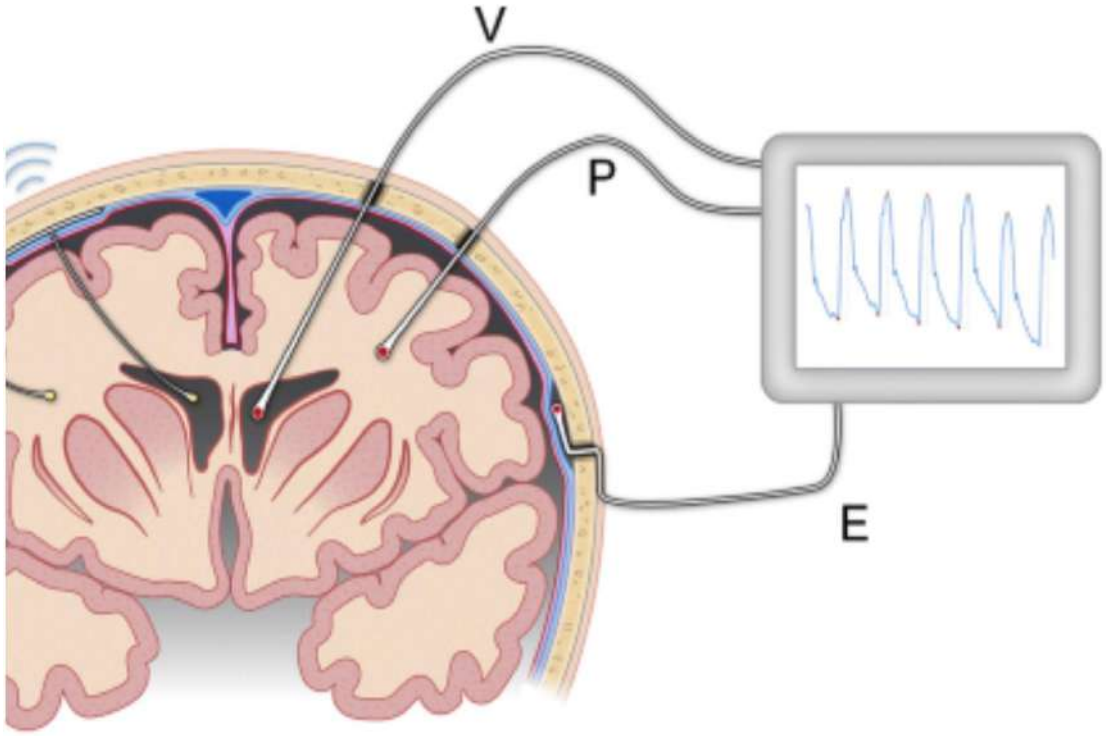

RA
LA
V
RL
LL


Cardiac monitor
Electrocardiogram
Central venous pressure waveform
Pressure bag
Drip chamber
Roller clamp
Valve port
Pressure tubing
Central venous catheter
Transducer board
PETER LAMB

Types of monitors according to parameters measured

1. Single parameter monitors

2. Multi parameters monitors


V
P
E

How to select monitor?

- <u>Depend on the following factors:</u>

1) Aim.
2) Experience.
3) Type of anesthesia.
4) Facilities & availability.
5) Nature of surgery.
6) Condition of the patient.

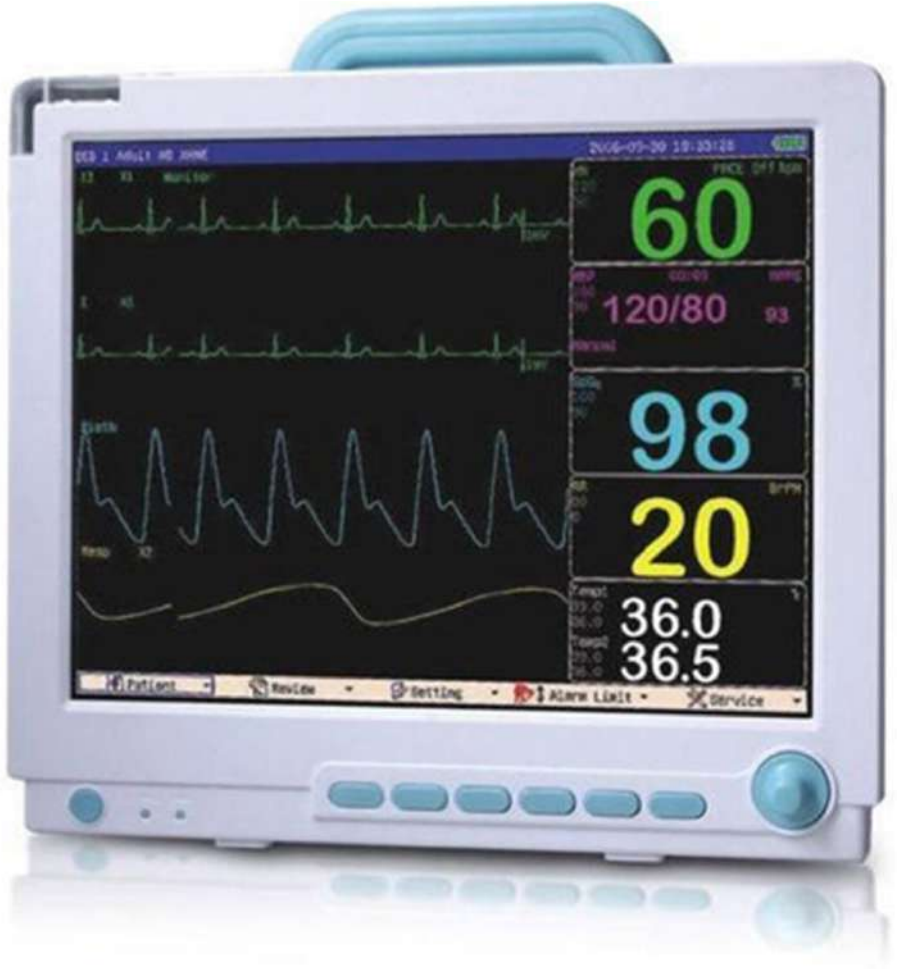
Main physiological parameters to be monitored in the ICU

1- ECG

2- Respiration e.g. O2 saturation

3- blood pressure

4- temperature.



Limitation of monitoring

- Delay.
- Danger.
- Decreased skill.
- Doubt of results.
- Distracting set up.


Questions

Oxygen Regulators

Dr. Muddather A. Mohammed

Emergency physician

Oxygen Therapy

Definition:

- Oxygen is a colorless, odorless, tasteless gas that is essential for the body to function properly and to survive.
- Oxygen therapy is the administration of oxygen at a concentration of pressure greater than that found in the environmental atmosphere
- The air that we breathe contain approximately 21% oxygen.

Purpose

- The body is constantly taking in oxygen and releasing carbon dioxide.
- If this process is inadequate, oxygen levels in the blood decrease, and the patient may need supplemental oxygen.
- The purpose is to increase oxygen saturation in tissues where the saturation levels are too low due to illness or injury.

INDICATIONS:

- ACUTE RESPIRATORY FAILURE
- ACUTE MYOCARDIAL INFARCTION
- CARDIAC FAILURE
- SHOCK
- HYPERMETABOLIC STATE INDUCED BY TRAUMA, BURNS OR SEPSIS
- ANAEMIA
- CYANIDE POISONING
- DURING CPR
- DURING ANAESTHESIA FOR SURGERY

OXYGEN – A PRESCRIBED DRUG

- MUST BE WRITTEN LEGIBLY BY THE DOCTOR
- PRESCRIPTION SHOULD BE DATED BY THE DOCTOR
- DOCTOR MUST INDICATE DURATION OF O2 THERAPY
- THE O2 % CONCENTRATION MUST BE PRESCRIBED
- THE FLOW RATE MUST BE PRESCRIBED

Sources of oxygen:

1- Oxygen cylinder

2-Oxygen wall outlet

- The **“Oxygen cylinder System”** is mainly composed of the oxygen cylinder and the oxygen regulator.
- Some important parts are:

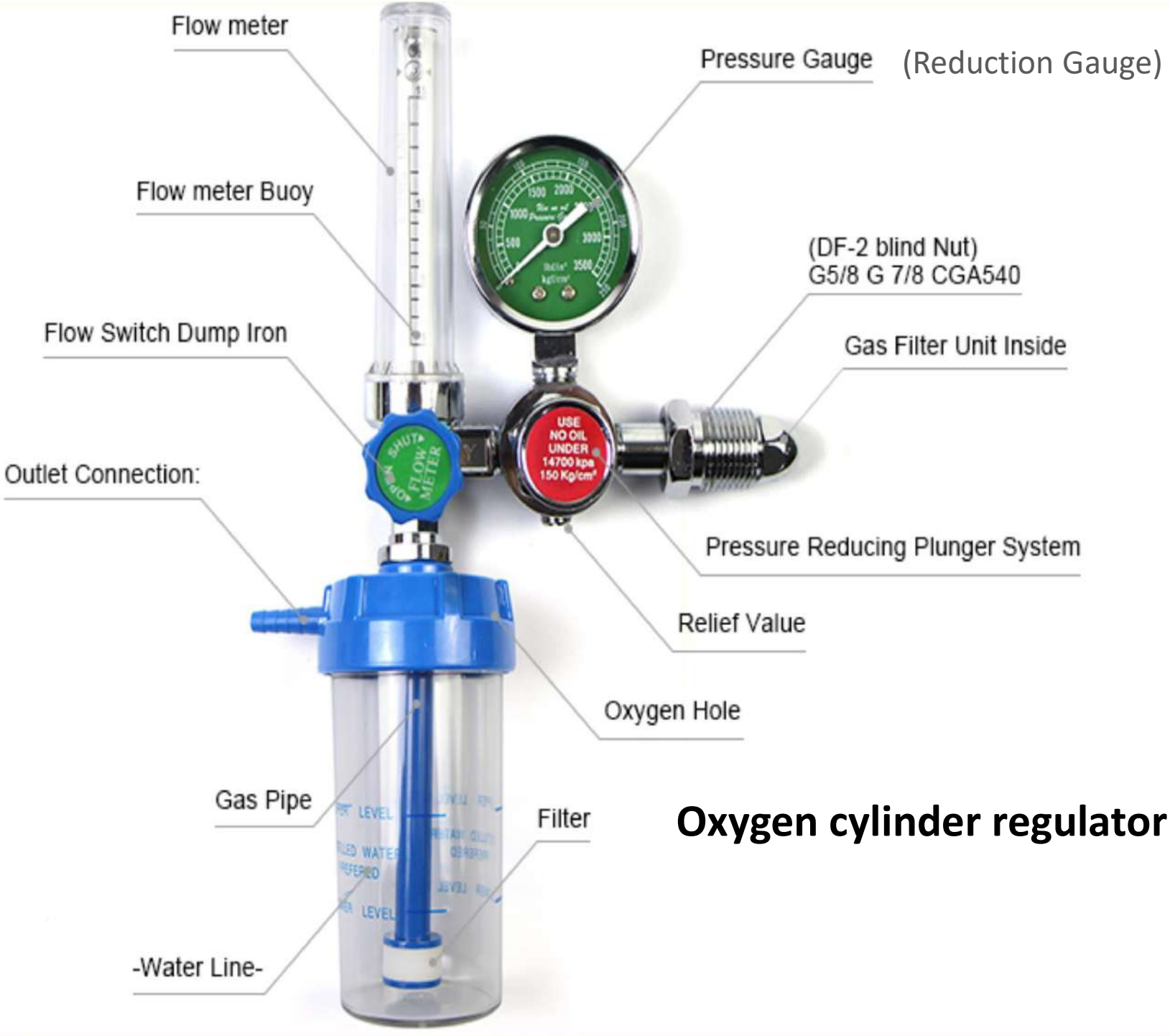
- **Oxygen cylinder** – is a heavy metal cylinder that keeps the oxygen under pressure.

1- Using oxygen cylinders:

- The oxygen cylinder is delivered with a protective cap to prevent accidental force against the cylinder outlet.

- To release oxygen safety and at a desirable rate, a regulator is used.


C
V
B
O
D


Flow meter
Pressure Gauge
(Reduction Gauge)
Flow meter Buoy
(DF-2 blind Nut)
G5/8 G 7/8 CGA540
Flow Switch Dump Iron
Gas Filter Unit Inside
Outlet Connection:
Pressure Reducing Plunger System
Relief Value
Oxygen Hole
Gas Pipe
Filter
-Water Line-
Oxygen cylinder regulator

Oxygen cylinder regulator

- A reduction gauge that shows the amount of oxygen in the tank.
- A flow meter that regulates the control of oxygen in liters per minutes.
- Oxygen is moistened by passing it through a humidifier to prevent the mucous membranes of the respiratory tree from becoming dry.

Oxygen key

2- Wall – outlet oxygen:

- The oxygen is supplied from a central source through a pipeline.

- Only a flow meter and a humidifier are required.

Oxygen wall outlet

Flow gauge regulators

- **Flow gauge regulators** are pressure-reducing device that can depressurize the high-pressure gas in the cylinder

- The flow gauge regulator has two dials that show gas flow and inlet pressure. It can maintain a stable outlet pressure under changing operating conditions of input pressure and output flow. Flow gauge regulator suitable high pressure, usually applying to anesthesia apparatus, respirator, and other medical gas equipment.

OXYGEN SAFETY PRECAUTIONS

Also, follow these guidelines:

- Do not stand oxygen cylinders upright unless they are well secured. If the cylinder falls, the

regulator or valve could become damaged or cause injury due to the intense pressure in the tank.

- Do not use oxygen around flames or sparks, including smoking materials such as cigarettes,

cigars and pipes. Oxygen causes fire to burn more rapidly and intensely.

- If defibrillating, make sure that no one is touching or is in contact with the victim or the resuscitation equipment.

- Do not use grease, oil or petroleum products to lubricate or clean the regulator. This could cause an explosion.

- Do not drag or roll cylinders.

- Do not carry a cylinder by the valve or regulator.


O_2
Questions ???

