MONITORING A PATIENT

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LEARNING OBJECTIVES

01

Understand the importance and advantages of accurate patient monitoring in clinical practice

02

Explain the principles and application of electrocardiograms (ECG) and pulse oximetry (SPO2).

03

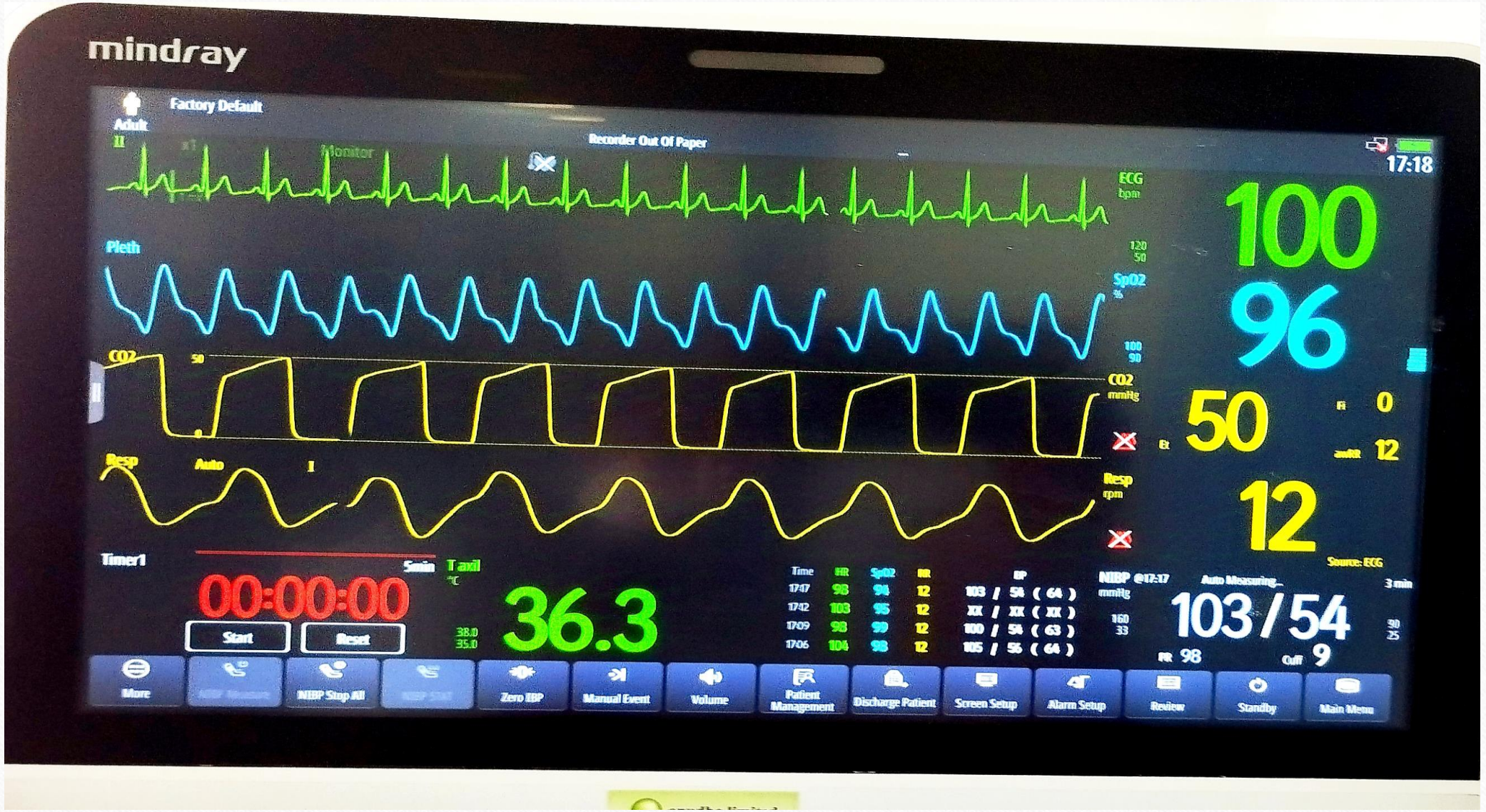
Identify and manage tachycardia and bradycardia, including the interpretation of different types of tachycardia.

04

Recognize key attributes of arrhythmias and factors affecting ECG quality.

05

Accurately interpret vital signs and assess the level of consciousness (LOC), considering influencing factors.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NIBP @17:17
mmHg
Auto Measuring...
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103 / 54
PR 98
Cuff 9
Source: ECG
More
NIBP Stop All
Zero IBP
Manual Event
Volume
Patient Management
Discharge Patient
Screen Setup
Alarm Setup
Review
Standby
Main Menu

INTRODUCTION (1)

- In Tanzania, the need for critical care services is a pressing issue
- The government has pushed hard to improve the standards
- However, in Nursing the challenge remain significant on the availability of qualified professionals.

INTRODUCTION (2)

- Providing safe and quality critical care services need qualified, well knowledgeable and skilled Nurses
- Bad luck, most Nurses working in ICUs they don’t have good foundation on basic critical care
- Using their basic knowledge acquired during their education carrier

INTRODUCTION (3)

- Physiological parameters monitoring in ICU is central part of Critical care package
- Simply interpretation of parameters and taking appropriate action timely
- Alerts you to any deterioration in a patient's condition and also helps to asses response to treatment

INTRODUCTION (4)

- Minor delay may lead to morbidity or mortality
- Delayed recognition of patient deterioration is mostly caused by human related monitoring failures (Van Galen et al., 2016)
- In most cases patient are connected on monitors

INTRODUCTION (5)

- Usually done by using cardiac monitors for accurateness
- Using these monitors properly need knowledge and skills as well.
- Monitors, reduces manual work, and reduces errors
- The parameter that needs to be monitored includes :
  - Body Temp,PR,RR,SaO_2,$EtiCO_2$, ECG, LoC and Urine Output
- It guides daily therapeutic interventions

ADVANTAGES OF ACCURATE PATIENT MONITORING

- Early notification of critical changes of patients' health status via alarms
- To guide daily intensive care therapy
- Improve patient safety significantly
- Gives useful real time information of the patient

