JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

CARDIOPULMONARY CONDITION

(23A503P)

BPT V

LIST OF PRACTICAL	
CARDIOPULMONARY CONDITIONS, (23A503P)	
PRACTICALS 1	CARDIOPULMONARY ASSESSMENT -ADULT
PRACTICALS 2	CARDIOPULMONARY RESUCSITATION
PRACTICALS 3	ECG MACHINE AND ITS PARTS
PRACTICALS 4	ECG INTERPRETATION NORMAL
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PRACTICALS 9	PERCIEVED EXERTION AND ITS CLINICAL IMPORTANCE
PRACTICALS 10	TO ANALYZE ABG

Practical – 01

AIM – To find out the clinical condition of the subject

- **Name –**
- **Age –**
- **Sex –**
- **Occupation –**
- **Address –**
- **Chief Complaint –**

SUBJECTIVE EXAMINATION
1. HISTORY OF PRESENT ILLNESS
→ Description of Symptoms
➤ Cough

- Description of onset – date, time and type.
- Duration – How long; Frequency – How often.
- Aggravating factors.
- Relieving factors.
- Course – from onset till time.
- Associated factors.
- Severity.
- Quantity – how large an area.
- Quality – character.
- Has Cough since ____years _____months.

➤ Sputum

- Description of onset – date, time and type.
- Duration – How long; frequency – how often.
- Aggravating factors.
- Relieving factors.
- Course – from onset till time.
- Associated factors.
- Severity.
- Quantity.
- Quality – character.
- Consistency.

➤ Dyspnea

- Description of onset.
- Duration.
- Aggravating factors.
- Relieving factors – frequency.
- Course – from onset till time.
- Associated symptoms.
- Feels breathless since _____years _____months.

➤ Chest Pain

- Description of onset – date, time and type.
- Location – Where on body.
- Relieving factor.
- Course – from onset till time.
- Associated factors.

- Duration – how long.
- Severity.
- Quality – character.
- Frequency – how often.

➤ **Hemoptysis**

➤ **Wheeze**

➤ **Paroxysmal Nocturnal Dyspnea (PND)**

➤ **Orthopnoea**

➤ **Palpitation**

➤ **H/O – fever, chills, loss of weight, dependent edema.**

COUGH – GRADING

- **Grade 1:** Has cough from 3 consecutive months for 2 consecutive years.
- **Grade 2:** Has bouts of cough for 4 to 6 times a day.
- **Grade 3:** Morning cough on most of the days of the week throughout the year.
- **Grade 4:** Daily persistent cough.
- **Normal:** Has occasional cough, usually associated with common cold.

SPUTUM – GRADING

Cough with Sputum:

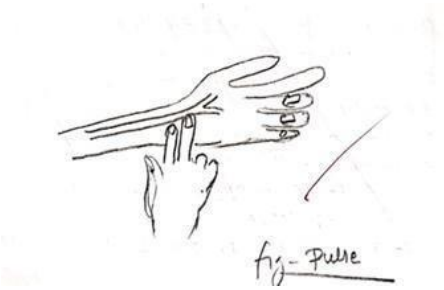
- Grade 1: Sputum from the chest, 3 months or more.
- Grade 2: Sputum from chest, 2 times a day, 4 per week.
- Grade 3: Sputum from the chest only in morning.
- Grade 4: Sputum from chest throughout day.

Sputum Color:

- White/yellow/gray/green – Strike off
- Blood stained/clot/fresh blood – Strike off
- Smell – neutral/foul – Strike off (inapplicable)

DYSPNEA – GRADING

- **Grade 1:** Becomes breathless walking upstairs or slight hill.
- **Grade 2:** On level ground walks slower than persons of the general condition, age & sex.
- **Grade 3:** Becomes breathless while doing housework, talking, or dressing.
- **Grade 4:** Has to rest after walking on level ground for 100 meters.