Monitoring and records in critically ill patient

Dr. Muddather A. Mohammed
Emergency physician

Introduction

The accurate measurement of physiological observations is essential in detecting the deteriorating patient and reducing adverse events.

• All patients in acute care settings should have observations performed

• Observations should at least the following:

◦ ***Respiratory rate***
◦ ***Oxygen saturation***
◦ ***Heart rate***
◦ ***Blood pressure***
◦ ***Temperature***
◦ ***Level of consciousness***

Introduction

• Frequency of observations should be consistent with the condition of the patient, but at least once every 8 hours and documented in the monitoring plan , **AND** can be changed according to patient condition.

• Observation charts should display observations in graphic format

Common sings of deterioration

- Change in respiration (Rate or character)
- Change in heart rate (Brady or tachycardia)
- Decreased oxygen saturation.
- Change in blood pressure.
- Change in temperature.
- Altered level of consciousness .

JOONDALUP HEALTH CAMPUS

ADULT OBSERVATION CHART EARLY WARNING SYSTEM (EWS)

URN: .....

Surname: .....

Forename: .....

Gender: ..... D.O.B. .....

Ward: .....

		0			1			2			MET			
DATE														
TIME														
TEMPERATURE X	>38.5° 38° 37.5° 37° 36.5° 36° 35.5° <35°													
SYSTOLIC BP ONLY V	>200 190 180 170 160 150 140 130 120 110 100 <90													
BP														
PULSE ●	≥140 130 120 110 100 90 80 70 60 50 40													
RR / MIN ●	≥36 30 24 18													
SpO_2%	≤85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100													
OXYGEN MODE	L/min % RA HIC NRBM													
PAIN SCORE	0-10													
ALERT •	A													
RESPONDS TO VOICE •	V													
RESPONDS TO PAIN •	P													
UNRESPONSIVE •	U													
EARLY WARNING SYSTEM SCORE														
TEMPERATURE SCORE														
SYSTOLIC BP SCORE														
PULSE SCORE														
RR SCORE														
SpO_2% SCORE														
AVPU SCORE														
EWS TOTAL SCORE														
NURSE INITIAL														

TOTAL SCORE 1 – 3	TOTAL SCORE 4 – 6	TOTAL SCORE ≥ 7	ALTERED EWS
INFORM SHIFT COORDINATOR AND REPEAT OBSERVATIONS IN ONE HOUR	MEDICAL REVIEW WITHIN 30 MINUTES AND IF AFTER HOURS, INFORM CNC	OR 1 PARAMETER IN RED BOX MET CALL	☐

Monitoring of respiratory function

- Important definitions:

Term	Definition
Dyspnoea	Difficulty in breathing
Orthopnoea	Dyspnoea necessitating an upright, sitting position for its relief
Tachypnoea	Abnormally rapid rate of breathing (>20 per minute)
Bradypnoea	Abnormally slow rate of breathing (<12 per minute)
Hypoxia	Inadequate oxygen at cellular level

Assessment of ventilation adequacy

Hypoxaemia can affect the following :

- ***Heart rate***: initially tachycardia (a non-specific sign), but severe hypoxaemia can cause bradycardia.

- ***Skin colour*** : initially pallor; hypoxia causes catecholamine release and vasoconstriction; central cyanosis is a late and often pre-terminal sign of hypoxaemia (if the patient is anaemic, severe hypoxaemia may not cause cyanosis).

- ***Mental status***: agitation (an early sign), drowsiness, confusion and impaired consciousness at later stage .

PULSE OXIMETRY

- **Definition**:

It is a simple, non-invasive bedside method of measuring arterial oxygen saturation in peripheral blood vessels, expressed as *S*pO2 . It measures the extent to which haemoglobin is saturated with oxygen.

PULSE OXIMETRY

- The pulse oximeter probe consists of two light-emitting diodes (one red and one infrared) on one side of the probe. These emit red and infrared light via a relatively translucent area of the body .

- Then it detect the amount of light passing through the capillary bed . The ratio of infrared light absorbed by oxyhaemoglobin and the red light absorbed by haemoglobin provides the data used to calculate the *S*pO2 .

Normal values for oxygen saturation

- Oxygen saturation targets in the acutely ill patient should be 94–98% or 88–92% in those patients at risk of hypercapnia, e.g. COPD . Lower levels sometimes accepted in certain clinical conditions


COVIDIEN
Nellcor
SpO₂
%
100
90
100
85
Pulse
BPM
60
170
30

Procedure for pulse oximetry

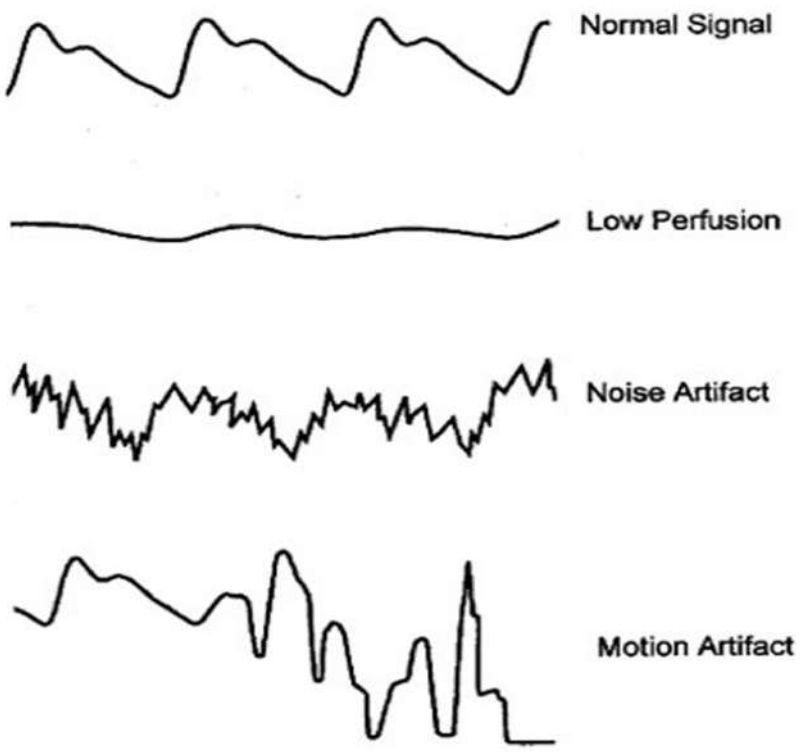
The following preliminary points should be observed:

- Wash and dry hands
- Ensure that the probe is clean
- Remove nail varnish or artificial nails
- Explain the procedure to the patient.

Select an appropriate site bed. These include finger (most popular), ear lobe, toe.

Apply the probe without pressure and take the reading when you have the pulse oximetry wave form.

Pulse oximeter wave form



Cardiovascular monitoring

ECG MONITORING

- Electrocardiograph (ECG) monitoring is one of the most valuable diagnostic tools in modern medicine. It is essential if disorders of the cardiac rhythm are to be recognised, and can help with diagnosis and alert health-care staff to changes in a patient's condition.
- Details of ECG abnormalities are already discussed in previous lectures.

Cardiovascular monitoring

ECG monitoring Procedure:

*Explain the procedure to the patient.

*Ensure adequate skin preparation.

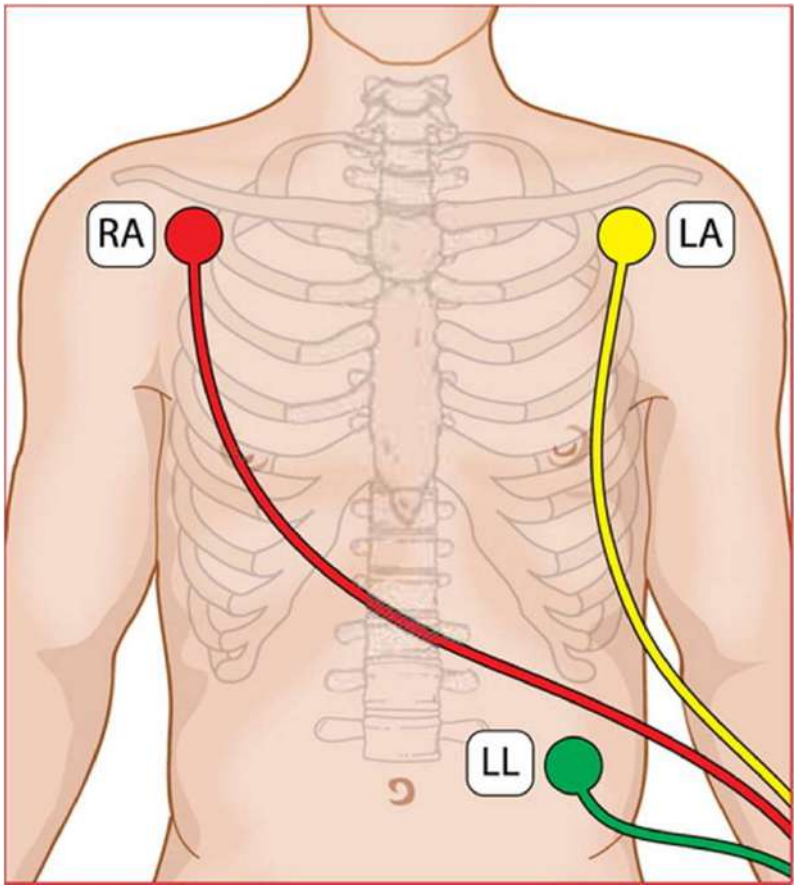
*Use ECG electrodes that are in date, with moist gel sponge.

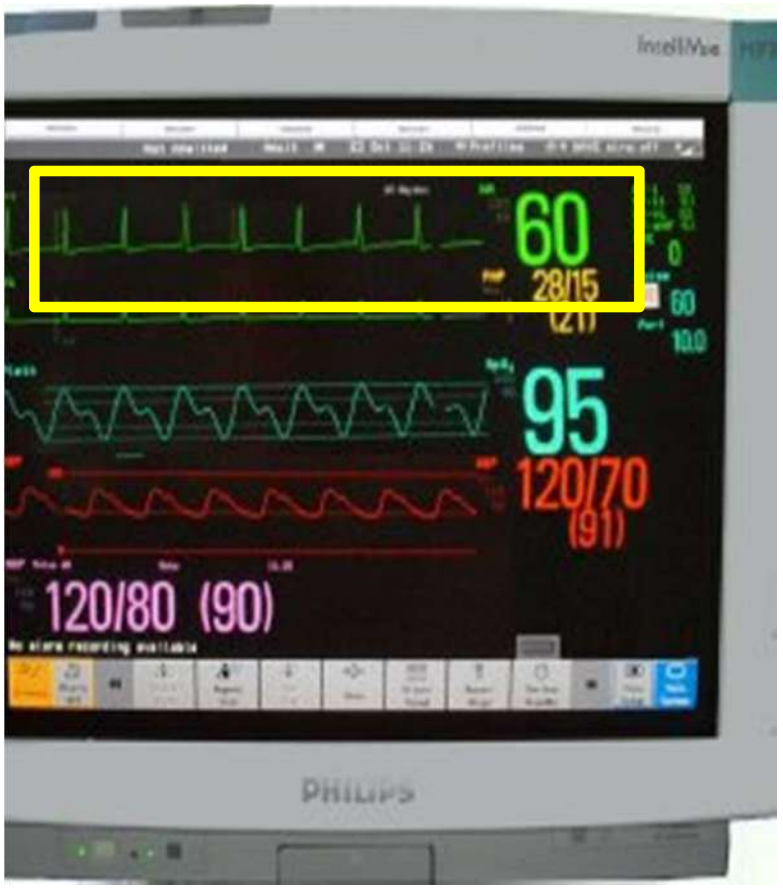
*Position ECG electrodes and select monitoring lead

*Set cardiac monitor alarms according to the patient's clinical condition.

*Ensure that the ECG trace is accurate.

*Ensure that the cardiac monitor is visible to the staff .


RA
LA
LL


60
28/15
95
120/70
(91)
120/80 (90)
PHILIPS

Arterial blood pressure measurements

- Arterial blood pressure (ABP) is the force exerted by the circulating volume of blood on the walls of the arteries.
- Changes in cardiac output or peripheral resistance can affect the blood pressure. A patient with a low cardiac output can maintain a normal blood pressure by vasoconstriction, whereas a patient who is vasodilated may be hypotensive despite a high cardiac output, e.g. in sepsis.