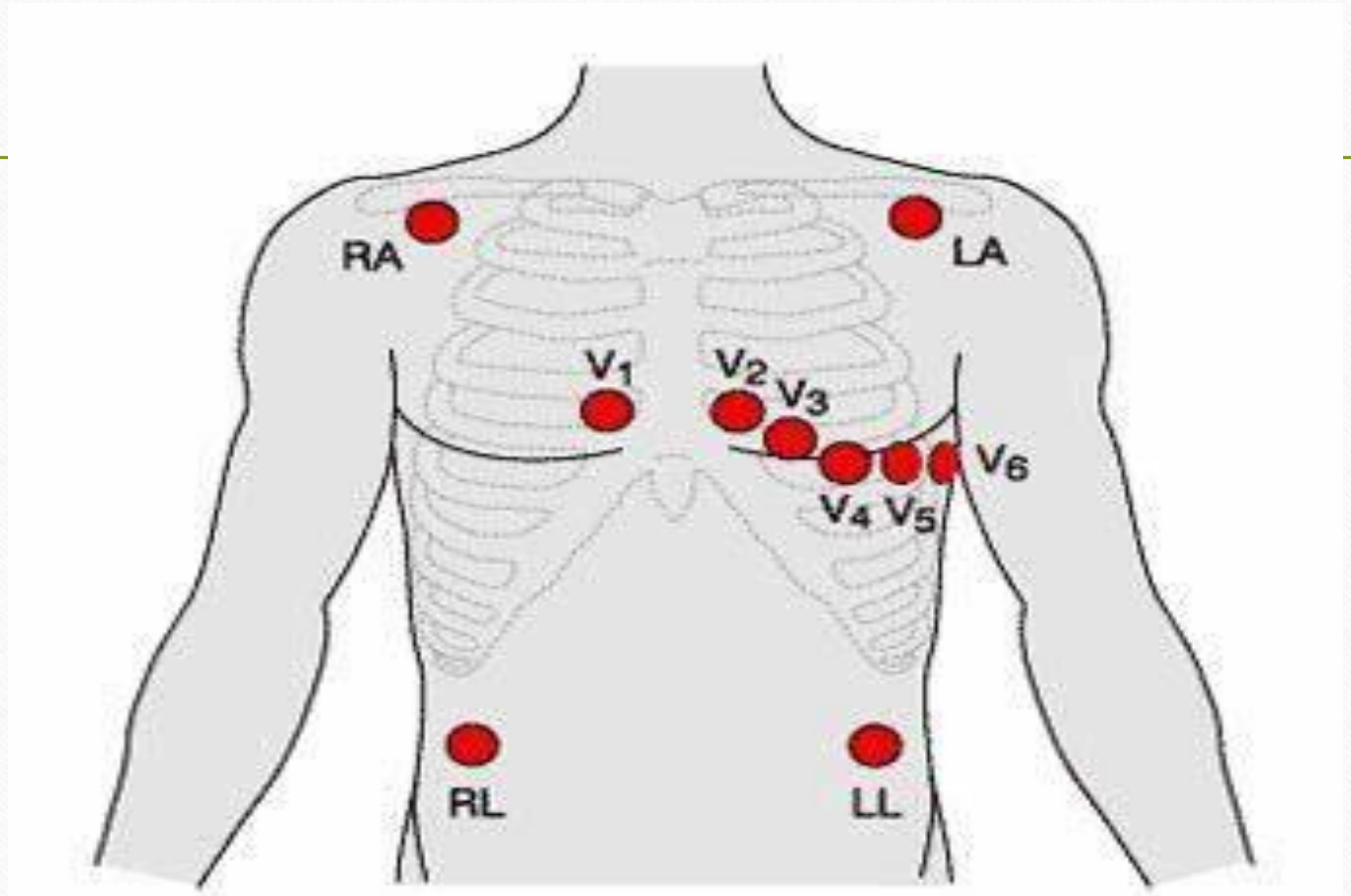
NOTE

- Careful attention to the trends of these deviations will alert you to early signs of clinical deterioration
- Inadequate awareness and limited knowledge among Nurses remain a challenge.

ELECTROCARDIOGRAM (ECG)

- Measures electrical activity of the heart along its axis.
- Lead II detect most arrhythmias which is the main role of the ECG in monitoring of patient especially in ICU
- Heart rate is calculated by the monitor
- For patient with arrhythmias the rate is calculated accurately

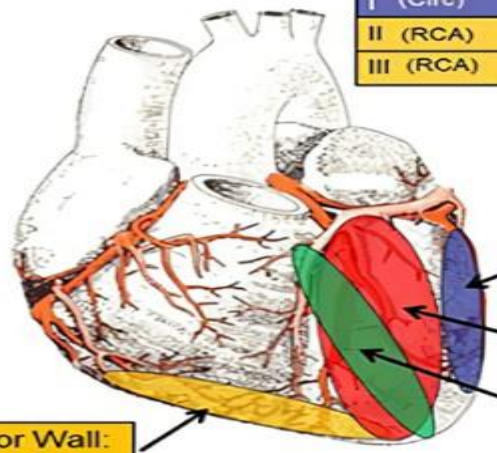
LEAD PLACEMENT



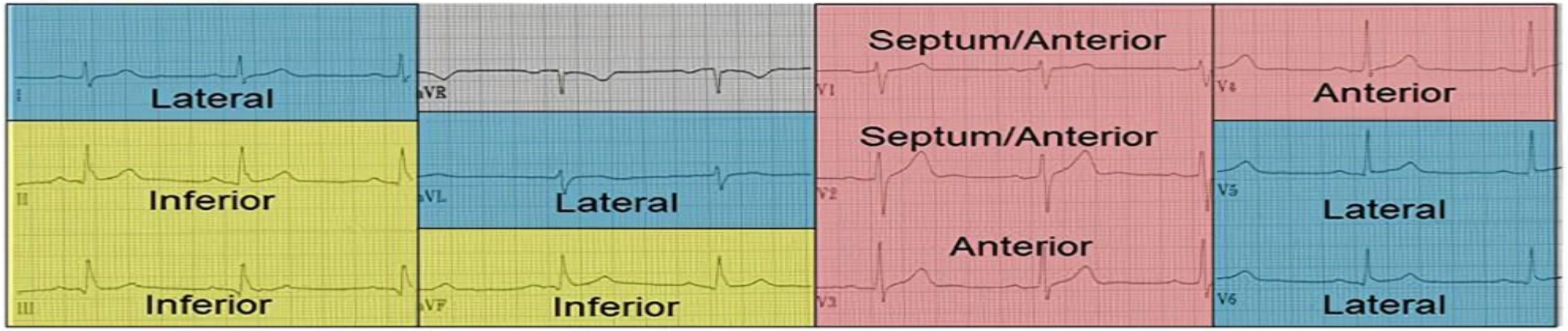
LEAD PLACEMENT

Which Leads Look Where?