OTHER HISTORIES

2. **Past Medical History**
3. **Personal History**
    - Cigarette Smoking: (Y/No) Age started _____per day _____Age stopped _____
4. **Family History**
5. **Current Medications History**
6. **Occupational and Environmental History**
7. **Socio-Economic History**

OBJECTIVE EXAMINATION

➤ Level of Consciousness (GCS)

1. VITAL SIGNS

- Temperature
- Heart Rate
- Pulse – rate, rhythm, strength.
    - Grading of pulse strength:
        - 0 = absent
        - 1 = diminished
        - 2 = normal
        - 3 = increased
        - 4 = bounding

- Respiratory rate

- Blood pressure

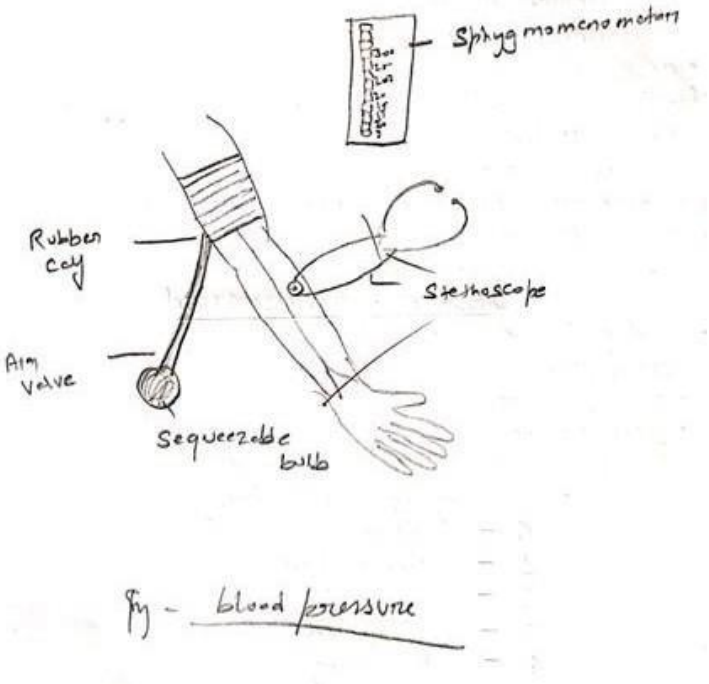


Fig - Blood pressure

2. ON OBSERVATION

- Body built
- Posture
- Head and Face
- Facial expression
- Bobbing of head (with pulse on inspiration)
- Nasal flaring
- Cyanosis / pallor
- Edema and puffiness

→ **Neck**

- Accessory muscles prominent
- Jugular venous pressure

→ **Chest**

- Retraction and bulging of chest (supraclavicular, infraclavicular, and intercostal)
- Breathing pattern
- I:E ratio
- Thoracic configuration: Normal shape (AP:T = 5:7)
- Epigastric excursion
- Hoover's sign and paradox of chest wall
- Symmetry of expansion
- Wound, incision, and scars

→ **Extremities**

- Pedal edema
- Cyanosis
- Nicotinic staining
- Tremors

3. PALPATION

→ Neck

- Lymph nodes
- Trachea position

→ Chest

- Tenderness
- Subcutaneous emphysema
- Point of maximal impulse (apex beat)
- Tactile fremitus

→ Chest Expansion

- Symmetry (upper, middle & lower chest)
- Measuring tape
    - Axilla level
    - Xiphisternum level
    - 2 inch above umbilicus

→ Extremities

- Oedema (pitting and non-pitting)
- Capillary perfusion

4. Percussion of LUNG FIELDS

5. Percussion for DIAPHRAGMATIC EXCURSION

6. AUSCULTATION

- Breath sounds
- Heart sounds
- Vocal resonance

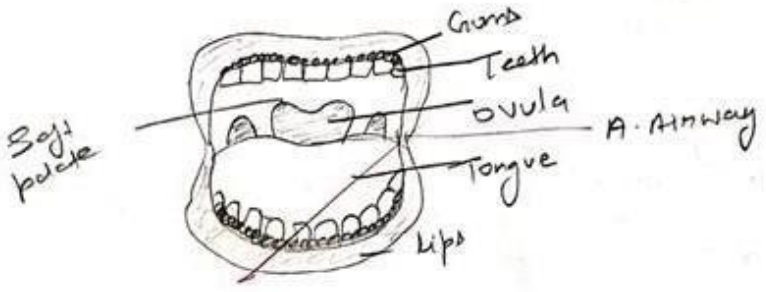


Fig - A. Airway

Practical-02

Aim: To Know about the Cardiopulmonary Resuscitation

When and whom to give cpr -

- Someone is not breathing and has no pulse.
- If someone is not breathing but has a pulse perform rescue breathing.