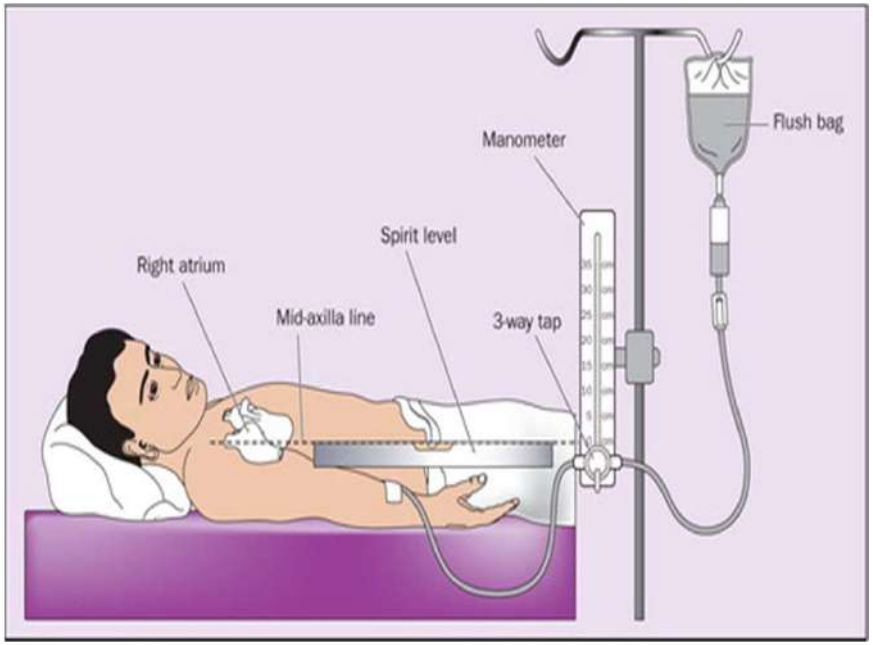
Factors affecting accuracy of blood pressure measurements

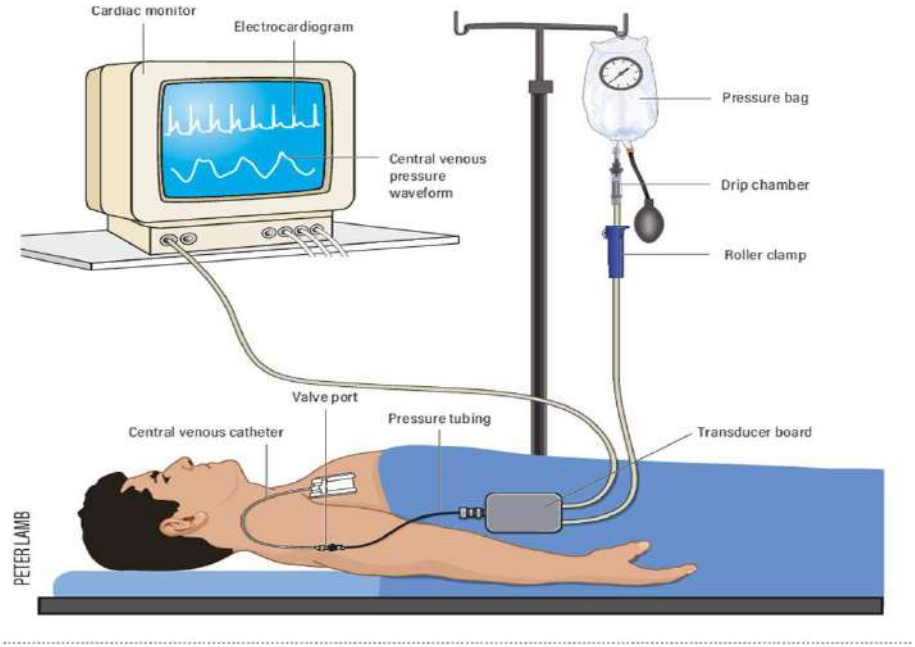
- *Cuff width*: if this is too narrow the blood pressure reading will be falsely high whereas if it is too wide it will be falsely low .
- *Position of the arm*: the arm should be supported in a horizontal position at the level of the heart.
- *Deflating the cuff too quickly:* cuff should be deflated at 2–3 mm/beat

CENTRAL VENOUS PRESSURE MONITORING

- Central venous pressure reflects right atrial filling pressure and aids assessment of right intra-ventricular volume and right side heart function .
- The normal CVP is 8–12 mmHg.
- A low CVP reading usually indicates hypovolaemia whereas a high CVP reading has a number of causes, including hypervolaemia, cardiac failure and pulmonary embolism.

CVP monitoring old and new method





SCALE

TRNSDUCER

Complications of Central venous line

- Malposition of the catheter or wire
- Carotid artery puncture
- Pneumothorax.
- Haemorrhage
- Infection
- Air embolus.
- Thrombosis
- Ventricular injury
- Cardiac arrhythmias

Neurological function monitoring

- Glasgow coma scale .
- Pupil shape, size, symmetry, and reaction to light.
- Intracranial pressure monitoring.

Use neuro- observation chart.

Glasgow Coma Scale

EYE OPENING			VERBAL RESPONSE			MOTOR RESPONSE		
								
Spontaneous	>	4	Orientated	>	5	Obey commands	>	6
To sound	>	3	Confused	>	4	Localising	>	5
To pressure	>	2	Words	>	3	Normal flexion	>	4
None	>	1	Sounds	>	2	Abnormal flexion	>	3
			None	>	1	Extension	>	2
						None	>	1

GLASGOW COMA SCALE SCORE

Mild	Moderate	Severe
13-15	9-12	3-8

NEUROLOGICAL OBSERVATIONS

Unit Record Number:

Family Name:

Given Names:

Date of Birth:

Age:

Sex:

Room No:

OR USE LABEL

GLASCOW COMA SCALE (GCS)

DATE:

TIME: 24 HR CLOCK

RECORD TO NEAREST

EYES OPEN RECORD OBS AS SERIES OF DOTS OR AS INDICATED EYES CLOSED BY SWELLING = C	SPONTANEOUSLY	4
	TO SPEECH / NAME	3
	TO PAIN	2
	NONE	1
BEST VERBAL RESPONSE ENDOTRACHEAL TUBE OR TRACHEOSTOMY = T	ORIENTATED	5
	CONFUSED	4
	INAPPROPRIATE	3
	INCOHERENT	2
	NONE	1
BEST MOTOR RESPONSE USUALLY RECORDED BEST ARM RESPONSE	OBEY COMMAND	6
	LOCALISE PAIN	5
	WITHDRAWS	4
	ABNORMAL FLEXION	3
	EXTENSION	2
	NONE	1
CIRCLE SIZE INDICATE R = L	TOTAL SCORE	

PUPIL SCALE (mm)

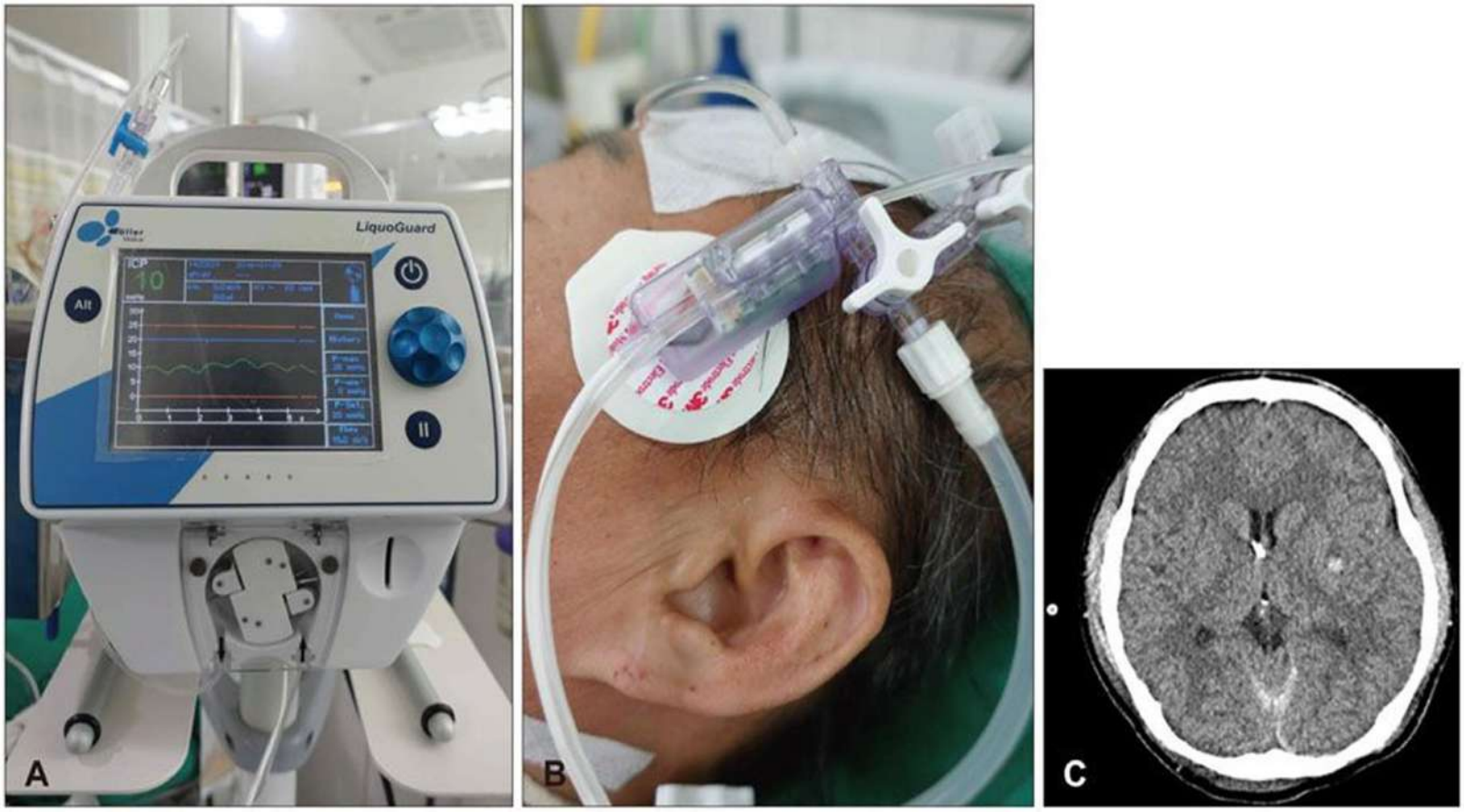
•	1
●	2
●	3
●	4
●	5
●	6
●	7
●	8

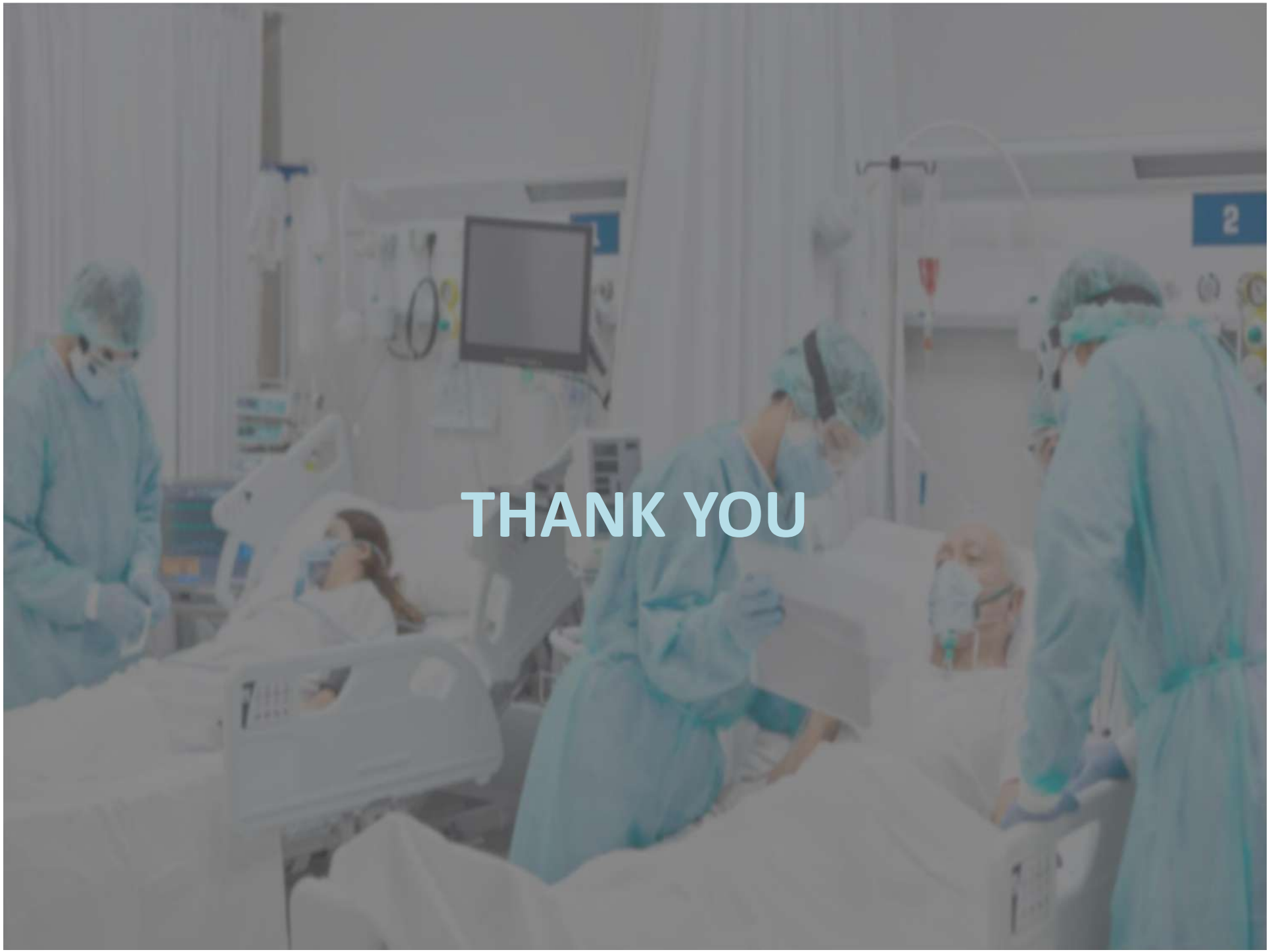
TPR	210
	200
	190
	180
	170
BLOOD PRESSURE	160
	150
	140
	130
	120
	110
	100
	90
PULSE RATE	80
	70
	60
	50
	40
	30
RESPIRATION	20
	10

PUPILS + REACTS S SLUGGISH - NO RESPONSE C EYE CLOSED	RIGHT	SIZE REACTION
	LEFT	SIZE REACTION

41	
40°	
39	
38	
37	
36	
35	
34	

INTRACRANIAL PRESSURE MONITOR

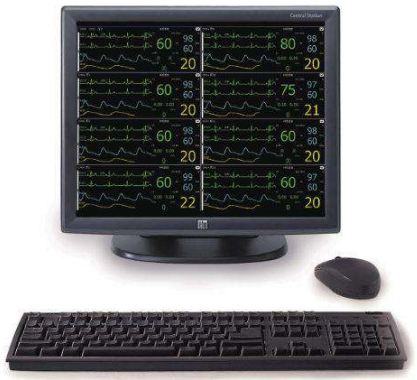



THANK YOU

Monitors in central monitoring station

Dr. Muddather A. Mohammed

Emergency physician



Agenda

- Definition
- Components
- Capabilities.
- Functions .

Central monitoring station system definition

- The central monitoring station system is a smart monitoring management system that connects a series of patient monitors together and back to a central monitor and even to hospital system.