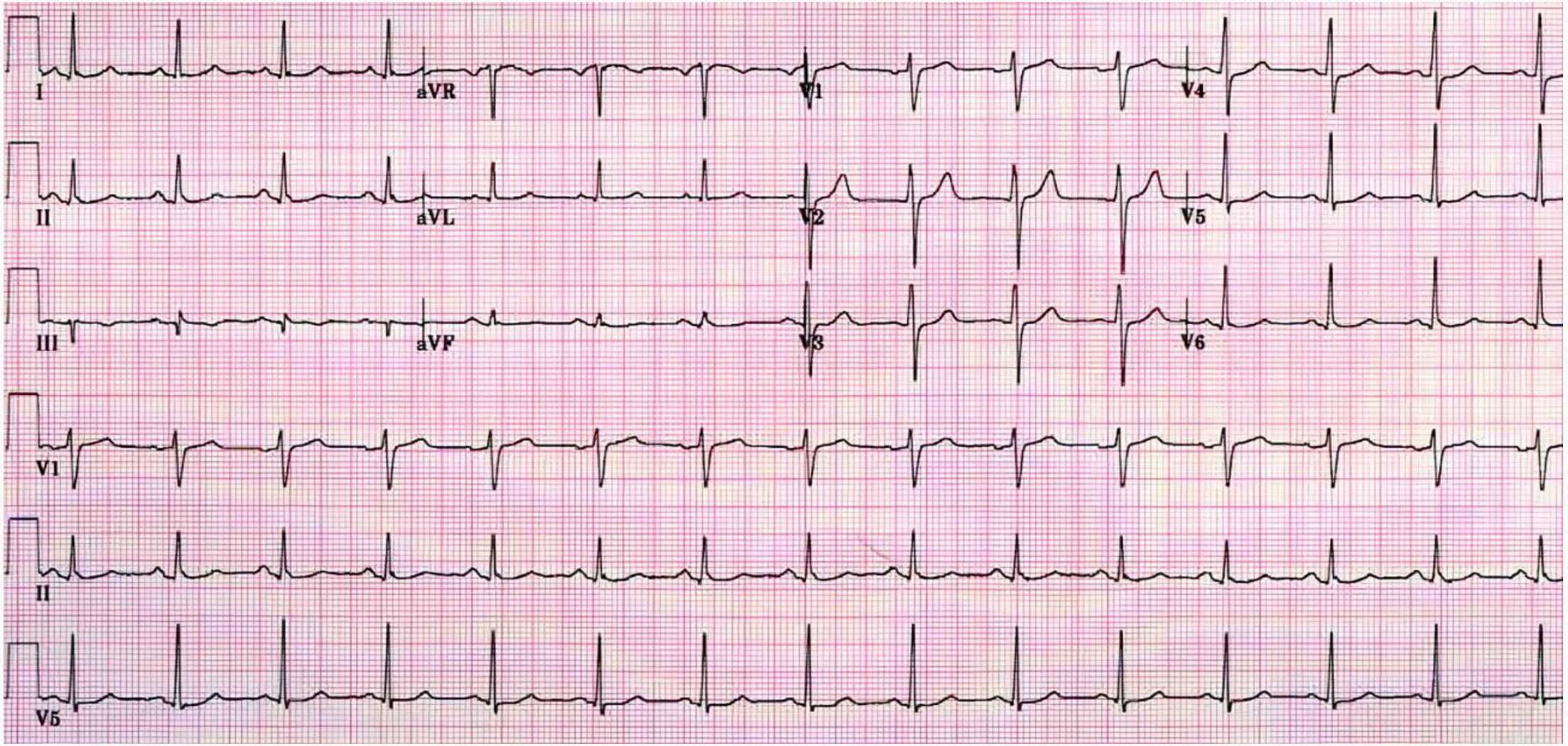
I (Circ)	aVR	V_1 (LAD)	V_4 (LAD)
II (RCA)	aVL (Circ)	V_2 (LAD)	V_5 (Circ)
III (RCA)	aVF (RCA)	V_3 (LAD)	V_6 (Circ)



Inferior wall: II, III, aVF
Septum: V1, V2
Anterior wall: V3, V4
Lateral wall: I, aVL (high lateral); V5, V6 (low lateral)
Anterior wall and septum often infarct together because both supplied by LAD, so anteroseptal MI shows in V1-V4



ECG



BRADYCARDIA (1)

- Any rhythm disorder with the **heart rate of below 60bpm.**
- But for assessment and management of a patient with **symptomatic bradycardia it is defined as the heart rate of less than 50bpm**

BRADYCARDIA (2)