Check list - check the CAB

- Circulation
- Airway
- Breathing

C is for circulation -

- Feel for a pulse -
- Put your fingers on the side of the neck or on the top of the underside of wrist.

Do not use your thumb, your own pulse will be felt, and this could lead to confusion.

A is for airway -

- Check the mouth or throat for blockage. Sweep the inside of the mouth with your fingers if necessary.

B is for breathing -

- Put your ear to the mouth and nose. Listen to see if they are breathing. Observe if the chest is rising.
- Feel for breaths on your cheek.

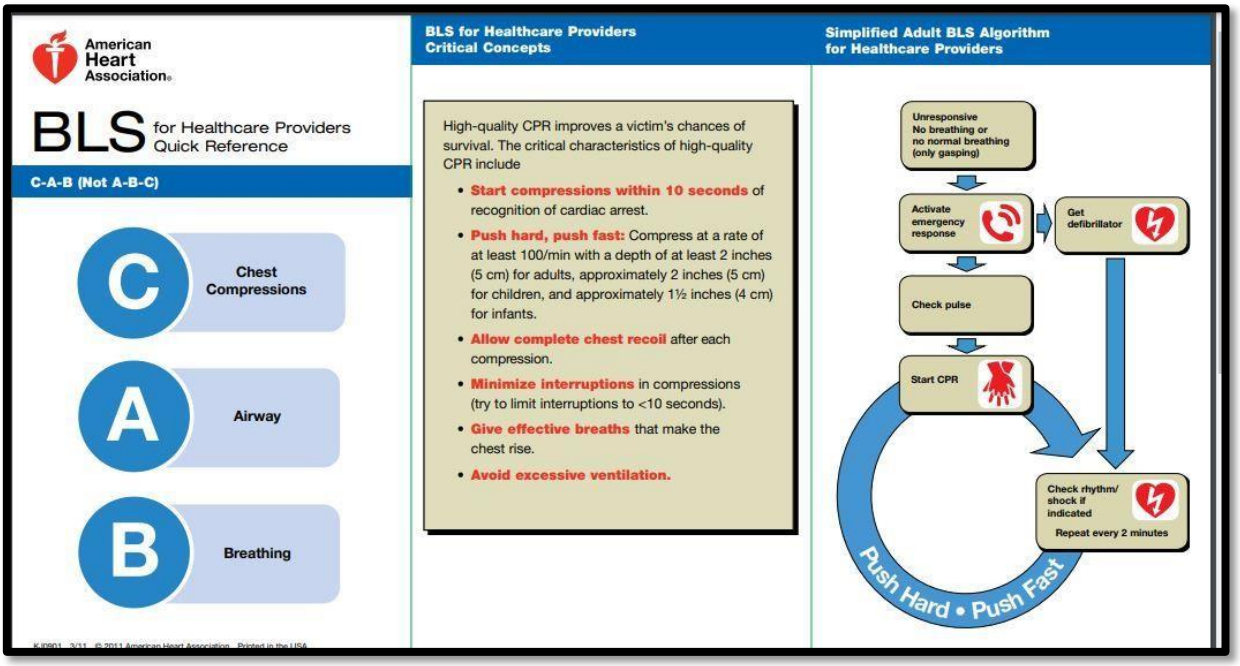
Rescue breathing - perform if a person has a pulse but is not breathing. Make sure they are lying on their back.

- Tilt the head back - lift the chin with one hand. Pinch the nostrils closed with the other.
- Close the airway through the nose by pinching it -
- Give 1 breath every 5 second.
- Take a normal breath. Cover the victim's mouth with yours to create an airtight seal.
- Watch for the chest to rise as you give each breath.

CPR procedure -

- To give compressions - put the heel of one hand on the center of the chest on the nipples.
- Put the other hand on top of the first hand. Push hard and push fast.
- Push at a rate of 100 times a minute. After each compression, release pressure on the chest to let it come back to its position.
- Keep your elbows locked so you don’t get tired quickly.
- Give 2 breaths, 1 second each. Give 30 compressions at a rate of 100/sec at 9 then give 2 breaths.
- Remember to release pressure after every compression.
- Keep going until 30 to 2 adult.
- The automated external defibrillation (aed) arrives.
- Victim starts to move or
- Trained help arrives.