Components

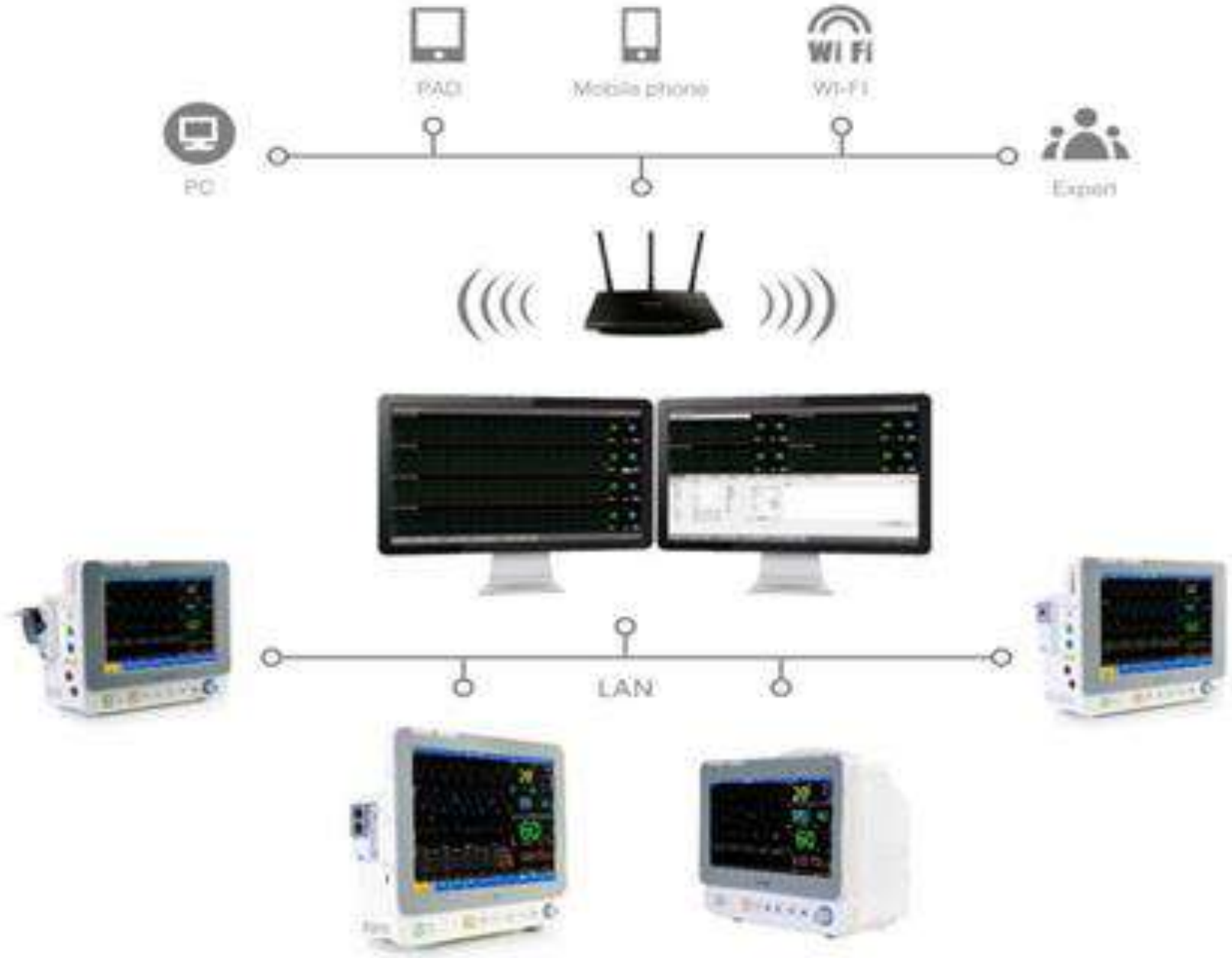
- It consist of multiple bedside multi- parameter patient monitors connected via connecting cables or wireless connection to central nursing station and can be also connected to hospital server system.
- All parameters of the patients monitors can be displaced on the central station allow real time observation of patient parameters. In wave form and numbers

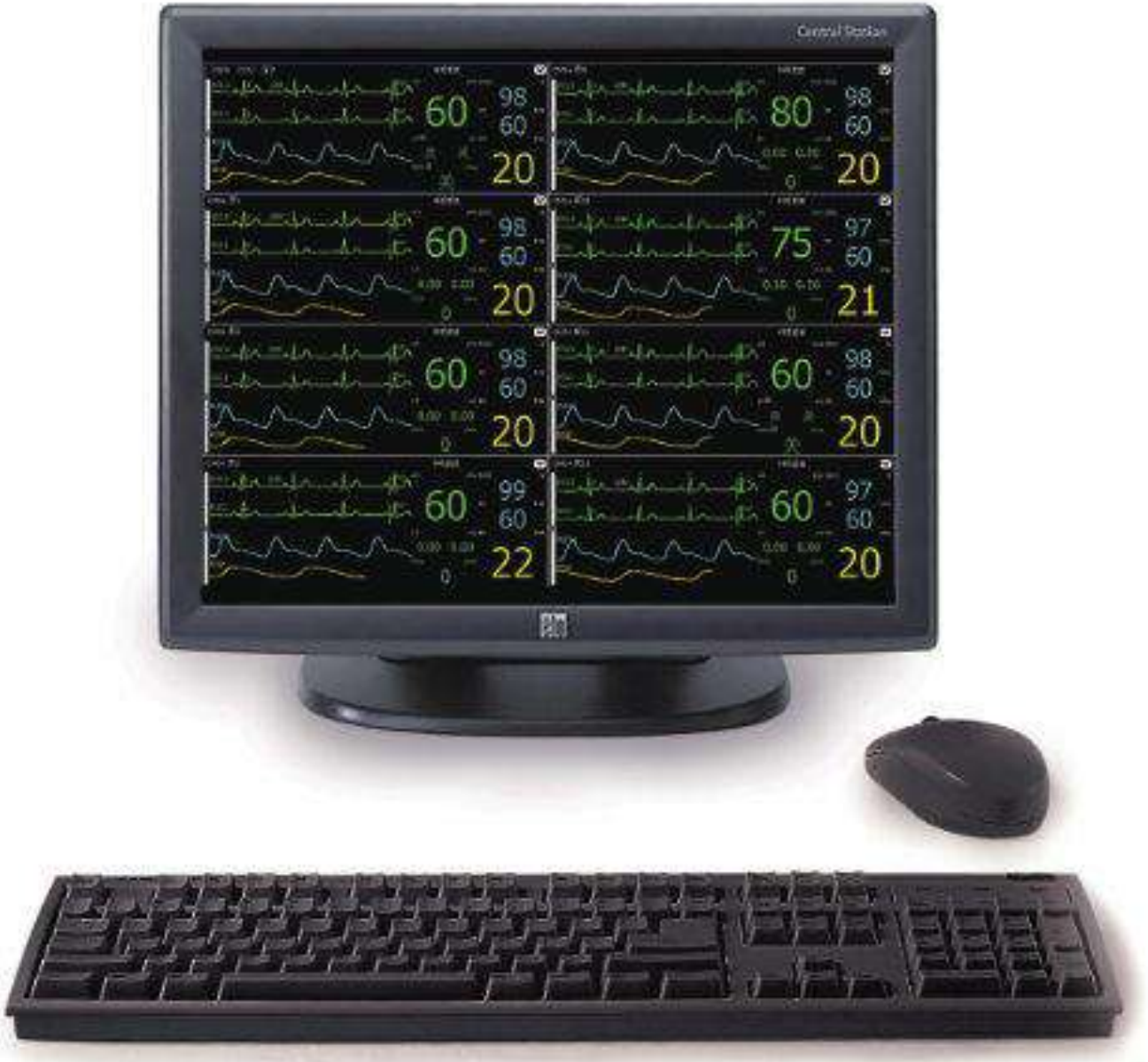
Central monitoring station system capabilities

- It has the capacity to connect number of bedside units together which means that members of icu can complete a ward check at a glance with patients real time data displayed at central station .
- Medical staff can review up to 240 hours of patient data.
- It has a user friendly Windows style interface which is supported by a networking system with wire or wireless networking.

Central monitoring station system capabilities

- It also has the feature of data transfer to the hospital's clinical information system.
- makes information accessible through WorkStations, ViewStations, PC’s (CMS Viewer) and even smartphones (MobileViewer)


PAD
Mobile phone
Wi Fi
Wi-Fi
PC
Expert
LAN


Central Station
60
98
60
20
80
98
60
20
60
98
60
20
75
97
60
21
60
98
60
20
60
98
60
20
60
99
60
22
60
97
60
20

Functions of central monitoring station system

- **Provides 240 hours of waveforms and trend data**
- **An entirely scalable solution with a variety functions and display setups Workstations allow users to view, edit and interact with networked patient monitors.**
- **With CMS Viewer, clinicians can remotely access patient data from any PC or laptop.**
- **Real-time patient data can be viewed on a smartphone (iOS or Android) with the CMS Mobile app.**
- **Capability of activation of alarm display and record.**

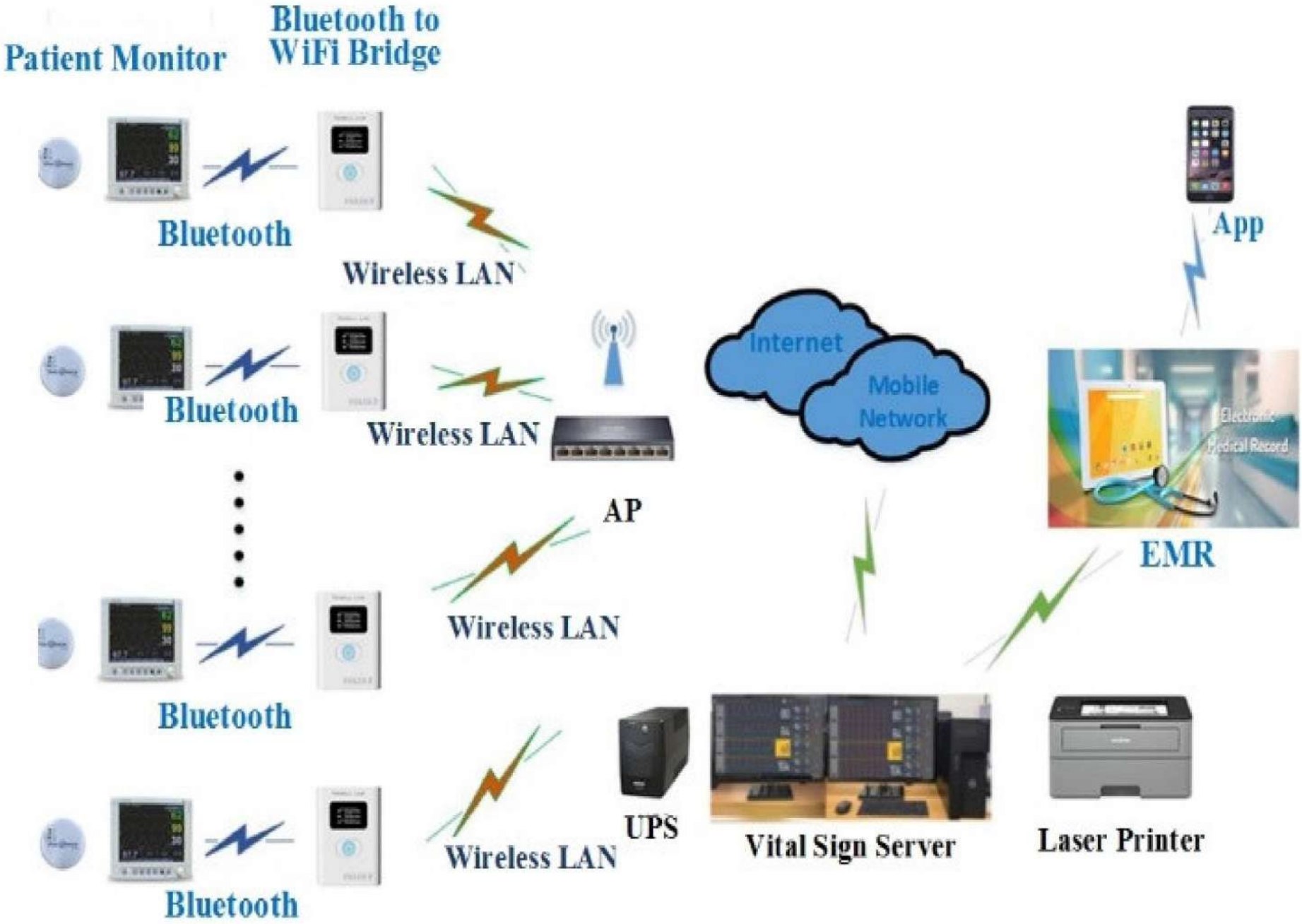
Functions of central monitoring station system

- Provides continuous real-time access and surveillance to patient monitoring data .
- Safe and secure central data store

- Up to 48-hour backup mechanism guarantees no loss of patient data.

- One CMS server supports up to 32 workstations, up to 128 monitoring devices.