- **Criteria for bradycardia**

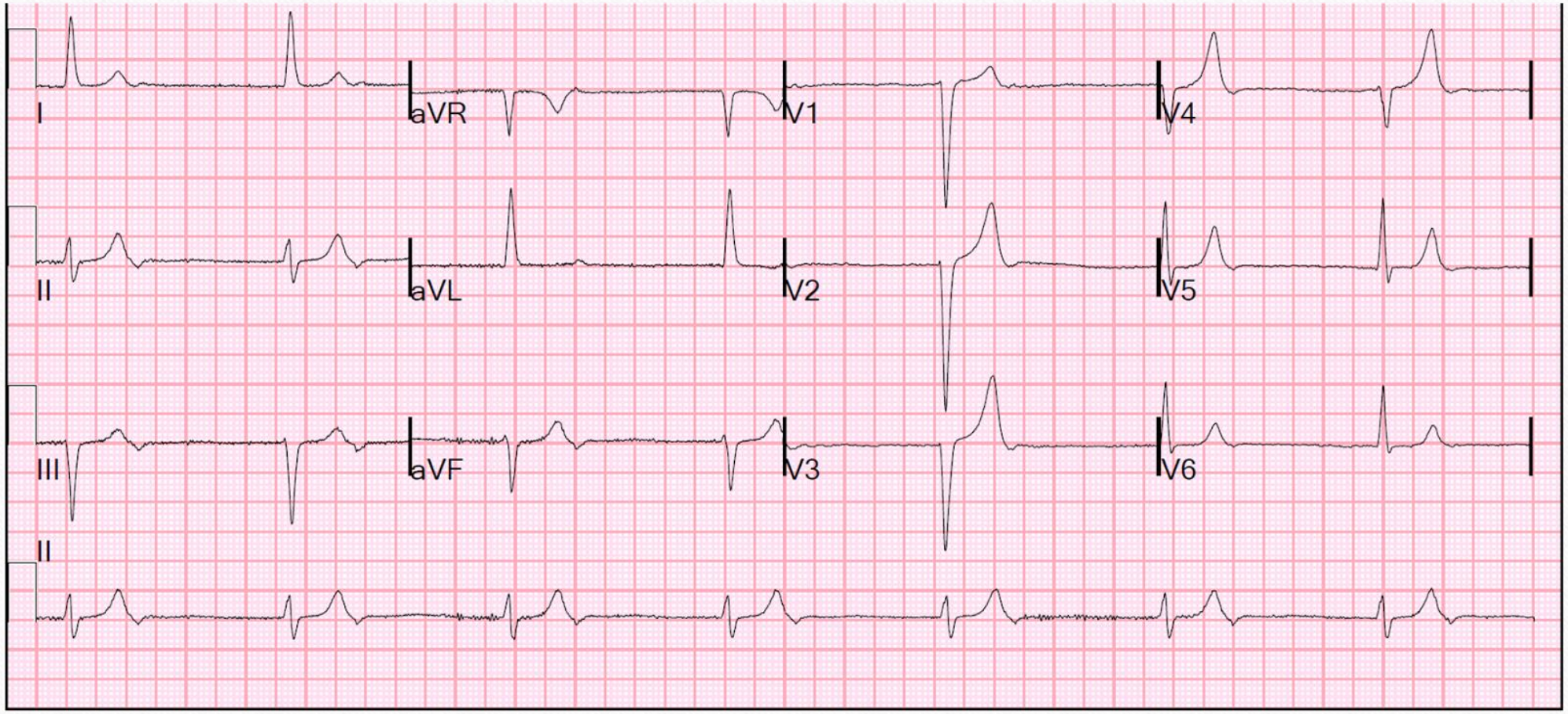
✓ Slow heart rates

✓ Patient has symptoms

✓ The symptoms are due to slow heart rates

- **Symptoms: Hypotension, altered mental status, chest discomfort, signs of shock.**

ECG FOR BRADYCARDIA (3)



ECG FOR BRADYCARDIA (4)

BRADYCARDIA ON CARDIAC MONITOR (5)

MANAGEMENTS OF BRADYCARDIA

- Maintain patent airway/
- Assist breathing (Give oxygen
- Keep the patient on cardiac monitor
- Do 12-lead ECG
- Establish IV access
- **Drugs: Atropine 1mg (repeat for 3-5 min), do not exceed 3mg**
- **Alternative: Epinephrine, Dopamine**

TACHYCARDIA (STABLE AND STABLE)

- Heart rates above 100bpm
- But for assessment and management of a patient with **symptomatic tachycardia it is defined as the heart rate of more than 150bpm *(Unless the patient is having ventricular dysfunction)***
- **Criteria for tachycardia**

✓ Patient is symptomatic and unstable

✓ Patient has signs and symptoms that are caused by tachycardia

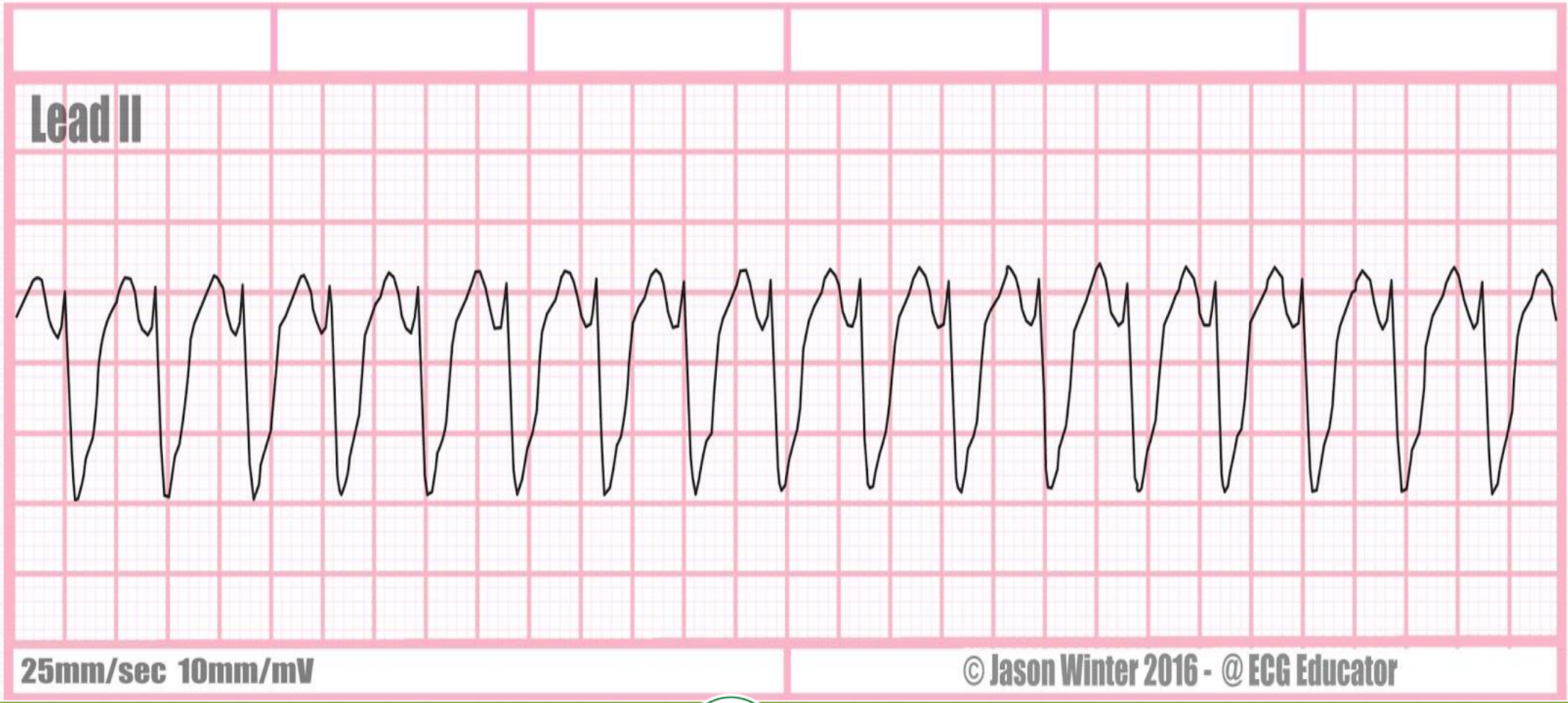
Symptoms: Hypotension, altered mental status, chest discomfort, signs of shock.