TEND
H.CLINICA
SILENCIAR
GUARDAR
Nom. Pac
CERRAR
VIS. CURVAS
Gan.ECG
Gan.RESP
PRES
SI
RESP
SI
ALARMA de F.C.
MAX 120
MIN 40
ALARM. de PRESION
MAX 180
MIN 60
ALARMA de RESP.
MAX 50
MIN 5
SAMSUNG


Patient Monitor
Bluetooth to WiFi Bridge
Bluetooth
Wireless LAN
App
Bluetooth
Wireless LAN
Internet
Mobile Network
Electronic Medical Record
AP
EMR
Wireless LAN
Bluetooth
UPS
Vital Sign Server
Laser Printer
Wireless LAN
Bluetooth


EXIT
STOP
CPOE is now in


THANK YOU

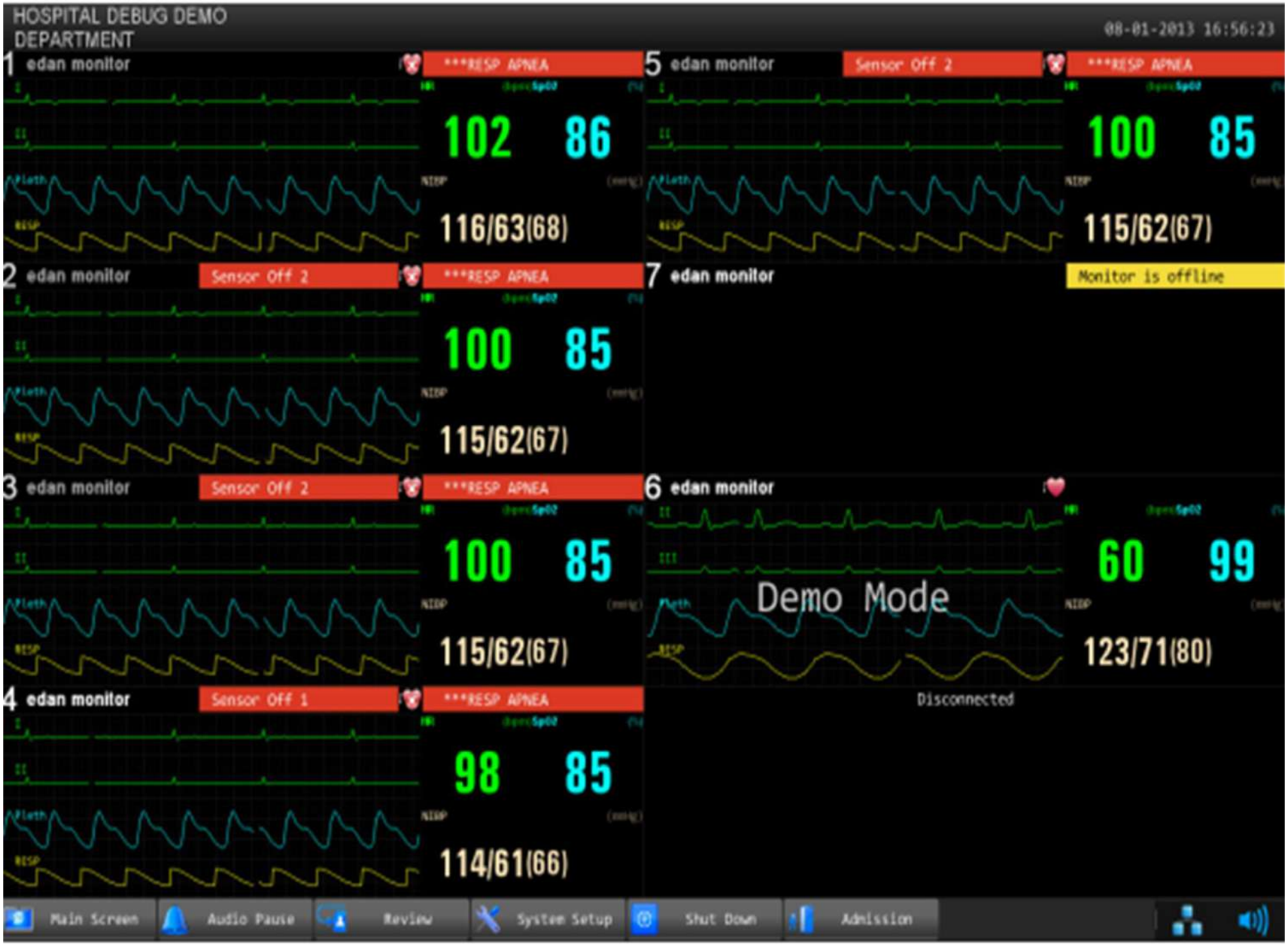
Monitors in central monitoring station II

Dr. Muddather A. Mohammed
Emergency physician

Display

- The main screen has three areas. At the top of the screen is the area displaying the system prompt information.
- The middle part is the main monitoring area.
- The bottom part is the system menu area.

Then different screens can be displayed according to the need


HOSPITAL DEBUG DEMO
DEPARTMENT
08-01-2013 16:56:23
1 edan monitor
***RESP APNEA
102 86
116/63(68)
2 edan monitor
Sensor Off 2
***RESP APNEA
100 85
115/62(67)
3 edan monitor
Sensor Off 2
***RESP APNEA
100 85
115/62(67)
4 edan monitor
Sensor Off 1
***RESP APNEA
98 85
114/61(66)
5 edan monitor
Sensor Off 2
***RESP APNEA
100 85
115/62(67)
7 edan monitor
Monitor is offline
6 edan monitor
60 99
Demo Mode
123/71(80)
Disconnected
Main Screen
Audio Pause
Review
System Setup
Shut Down
Admission


HOSPITAL DEBUG DEMO
DEPARTMENT
08-01-2013 17:01:03
1 edan monitor
***NIBP DIA High
HR (bpm) SpO2 (%) NIBP (mmHg)
94 61 114/97(69)
2 edan monitor
Sensor Off 2
*VFIB/VTAC
HR (bpm) SpO2 (%) NIBP (mmHg)
92 61 113/96(68)
3 edan monitor
Sensor Off 1
**AEP Low
HR (bpm) SpO2 (%) NIBP (mmHg)
90 61 112/95(67)
4 edan monitor
Sensor Off 1
**AEP Low
HR (bpm) SpO2 (%) NIBP (mmHg)
90 61 112/95(67)
5 edan monitor
Sensor Off 2
*VFIB/VTAC
HR (bpm) SpO2 (%) NIBP (mmHg)
92 61 113/96(68)
7 edan monitor
Monitor is offline
6 edan monitor
HR (bpm) SpO2 (%) NIBP (mmHg)
60 99 123/71(80)
Disconnected
Main Screen
Audio Pause
Review
System Setup
Shut Down
Admission


Test Hospital
Current Time:12-20-2011 17:25:36
CO lead off
ST_AVR HOH
I
II
PLETH
HR (bpm) SpO2 (%
63 60
NIBP (mmHg) PR (bpm
62 / 46
(87)
72
Group 1
System Setup
Logout


HOSPITAL DEBUG DEMO
DEPARTMENT
08-01-2013 17:13:44
1 edan monitor
Sensor Off 2
***RESP APNEA
80
62
100/80(60)
2 edan monitor
Sensor Off 2
***RESP APNEA
80
62
100/80(60)
3 edan monitor
Sensor Off 1
***RESP APNEA
78
62
99/79(59)
4 edan monitor
Sensor Off 2
***RESP APNEA
80
62
100/80(60)
5 edan monitor
Sensor Off 1
***RESP APNEA
78
62
99/79(59)
7 edan monitor
Monitor is offline
6 edan monitor
Demo Mode
60
99
123/71(80)
Disconnected
Patient Mgmt
Single Bed View
Wave Review
Alarm Review
Trend Review
NIBP Review
Parameter/Waveform Setup
12-L Review
Alarm/NIBP Setup
Full Screen
Print
NO.
1
/ 1
SIZE
100%
Close
Wave Review
Main Screen
Audio Pause
Review
System Setup
Shut Down
Admission

Drug Calculation

From the **Drug** drop-down list, you can select one to calculate its amount, liquid volume, concentration, etc.

- Drug A
- Drug B
- Drug C
- Drug D
- Drug E
- EPINEPHRINE
- HEPARIN
- ISUPREL
- LIDOCAINE
- NIPRIDE

Drug A, Drug B, Drug C, Drug D and Drug E are user-defined drugs.

The calculation procedure is listed below:

1. Confirm whether the patient type is correct and the weight is entered.
2. Select a drug to be calculated from the drug list.
3. Input correct parameter values under the direction of a doctor.
4. Select **Basic, Dose Type** and **Step** for titration table.
5. Click on the **Calc** button, the calculation result will be displayed in the drug parameter area and titration table.

Maintenance and safety

1- Read the manual prior to using the system.

2- The system should be used within temperature from +5℃ to +40℃ .

3- Keep the environment clean. Avoid vibration. Keep it far from corrosive reagents, dust areas, high-temperature and humid environment.

4- The user must check that the equipment, cables and transducers do not have visible evidence of damage that may affect patient safety or monitoring capability before use.

The recommended inspection interval is once per week or less. If damage is evident, replacement is recommended before using it.

5 -Turn off the system power before connecting or disconnecting any accessory to the system

6- do not operate the system if it is not operating normally or requires service.

7- Turn off the system power and remove the power cable before maintaining the system.

8- Preventive maintenance of the system including periodic cleaning and appearance checking can be finished by the user because this maintenance does not touch the interior.

9- Avoid using corrosive material to clean. Removing all dust from the exterior surface of the equipment with a with a soft cloth, slightly dampened with a mild detergent solution or cool disinfector.

10- Avoid pouring liquids on the equipment while cleaning, and do not immerse any parts of the equipment into any liquids

Alarm system and devices

Dr. Muddather A. Mohammed

Emergency physician

Introduction

- “One needs only to step onto any busy hospital unit to hear a cacophony of alarms. Alarms that are deactivated or ignored are a serious concern and have resulted in patient deaths. We need an interdisciplinary approach that addresses both false and non-actionable alarms to restore a safe care environment.”

Marjorie Funk, PhD, RN, FAHA, FAAN

Professor, Yale University School of Nursing

Definition of alarm

- English (‘to arms!’): from Old French alarme, from Italian allarme, ‘to arms!’, to call for help.
- Medical alarm is a warning signal such as a loud noise or flashing light that gets your immediate attention
- Alarm system or device is the device that produces the alarm signal visual or audio or both.

Nurse call system

- Definition

It is a system that allow a patient to call or contact nursing staff and enables healthcare professionals to provide exceptional care.

Nurse call system

- **It consists of**

1- Patient room devices as :

bedside call station

pillow speaker

Call cord

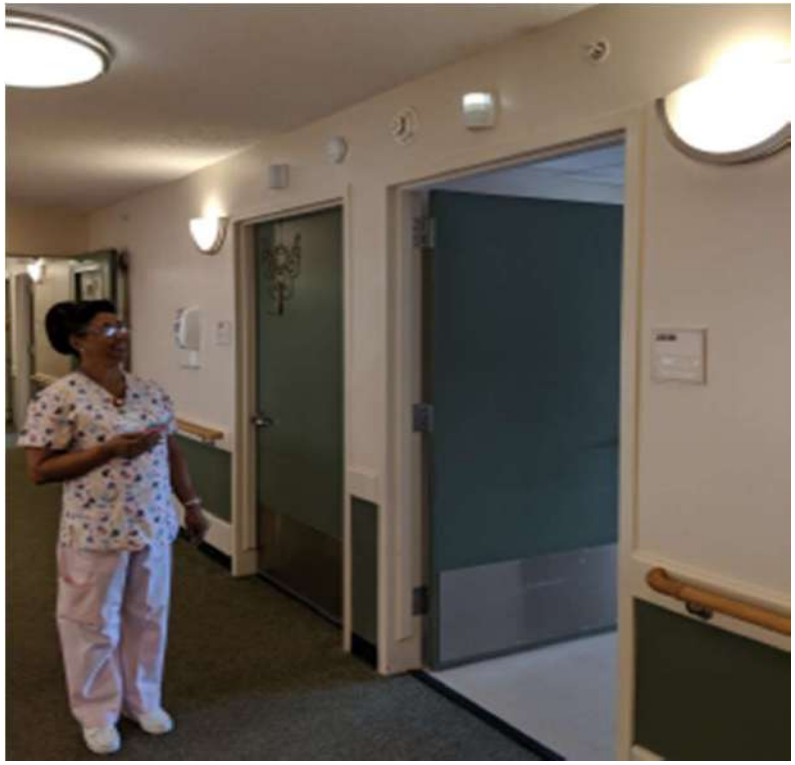
Bathroom station

Code station

Nurse call system

2- Dome Light/Corridor Light

- **The dome light is typically located outside of patient site.**
- **The dome light alerts staff to the correct location of where the call's response.**
- **These lights use multi-colored LEDs to communicate a variety of different information to indicate the type of caregiver needed in the room**



Nurse call system

3- Nurse Console

- The nurse console is typically located at the local nursing station .
- The console receives all calls that are placed within the ward .
- It demonstrate patients needs as well as allowing staff to start workflows in organized manner.

Nurse call system

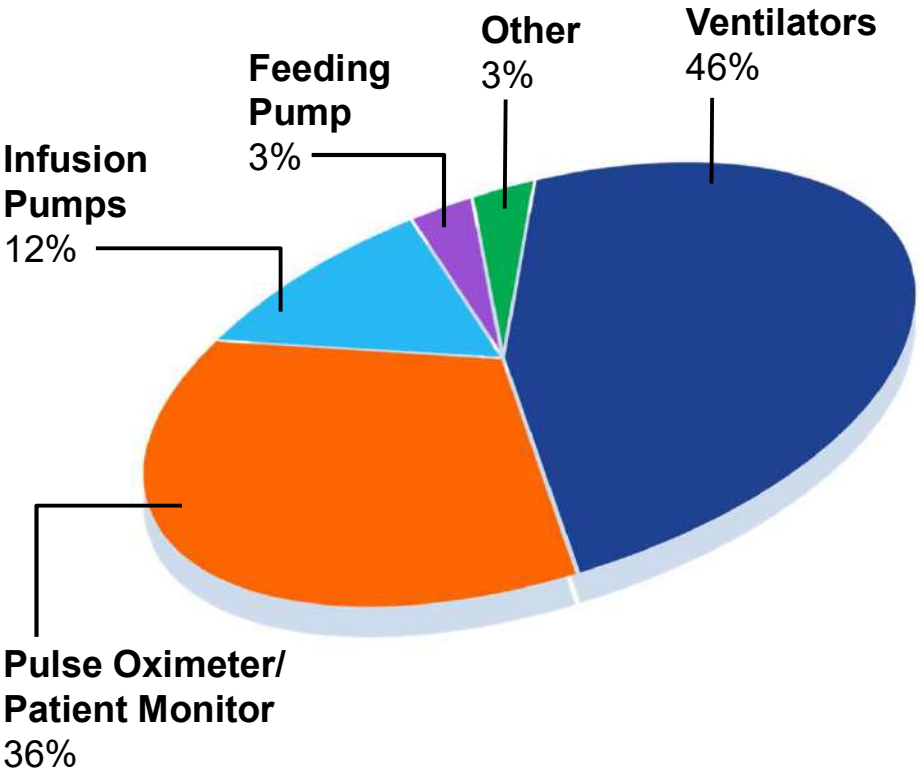
Medical devices alarms

Aim of medical devices alarms

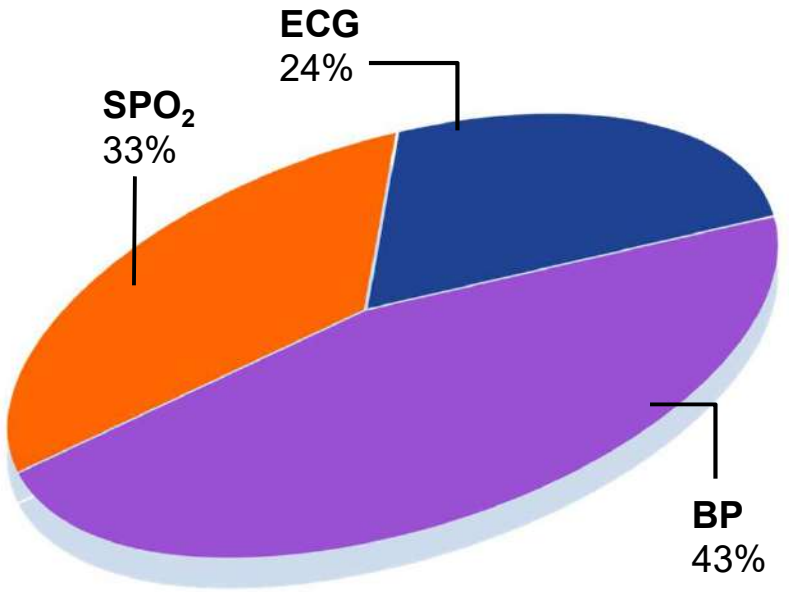
- Alarms are intended to call the attention of caregivers to patient or device conditions that deviate from a predetermined ‘normal’ status.