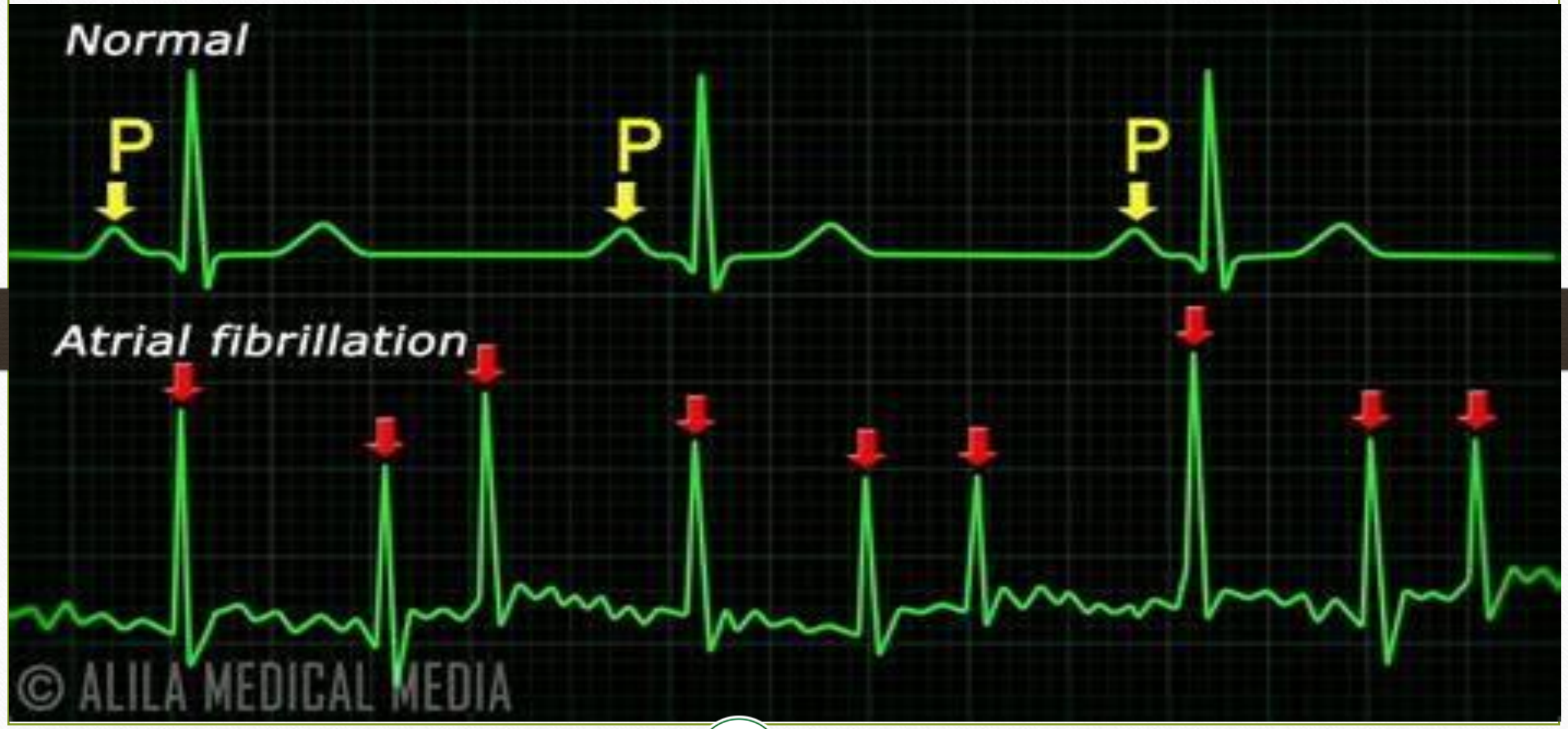
TYPES OF TACHYCARDIA

1. Sinus tachycardia
2. Atrial fibrillation
3. Atrial flutter
4. Supraventricular tachycardia (SVT)
5. Ventricular tachycardia
6. Wide complex tachycardia

Sinus Tachycardia

Ventricular Tachycardia (VT)