Major sources of alarms

Types of clinical devices that alarm



Types of patient monitor alarms



Definition of Terms:

- ***High Risk Clinical Alarms Condition***
  - A medical condition that is considered immediate life threatening to a patient if actions are not taken.

- ***Critical Alarms***
  - Alarms on medical equipment are designed to alert staff to the presence of a life-threatening condition.

Definition of Terms:

- ***Non-Critical Alarms***
  - **Alarms on medical equipment are designed to alert staff to the presence of a non-life threatening condition.**
    - ***Low Risk*: Non-life threatening but needs attention**
    - ***Moderate Risk:* Potential for harm if the issue causing the alarm is not acted upon.**

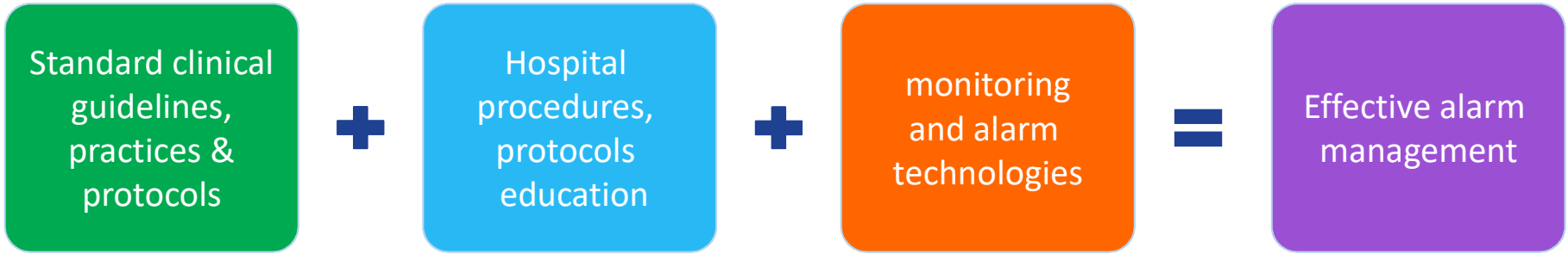
High Priority Clinical Risk Alarms:

Higher Priority Clinical Risk Alarms have been identified as follows:

1. **BiPap**
2. **Cardiac Monitor**
3. **Fetal Monitors**
4. **IV Pumps, syringe pumps**
5. **Pulse Oximetry**
6. **Ventilators**

Effective alarm management

•Effective alarm management initiatives are built on coordinated strategies that combine staff training, evidence-based procedures and protocols, and appropriate monitoring and alarming technologies, which meet the needs of specific patient conditions.



Policy and Procedure on Clinical Alarms

1. Critical alarms on clinical monitoring and intervention systems will be maintained in the “on” position and will be sufficiently audible to the staff.
2. Non-critical alarm parameters will be set either to the default settings established by the manufacturer or as clinically warranted based on the patient’s condition.
3. Operational functionality of medical device alarms will be checked in according to the manufacturer instructions as part of the equipment’s biomedical preventative maintenance and repair program.

Policy and Procedure on Clinical Alarms

4. Staff training on proper operation of medical devices will include the identification and verification of critical alarms and settings.

5. A cross-disciplinary team that includes representation from clinicians, clinical engineering, information technology, and risk management will meet as needed.

Alarm fatigue

- Alarm fatigue may occur when the sheer number of monitor alarms overwhelms clinicians, possibly leading to alarms being disabled, silenced, or ignored.

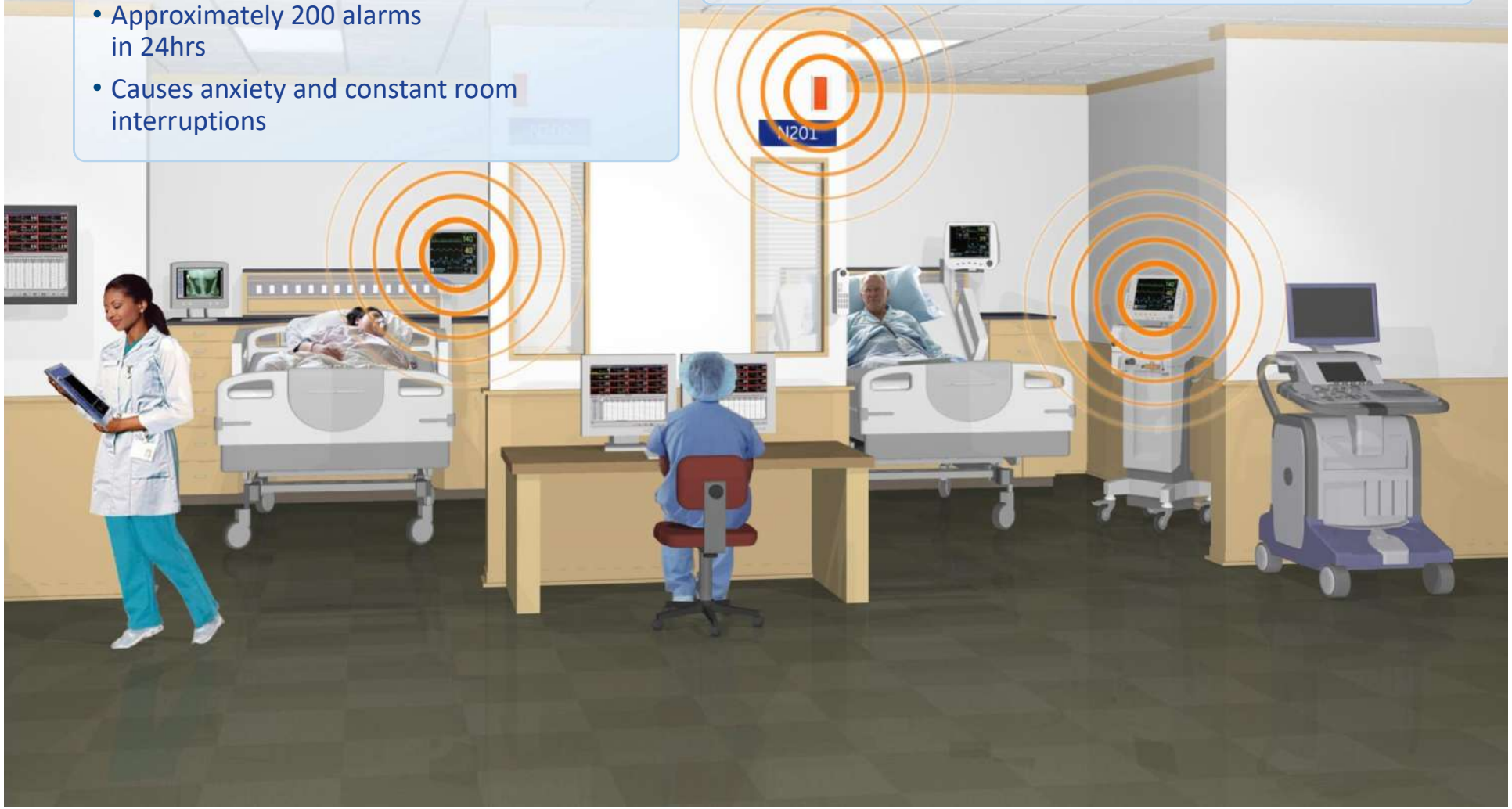
Affects everyone

Patient and family

- Approximately 200 alarms in 24hrs
- Causes anxiety and constant room interruptions

ICU Nurses

- Approximately 1,000 alarms in a week
- Disrupts patient care, can reduce trust in alarms, delay in reaction time or reduce probability of responding




Thank you
CareFusion
MedSystem III
STOP
CHARGE
A
B
C

Medical records

Dr. Muddather A. Mohammed

Emergency physician

RECORDS OF INTENSIVE CARE UNIT

Types

1. Paper based records.

2. Electronic medical records .

Paper based medical records

- The medical record

is an account of the personal and medical history of the patient, findings of medical examination, results of diagnostic tests, treatment and nursing care, daily progress notes and charts also advice on discharge.

- Documentation in the ICU is carried out for a number of reasons. It ensures continuity of care and provides up-to-date patient status.
- The intensive care staff has to be highly skilled today due to technological advances and complex care of the critically ill patients.
- Also the documentation of care required are complex and time consuming

Principles of Record Writing

- clinical record is a legal document, it is essential that they should be written clearly, accurately, appropriately and legibly.
- All entries should be signed by the individual who writes them.
- Care to be taken, not to make any errors on the records. If anything is crossed out, it should be dated and initialed.

- Records should be written in chronological order as to date and time.
- When recording medications and treatments, note exact time and date on which they are carried out.

- Each page of the record should be properly identified with the name, age, I.P. No., O.P No., date ect.

- only standard abbreviations should be used .

- Records should be truthful, brief and complete. It should include all the services given to the patients, the observations made on the patient , charts, and the results of treatment etc.

Types of ICU Records

1-Patient records

for example

Bio data of the patient, Diagnosis, history, physical exam, investigations, Treatments & medications, Progress notes and
Summary made at the discharge of the patient

PATIENT INFORMATION FORM

NAME_____ SS#_____

ADDRESS_____

CITY_____ STATE_____ ZIP CODE_____

HOME PHONE # ( )_____ WORK PHONE # ( )_____

BIRTHDATE_____ MALE[ ] FEMALE[ ] MARITAL STATUS _____

INSURANCE INFORMATION ** (PROVIDE COPIES OF CARDS) ******

PRIMARY INSURANCE_____ PRE-CERT/ REF #_____

GROUP NUMBER_____ ID NUMBER_____

SUBSCRIBER_____ EMPLOYER:_____

BIRTHDATE_____ SS#_____

RELATIONSHIP TO PATIENT: [ ] SELF [ ] SPOUSE [ ] PARENT [ ] OTHER_____

SECONDARY INSURANCE_____ PRE-CERT/ REF #_____

GROUP NUMBER_____ ID NUMBER_____

SUBSCRIBER_____ EMPLOYER:_____

Dartmouth-Hitchcock
MEDICAL CENTER
One Medical Center Drive, Lebanon, NH 03756

Pre-Procedure History & Physical Examination

Addressograph

History & Physical completed by: ❑ DHMC Staff Clinician ❑ non-DHMC Staff Clinician

Chief Complaint/Diagnosis: _____ Patient Age: _____ Code Status: _____

Planned Procedure: _____

History of Present Illness: _____

Medical/Surgical History: _____

Family History: _____

Social History: _____

Advanced Care Planning: _____

(Write name of Durable Power of Attorney for Health Care or patient's preferred medical decision-maker and relationship to patient.)

Advise patient that this named person would be asked to give medical consent on behalf of the patient to all medical treatments related to the current Operative or Major Diagnostic or Therapeutic Procedure identified above. This named person's authority will only exist when the patient is unable to make his/her own medical decisions. Consideration should be given to postponing procedures under circumstances in which no medical decision-maker is identified.

Drug/Latex Allergies/Sensitivities: _____

❑ ADR/Allergies List reviewed and updated in EMR

❑ No known allergies

Current Medications: _____

❑ Medication list reviewed and updated in EMR

Review of Systems (ROS)

1) Pertinent positive findings: _____

❑ None

2) Remaining ROS (including: Cardiovascular, Respiratory, Gastrointestinal, Genitourinary, Musculoskeletal, Neurological, Psychiatric, Endocrine, EENT): _____

❑ All negative

New Jersey Department of Military and Veterans Affairs

New Jersey Veterans Memorial Homes (VMH) at Paramus - Menlo Park - Vineland

EMPLOYEE PHYSICAL EXAMINATION FORM

PAGE 2

Last Name:	First Name:	Middle Initial:	Today's Date:	Job Title:

DOB	Age	Sex	HT	WT	Temp.	Pulse	Resp.	B/P	Drug/Food Allergies

Vision: R 20/____ L 20/____ **Pupils:** Equal___ Unequal___ **Glasses/Lenses:** Y / N **Hearing:** ☐ Normal ☐ Impaired ☐ Hearing Aid

PHYSICAL EXAM	NORMAL	ABNORMAL	COMMENTS
1. **General Appearance / BMI**			
2. **Skin**			
3. **HEENT**			
4. **Teeth**			
5. **Neck**			
6. **Lungs**			
7. **Heart**			
8. **Abdomen**			
9. **GU System**			
10. **Musculoskeletal Functioning** (Full ROM to all extremities? History of injury to knees or hips?)			
11. **Back / Spine** (History of injury?)			
12. **Neurological** (Gross observation of gait, coordination, tremors, etc.)			
13. **Psychiatric** (tics, stuttering, nail-biting, cognition, orientation, affect, obvious personality disorders, etc.)			