Normal
P
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Atrial fibrillation
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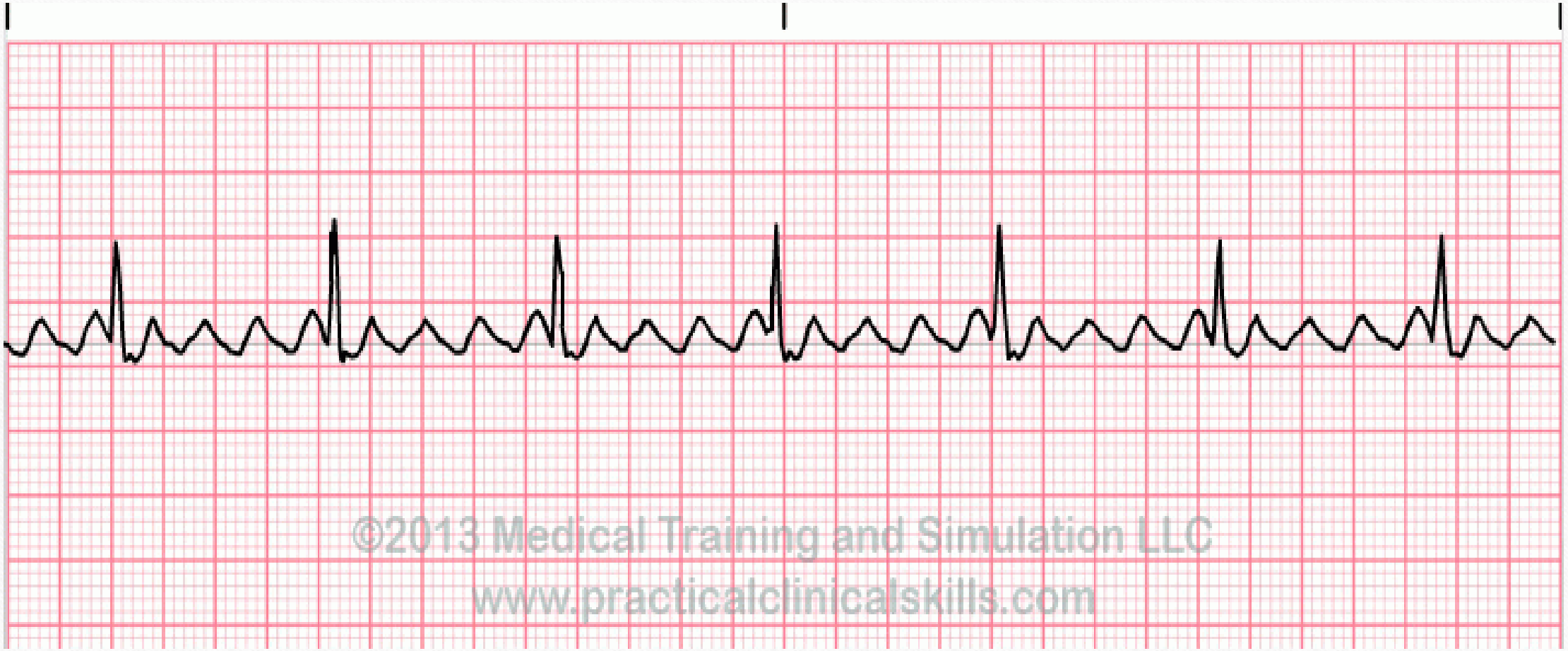
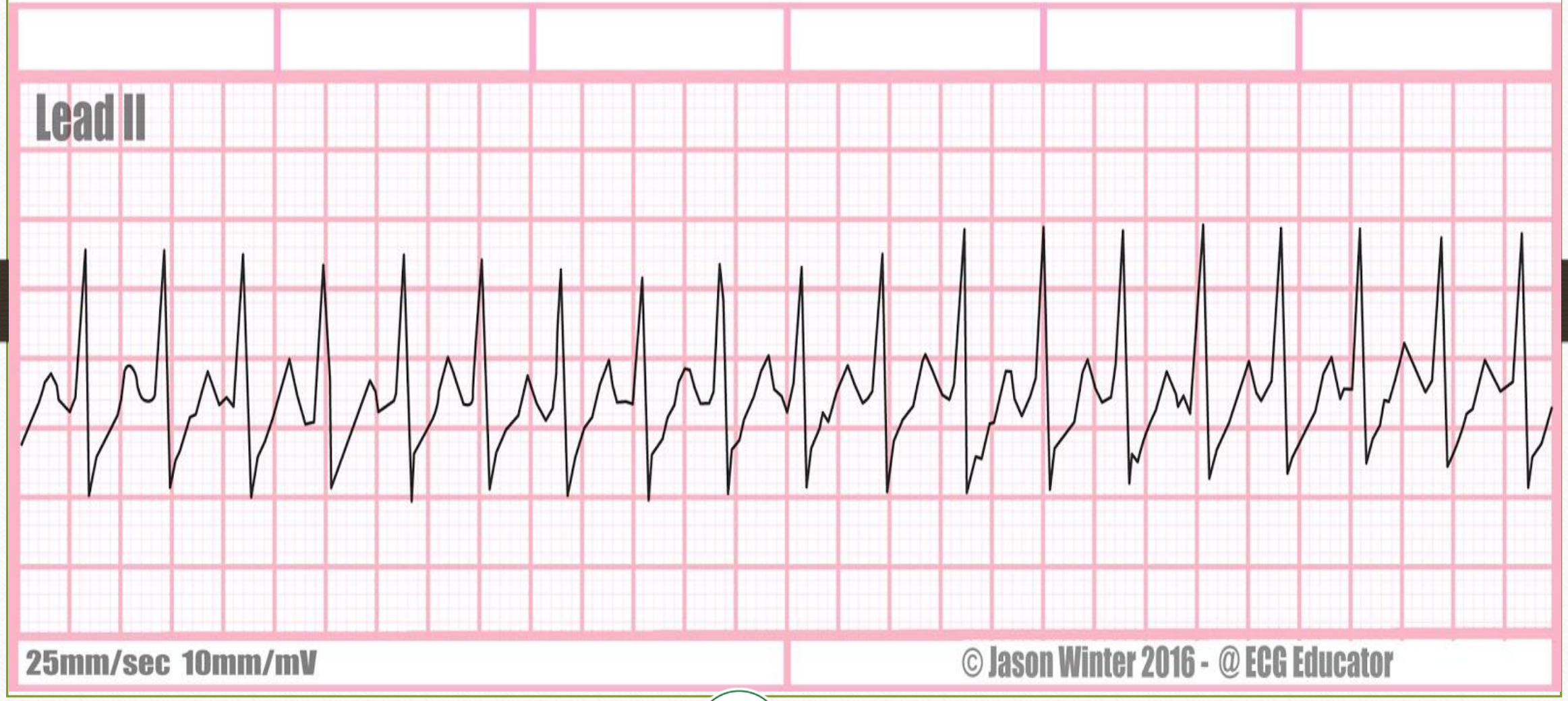
ATRIAL FLUTTER



Supraventricular Tachycardia (SVT)



MANAGEMENTS OF TACHYCARDIA

- Maintain patent airway/
- Assist breathing (Give oxygen)
- Keep the patient on cardiac monitor
- Do 12-lead ECG
- Establish IV access

Prepare the following (bed side): For Cardioversion/defibrillation

- Oxygen saturation monitor
- Suction device
- IV line
- Intubation equipments

- Arrhythmias usually is diagnosed by setting alarm limits (Brady vs Tachy)
- Alarm setting must be at acceptable range for normal person in accordance with age.
- Cardiac arrhythmias is common especially for ICU patients

ATTRIBUTES OF ARRYHTHYMIAS (1)

- Electrolyte imbalances
- Metabolic disturbances
- Invasive lines
- Multiple drug therapy and
- Quick changes in their intravascular volumes

ATTRIBUTES OF ARRYHTHYMIAS (2)

- Continuous ECG monitoring facilitates quick identification of arrhythmias for early promptly respond to such events.
- It is important to be familiar with the basics of ECG for accurate monitoring of a patient.

WHAT ECG TELLS?