Physician's review of person's medical history as recorded on reverse side of this form: _____

PPD / Mantoux Test for Tuberculosis: 1st Step Date: _____ Result: _____ 2nd Step Date: _____ Result: _____

Chest X-Ray: Date Performed: _____ Results: _____

THIS APPLICANT IS FIT FOR EMPLOYMENT: YES: _____ NO: _____ Deferred for Functional Capacity Evaluation: _____

_____ _____

Examining Physician's Signature Date Physical Examination Performed

2- Nurse's and caring staff notes:

they are a record of treatments and measures carried out by the nurses and caring staff, their effects, the observations made on the patient. Observation should be as specific and objective as possible.

510-112

NSN 7540-00-634-4123

MEDICAL RECORD

NURSING NOTES

(Sign all notes)

DATE	HOUR A.M.	HOUR P.M.	OBSERVATIONS Include medication and treatment when indicated
3 NOV 95	0800		25 y/o White Male admitted ambulant from GI clinic with diagnosis of duodenal ulcer. Presenting Complaint was intermittant epigastric pain. Complains of "mild" pain at present. In no acute distress. TPR 98°-86-16. BP 106/72. Scheduled for elective surgery on 6 Nov 95
			Sylvester Anderson CPT ANC

(Continue on reverse side)

PATIENT'S IDENTIFICATION *(For typed or written entries give: Name—last, first, middle; grade; rank; rate; hospital or medical facility)*

REGISTER NO.

WARD NO.

NURSING NOTES

Medical Record

STANDARD FORM 510 (Rev. 7-91)
Prescribed by GSA/ICMR, FIRMR (41 CFR) 201-9.202-1

3- Doctor's order sheet

The doctor's orders regarding the medication investigations, diet etc., are written on special sheets

☐ **STAT PHARMACY ORDER**
(Place X in Box)

Baptist Hospital of Miami

Do Not Use Abbreviations: U, IU, Q.D., Q.O.D., Trailing zero (X.0 mg), Lack of leading zero (.X mg), MS, MSO4 and MgSO4

DATE	TIME	DOCTOR'S ORDER SHEET *Use blank half point pen.*
		***Reminder:* Date, time all orders. Print name & ID # under signature.**

ONE SET OF ORDERS PER PAGE /
***MARK THROUGH BLANK LINES** / SCAN ALL ORDERS!*

Physician's Signature _____
AND
Print Name _____ **I.D. #:** _____

SCANNED
DATE: _____ **TIME:** _____ **INITIALS:** _____

Form # 496 Rev 11/06

4- Graphic observation charts

On this the temperature, pulse and respirations are written in a graphic form so that a slight deviation from the normal can be noted .

Other Information such as blood pressure, number of bowel movements, the body weight.

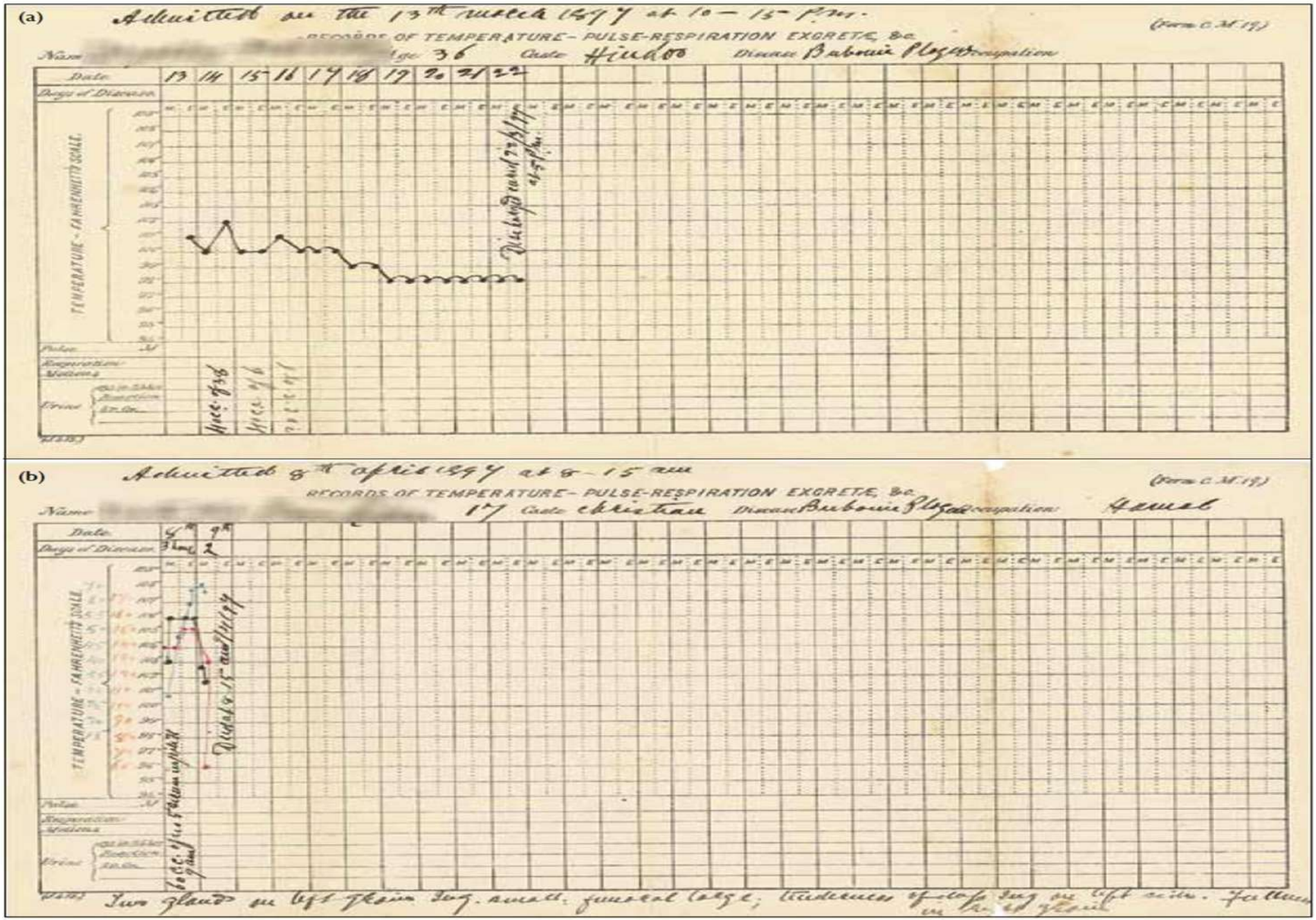
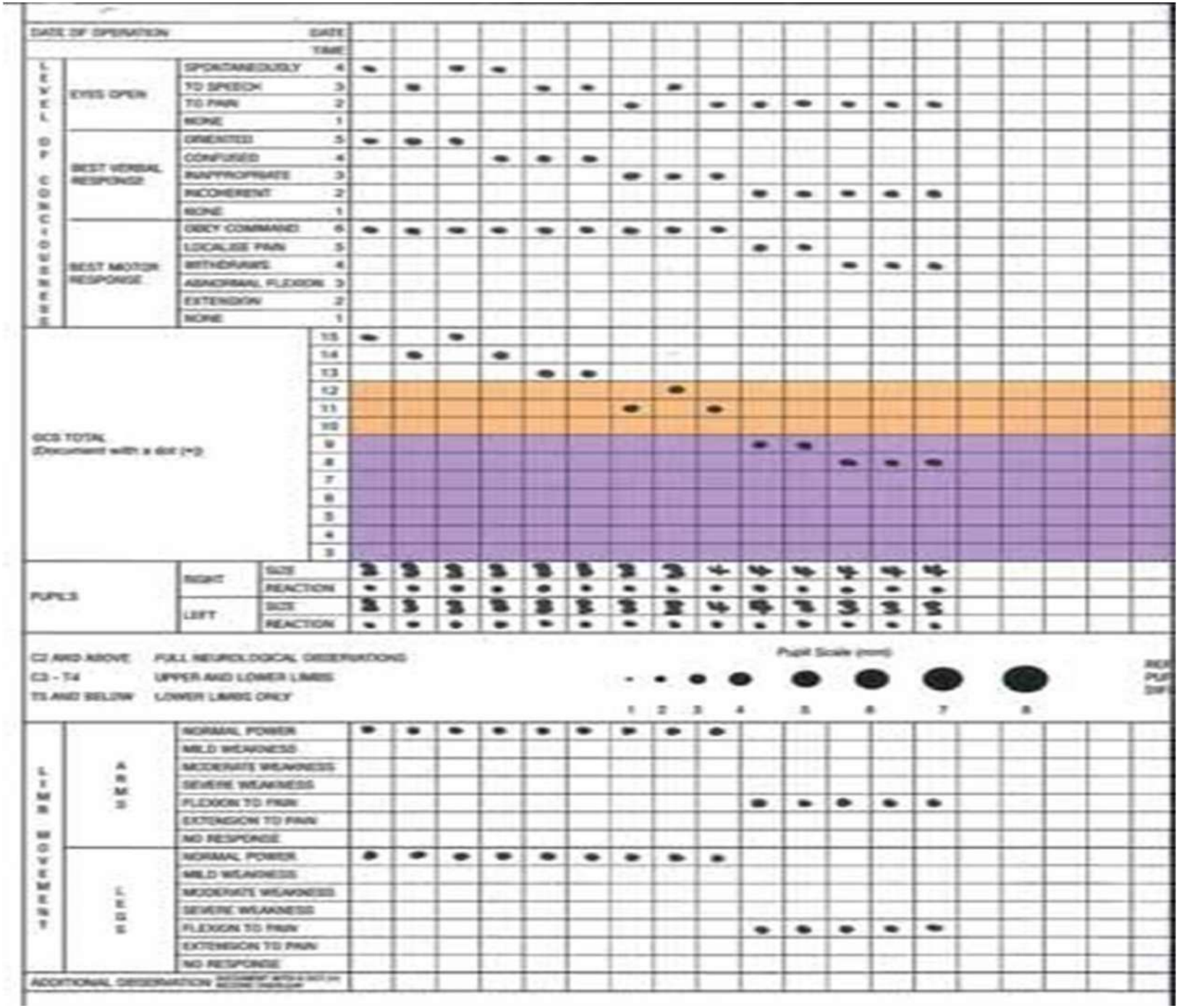


FIG. The temperature charts of two of the patients treated by Dr NH Chosky in Bombay in 1897; the patient in (a) recovered following three injections of plague antiserum, and the patient in (b) died without showing a response to the antiserum

The charts were donated to the Hong Kong Museum of Medical Sciences in 1996 by Mrs Ashburner, granddaughter of Dr James Lowson


DATE OF OPERATION
DATE
TIME
LEVEL OF CONSCIOUSNESS
EYES OPEN
SPONTANEOUSLY 4
TO SPEECH 3
TO PAIN 2
NONE 1
BEST VERBAL RESPONSE
ORIENTED 5
CONFUSED 4
INAPPROPRIATE 3
INCOHERENT 2
NONE 1
BEST MOTOR RESPONSE
OBEY COMMAND 6
LOCALISE PAIN 5
WITHDRAWS 4
ABNORMAL FLEXION 3
EXTENSION 2
NONE 1
GCS TOTAL
(Document with a dot (•))
15
14
13
12
11
10
9
8
7
6
5
4
3
PUPILS
RIGHT
SIZE
REACTION
LEFT
SIZE
REACTION
C2 AND ABOVE FULL NEUROLOGICAL OBSERVATIONS
C3 - T4 UPPER AND LOWER LIMBS
T5 AND BELOW LOWER LIMBS ONLY
Pupil Scale (mm)
1 2 3 4 5 6 7 8
LIMB MOVEMENT
ARMS
NORMAL POWER
MILD WEAKNESS
MODERATE WEAKNESS
SEVERE WEAKNESS
FLEXION TO PAIN
EXTENSION TO PAIN
NO RESPONSE
LEGS
NORMAL POWER
MILD WEAKNESS
MODERATE WEAKNESS
SEVERE WEAKNESS
FLEXION TO PAIN
EXTENSION TO PAIN
NO RESPONSE
ADDITIONAL OBSERVATION

5- Intake and output chart.

Patients on intravenous fluids or on the fluid diet, critically ill patients, post-operative patients, patients with oedema, patients having vomiting and diarrhoea, patients getting diuretics etc.,

should have their intake and output maintained and recorded on special chart.

North Tees and Hartlepool NHS
NHS Foundation Trust

Fluid Balance Chart (#2)

Name:
Address:
DOB:
CRN/ Hospital No:
NHS Number:

Ward: ..... Consultant: ..... Patient's weight: .....
Date Commenced: ..... Refer to Guidelines if chart is predominantly used for input only (e.g. Rehab)

Time	Intake: ml						Output: ml						
	Oral	IV (1)	IV (2)	Other		Running Total	Urine*	NG	Other (chest drain, etc) Vomit	Bowels		Running Total	Initials
24.00													
01.00													
02.00													
03.00													
04.00													
05.00	**Patient admitted to the ward here**												
06.00		1000								+			
07.00	SIPS	I					Pu'D		++	++			
08.00		I							++				
09.00	SIPS									+			
10.00	**Patient is being seen around now...**												
11.00													
12.00													
13.00													
14.00													
15.00													
16.00													
17.00													
18.00													
19.00													
20.00													
21.00													
22.00													
23.00													
Final Totals													

Total Intake **(A)**	Output Measurement			**Balance (A – D)**
	Output **(B)**	Insensible Loss **(C)** **600ml** or Calculated:_____	**Total Output (D)** (B&C Added)	This must not be left blank

Low urine output triggers EWS 4+ if patients are having hourly urine measurement and urine output is less than 30ml/hr for 3 hours in a row OR if the patient is catheterised and urine output is found to be less than 120 mls on four hourly emptying

6-Others

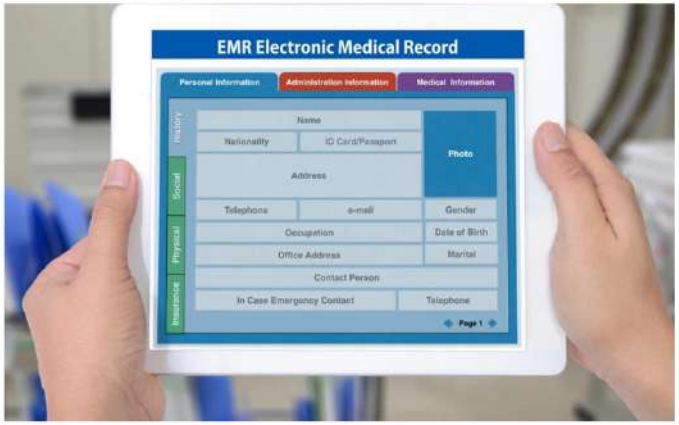
Reports of laboratory and imaging tests, ECG collection, Consent form for operations and anesthesia Reports of anesthesia, physiotherapy, and other special treatments.