- Myocardial ischemia, electrolytes specifically potassium level and Heart broke
- Some of arrythmias like A/F,VT
- Sometimes ECG may display electrical activity of the heart while patient has no CO. (PEA)
- Always check what the monitor tells you corresponds with the patient clinical status

NOTE: A normal ECG does not always indicate well patient, need careful interpretation

FACTORS AFFECTING QUALITY ECG

- Poor contact btn the skin and the electrodes
- Sweat skin, Dirty skin
- Shivering(somatic movement)
- These may give you arrhythmias appearance waves

PULSE OXIMETRY (SPO2) (1)

- Measure oxygen saturation in the tissue.
- Measured by using Pulse Oximetry
- It is expressed as SPO2 ranges 95-100% normative ranges
- A fall in SPO2 indicates the development of HYPOXIA

PULSE OXIMETRY (SPO2) (2)

- Before any visual evidence of Confusion and unconsciousness
- HYPOXIA becomes evident by using oximetry
- An SPO2 of less than 90% is of grave concern.
- Normal person breathing air ranges 95-100%

PULSE OXIMETRY (SPO2) (3)

- For smokers and those with chronic lung disease may be slightly lower 92-95%
- Patients with pulmonary derangement have impaired gas exchange and low SPO2
- Think on dangers of hypoxia

PULSE OXIMETRY (SPO2) (4)

- Most SPO2 monitor display value for heart rate
- Gives audible tone in time with the heart beat
- The pitch of pulse tone varies as the SPO2 level changes
- When you hear the tone with change in its pitch look at your monitor immediately

PLETHMOGRAPHY

- Pulse waveform on the screen of the monitor
- This gives information about the quality of the signal strength for SPO2 detection
- Good signal indicates well perfused tissue with good temperature distribution
- Weak or absent alert you to assess patient perfusion and blood pressure

OXIMETRY CONT…

- Tells you about oxygen delivery to the tissue dictated by
  - ➢ hemoglobin level
  - ➢ cardiac output
- SPO2 is determined by both breathing and ventilation
- In cold or shocked patient place a probe in a central site
- Coldness impairs the quality of signals

FACTORS INFLUENCE THE SPO2

- Movement of the patient
- Incorrect positioning of the probe
- Hypothermia
- Hypovolemia
- Vasoconstriction
- Nail polish - as it absorbs the light waves used to measure SPO2 or SaO2
- Pulse Oximeter

ETICO2 (CO2) MONITORING

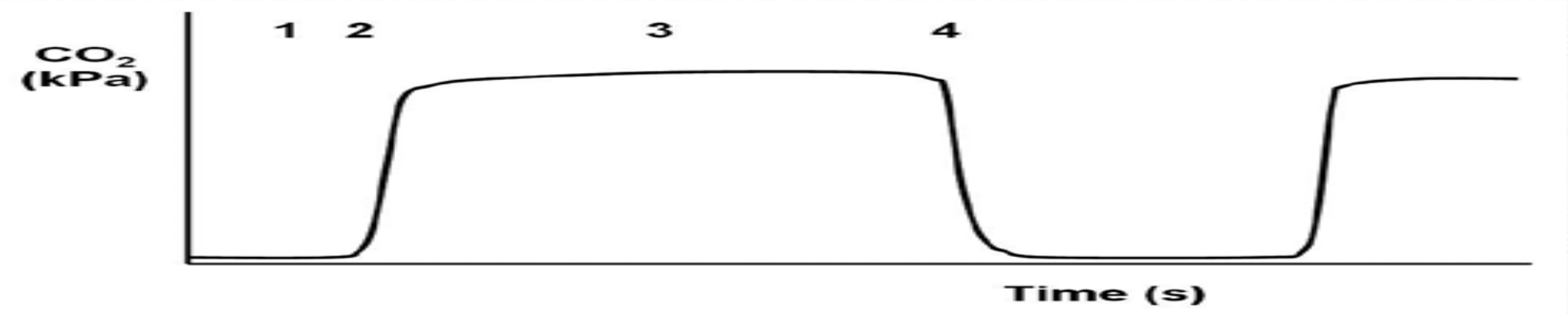
- Maximum partial pressure CO2 at the end of exhalation
- Measured by using sampling line
- Monitor analyse the gas and the value are displayed on screen
- This can be done to both intubated and non- intubated patients
- Normal EtiCO2 35-45 mmHg, normal acid-base status

INFORMATION OBTAINED

- Gives a clue on the ACID-BASE status of the body tissue
- Real time respiratory status
- Gives information about ventilation
- Tell us about metabolic activities of the patient
- Confirm the ETT placement for intubated patients

CAPNOGRAPHY

- Provide continuous CO2 waveform usually plotted against time (capnography



MEANING OF ETICO2 LEVEL

Low level of CO2 <35mmHg

- Hyperventilation
- Hypocarbia and Favors alkalotic state (Alkalosis)
- Decreased metabolic activities

High level of CO2 >45mmHg

- Hypoventilation
- Hypercarbia and favors acidemia state (Acidosis)
- Increased metabolic activities

BLOOD PRESSURE (BP)

- Pressure exerted by the circulatory blood on the arterial walls.
- It provides an important reflection of the blood flow when the heart is contracting (systole) and relaxing (diastole)
- Three values are considered when measuring
  - Systolic (SBP),
  - Diastolic (DBP)
  - Mean (MBP) pressure.

MEAN ARTERIAL PRESSURE (MAP)

- Mean pressure during the cardiac cycle
- Determinant of organ perfusion
- Important parameter during resuscitation procedures
- Changes in BP can be reflective of underlying pathologies
- The body’s attempts to maintain homeostasis.
- Refers to BP ranges in accordance with age

FACTORS INFLUENCING BP

- Cardiac output
- Peripheral vascular resistance
- Blood volume
- Blood viscosity
- Blood vessel wall elasticity

- A decrease in BP is often seen in patients prior to cardiac arrest.
- **Hypotension** if not attended can lead to inadequate perfusion of the vital organs.
- **Hypertension**, the myocardial workload is increased and it can therefore precipitate cerebral vascular incidents (CVA)
- BP can be measured non-invasively using a sphygmomanometer (BP cuff)
- Invasively using arterial lines inserted in large blood vessels such as the radial or femoral artery

RESPIRATORY RATE

- (RR) refers to the number of breaths as calculated over one minute
- Normal RR being 12-20 breaths per minute adult.
- Increase or decrease in RR is the most sensitive indicator of clinical deterioration and impending adverse events such as cardiac arrest or death

- **Tachypnoea** RR > 20 bpm
- It is a sign of respiratory distress
- A RR >24 bpm is a medical concern

Bradycardia RR <10 bpm

- Caused by drugs (e.g. opioids), hypothermia
- Fatigue, central nervous system depression.
- It indicates the possibility of respiratory failure.