Questions
Medical Record

Electronic Medical Record (EMR)

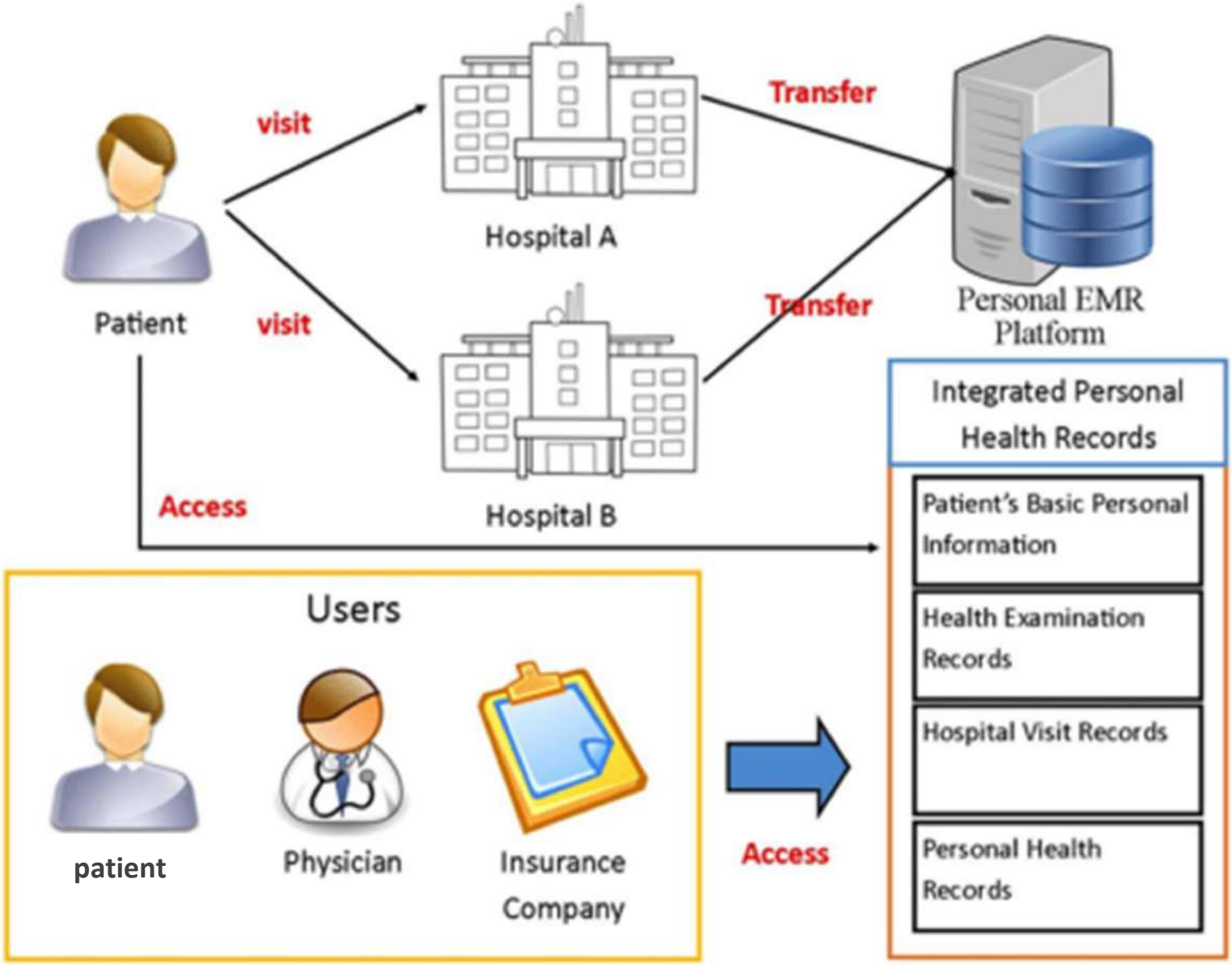
Dr. Muddather A. Mohammed

Emergency physician



Electronic medical records

- Is a medical record in digital format. It provides secure, real-time, patient information to aid clinical decision-making by providing access to a patient's health information . It is typically accessed on a computer over a network.


Patient
visit
visit
Hospital A
Hospital B
Transfer
Transfer
Personal EMR Platform
Access
Integrated Personal Health Records
Patient's Basic Personal Information
Health Examination Records
Hospital Visit Records
Personal Health Records
Users
patient
Physician
Insurance Company
Access

Purpose of EMR

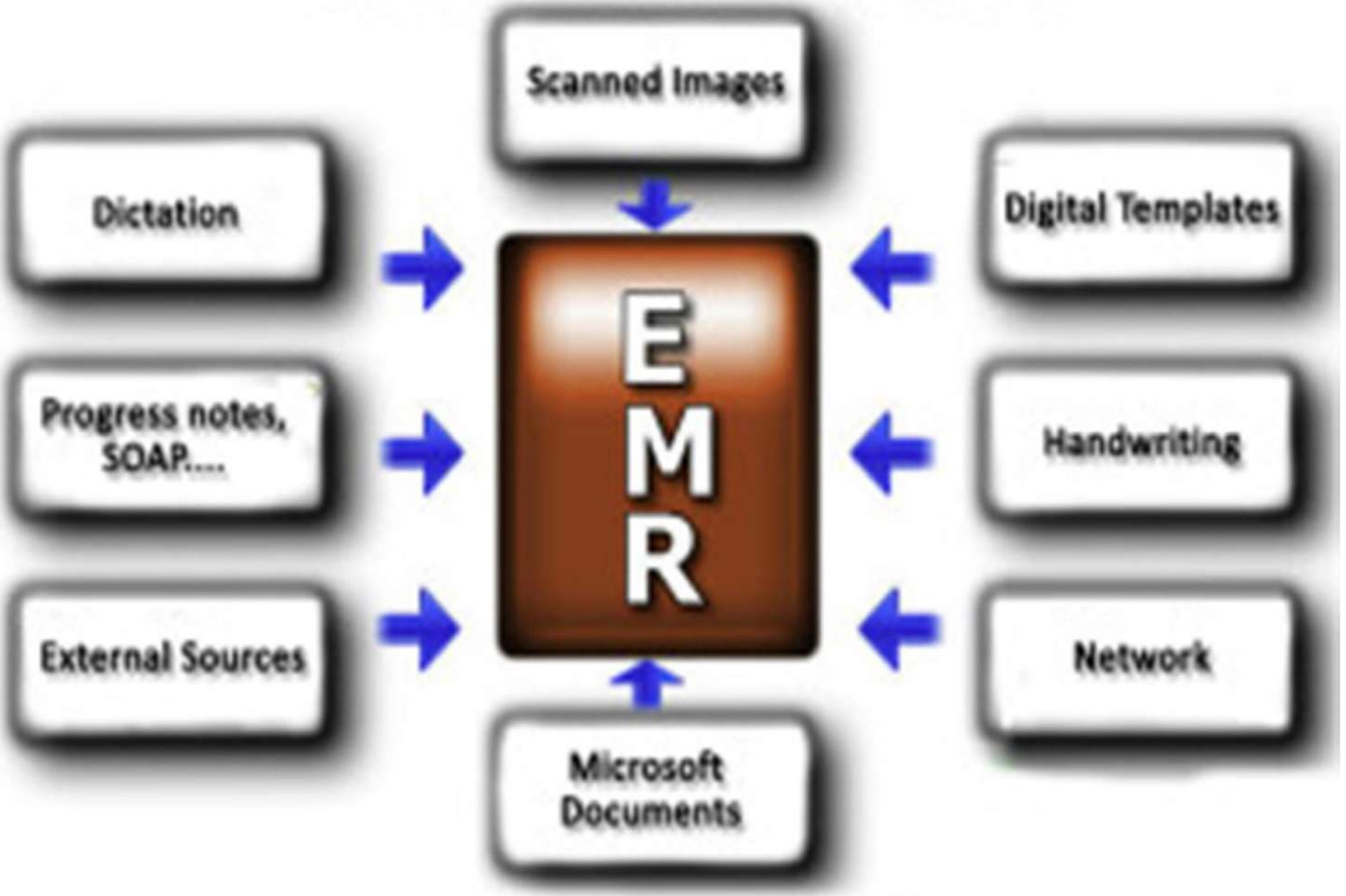
- Provide the electronic equivalent of the patient chart
- Bring together all of the data about a patient into a single source
- Support patient care and improve its quality
- Support and enhance physician decision making

- In this system data entered digitally by 2 sources:

1- Manually e.g. through key board .

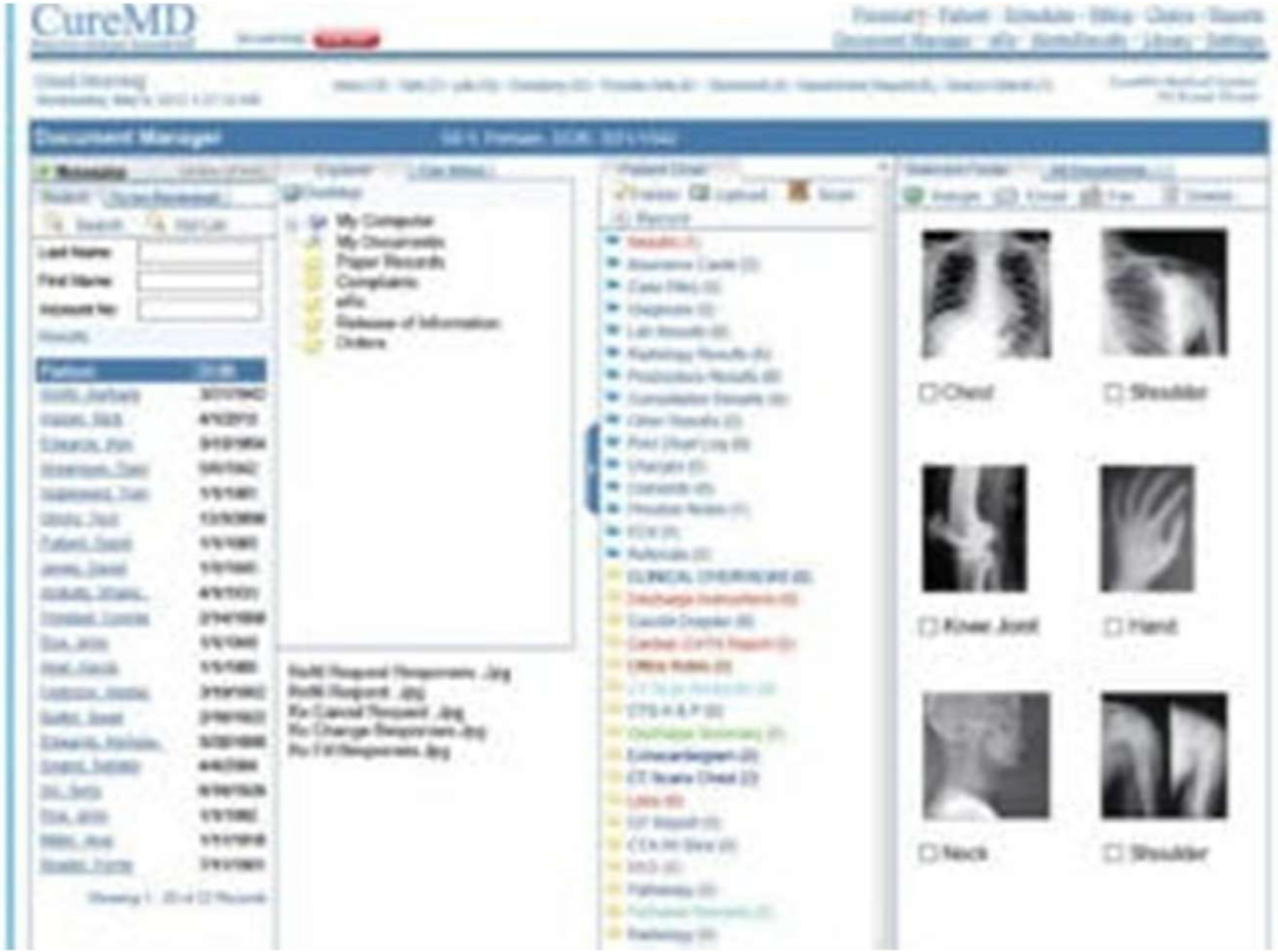
2- from other ICU devices as monitors , ventilators and others.

Electronic Medical Record



Electronic medical records

- The main differences from paper recording is
  1- Its more accurate ,clear , real time .
  2- Less errors due to hand writing.
  3- Can be accessed by many station at same time
  4- More secure
  5- Can be accessed by remote stations as other hospital or mobile application for authorized personnel


CureMD
Document Manager
My Computer
My Documents
Paper Records
Complaints
eRx
Release of Information
Orders
Chest
Shoulder
Knee Joint
Hand
Neck
Shoulder

Data Security

What Is C,I,A

- Confidentiality (only the right people see it)
- Integrity (the information is what it is supposed to be – it hasn't been changed)
- Availability (the right people can see it when needed)