RESPIRATORY SYSTEM EVALUATION

- While the measurement of RR is vital, it is also important to assess:

Respiratory pattern

- Chest movement, Depth of inspiration

Workload of breathing, Use of accessory muscles
Breathing sound

RR CONSIDERATION

- Increased RR indicates Hyperventilation
- Giving out much CO2 → Alkalotic → Acid-base derangements
- Decreased RR indicates Hypoventilation
- Retaining CO2 → Acidemia → Acidosis very fatal
- High risk of Hypoxia → anoxia → Anoxic Brain damage
- Respiratory failure, state of emergency need immediate intervention

PULSE RATE (PR)

- The palpable rhythmic expansion of an artery produced by volume of blood pushed into the vessel by the contraction and relaxation of the heart.
- It reflects both the circulating volume and the strength of contractility
- There are many factors that can impact the pulse of a patient, including
- Age, medication (e.g. beta-blockers), existing medical conditions (e.g. fever, pain) and Volemic state

PULSE CONT….

- Pulse incorporates more than just heart rate, the measurable characteristic of the pulse.
- When palpating pulsation, gives the following

❖The strength/amplitude of the pulse

❖Regularity of the pulse.

❖The peripheral equality of pulses should also be considered

TEMPERATURE

- Body temperature the balance between heat produced and heat lost (thermoregulation)
- Common body temperature measured is Axillary one
- However, Rectal and Oral temp are considered a core body temp

❖Surface body temperature/how the patient feels to touch

FACTORS AFFECTING BODY TEMPERATURE

- The underlying pathophysiology (e.g. infection or sepsis)
- Skin exposure to cold environment (e.g. in the operating theatre)
- Age.
- Damage to the thermal regulatory center
- The site of temperature measurement c

TEMPERATURE ……

- Peripheral thermometers axillary and anal are preferred in critically ill patients
- Documentation of the site of measurement together with the measured temperature is essential for the accuracy of the measurement.

BODY TEMPERATURE CONT…..

- Normal body temperature in healthy individuals is considered to be 36.8°C ± 0.4°C [98.2°F ± 0.7°F] (measured in the oral cavity)
- Clinically, temperatures of 33-35°C (91-96.8°F) hypothermia
- Any temperature >38.3°C (100.94°F) is considered as a fever/hyperthermia.
- A cool skin temperature can also be indicative of poor peripheral perfusion (a circulatory problem)
- The capillary refill time (normative <2 secs) should therefore also be assessed.

DANGERS OF RAISED/DECREASED TEMPERATURE

Buzzing

LEVEL OF CONSCIOUSNESS (LOC)

- It can be defined as the “degree of arousal and awareness” of a patient.
- LOC important indicator of cerebral functioning.
- Commonly assessed using the GCS
- The simpler ACVPU rapid neural assessment method can also be used

LOC CONT……

- Alert
- Confusion
- Responsive to Verbal stimulation
- Responsive to Painful stimulation
- Unresponsive

- The GCS assesses two aspects of consciousness, namely:
- Arousal/Wakefulness
- Patient awareness in demonstrating an understanding of what a practitioner said through the ability to complete tasks

LOC CONT….

- A GCS score < 12 is considered significant concern
- A patient with GCS < 9 will probably require airway intervention and intubation when necessary.
- A reduction of 2 points on the GCS is considered significant indicator of clinical deterioration of the patient.

FACTORS AFFECTING LOC

- Side effects of some medications

➢sedatives or analgesics,

(benzodiazepines, anxiolytics, opioids)

- Hypoxia
- Hypercapnia/hypercarbia
- Hypoglycemia
- Hypotension
- Alcohol
- Cerebral pathology, etc.

PAIN

- This is unpleasant experience to any person
- It can be physical or psychological pain
- Critically ill patients in the ICU frequently experience acute pain

❖Surgical and post-traumatic wounds

❖Prolonged immobilization

❖The use of invasive monitoring devices

❖Mechanical ventilators

❖Even nursing care (for example, changing dressings, position)

PHYSIOLOGICAL RESPONSE TO PAIN

- The physiological consequences of inadequate pain management are predictable and potentially harmful.
- Physiological responses to pain include increases in RR, HR and BP.
- Pain also increases patients' anxiety and leads to sleep disturbances which will affect the optimal recovery of the patient.
- Assessment of pain is therefore vital for patient recovery and improved functional outcomes.

PAIN ASSESSMENT

- Tools for the assessment of pain in the ICU include
- The numeric pain rating scale
- The analogue scale
- The behavioral pain scale and
- The critical care pain observation tool(CPOT)

- A heightened sympathetic activity like
  - Hypertension
  - Increased heart rate.
  - Restlessness
- Can be an indicators of pain in heavily sedated or paralyzed patients

PAIN MANAGEMENT

- Pain can be managed with analgesics together with physiotherapeutic modalities.
- Physiotherapeutic interventions for pain do not aim to be a substitute for analgesic medication
- Aim to reduce the total dose of analgesic medication needed to reduce their unavoidable side effects
- Most of pain are under managed and sometimes neglected

URINE OUTPUT

- Even though urine output is an indicator of renal perfusion,
- It is frequently used as an indicator of cardiac output (25% of cardiac output perfuses the kidneys).

URINE AMOUNT

- Normal urine output in adults is at least > 0.5 ml/kg/h signifies adequate renal perfusion
- New born and Infant up to 1yr- 2mls/kg/hour
- Toddlers: 1.5mls/kg/hour
- Older children: 1mls/kg/hour

- With urine output of less than 500ml in 24 hours,
- The kidneys are unable to excrete the waste products of metabolism
- Results in uremia, metabolic and electrolytes derangement

- A drop in urine output may be the first clinical indicator of fluid and electrolyte imbalance
- Considered an early sign of hypovolemia.
- When cardiac output falls so does renal perfusion, ultimately leading to renal failure.

URINARY OUTPUT TERMINOLOGIES

- Anuria <50ml urine in 24 hrs
- Oliguria <400 ml urine in 24 hrs (<0.5ml/kg/h)
- Polyuria >3000 ml urine in 24hrs
- Dysuria Painful micturition

thank you for listening