Step-by-Step CPR Guide
1. Shake and shout
2. Call 911
3. Check for breathing
4. Place your hands at the center of their chest
5. Push hard and fast—about twice per second
6. If you've had training, repeat cycles of 30 chest pushes and 2 rescue breaths


American Heart Association
BLS for Healthcare Providers Quick Reference
C-A-B (Not A-B-C)
C Chest Compressions
A Airway
B Breathing
BLS for Healthcare Providers Critical Concepts
High-quality CPR improves a victim's chances of survival. The critical characteristics of high-quality CPR include
Start compressions within 10 seconds of recognition of cardiac arrest.
Push hard, push fast: Compress at a rate of at least 100/min with a depth of at least 2 inches (5 cm) for adults, approximately 2 inches (5 cm) for children, and approximately 1½ inches (4 cm) for infants.
Allow complete chest recoil after each compression.
Minimize interruptions in compressions (try to limit interruptions to <10 seconds).
Give effective breaths that make the chest rise.
Avoid excessive ventilation.
Simplified Adult BLS Algorithm for Healthcare Providers
Unresponsive No breathing or no normal breathing (only gasping)
Activate emergency response
Get defibrillator
Check pulse
Start CPR
Check rhythm/ shock if indicated
Repeat every 2 minutes
Push Hard • Push Fast

Practical - 03

Aim: The ECG Machine and Its Components

- To demonstrate the ECG machine and its components.

2. Components of the ECG Machine

1. **Electrocardiograph (ECG) Equipment**
    - Can diagnose various cardiac diseases by capturing the heart's electrical activity using various components of the ECG machine.
2. **Electrodes**
    - ECG electrodes record electrical impulses from the heart.
    - Placed on specific parts of the patient's body (limbs and chest) to obtain bipolar/unipolar readings.
    - Function: Convert electrical impulses into signals for the ECG machine to process.
3. **Leads**
    - Link the electrodes to the ECG equipment.
    - Types: Limb leads (I, II, III, AVR, AVL, AVF), chest leads (V1-V6).
    - Capture impulses from specific heart locations.
4. **ECG Machine Display**
    - Displays the heart's electrical activity in waveforms.
    - Modern ECG equipment may have digital displays for real-time tracing, allowing better diagnosis of abnormalities.
    - Display also lets you adjust paper space and filter settings.
5. **Paper and Printer**
    - ECG machines use special paper for recording traces.
    - Paper is often thermal with a grid for accurate measurements.
    - High-quality paper and printers are required for precise recordings.
6. **Power Source**
    - ECG equipment requires consistent electricity to function properly.
    - Often powered by mains or rechargeable batteries.
    - Reliable power sources prevent data loss during recording.
    - Some ECG machines include backup battery systems to manage power outages.
7. **Control Panel**
    - Includes buttons and knobs for personnel to control recording speed, filter settings, and stop/start recording.
    - Allows adjustments like lead selection and rhythm analysis.

3. ECG Machine Spare Parts

- Regular maintenance of ECG machine parts is necessary.
- Common spare parts: electrodes, leads, printer paper, and batteries.
- Keep the ECG machine functional to ensure accurate recordings.
- Regular servicing and replacing worn-out parts prevent downtime.

4. How to Connect the ECG Machine

1. Turn on the ECG machine and confirm it's grounded.
2. Ensure electrodes are frequently affixed to the patient's skin in standard placement.
3. Attach leads to electrodes, ensuring good alignment and a tight connection.

4. Adjust control panel settings (e.g., paper speed, filter settings) based on requirements.
5. Begin the ECG recording and check the screen to confirm a clear waveform.
6. After recording, check the ECG tracing for abnormalities, print if needed, and document.

5. Modern ECG Machine Options to Consider

1. **Schiller ECG Machine**
   - Reliable, widely used for accurate ECG tracings.
   - Often advanced with features like seamless integration for efficient cardiac care.
2. **Contec ECG Machine**
   - Compact and portable solution for ECG monitoring.
   - Provides dependable performance and ease of use, suitable for healthcare settings.
3. **Nidek ECG Machine**
   - Designed for precise ECG measurements and analysis.
   - Often compatible with modern facilities for construction, monitoring, and quality medical care.

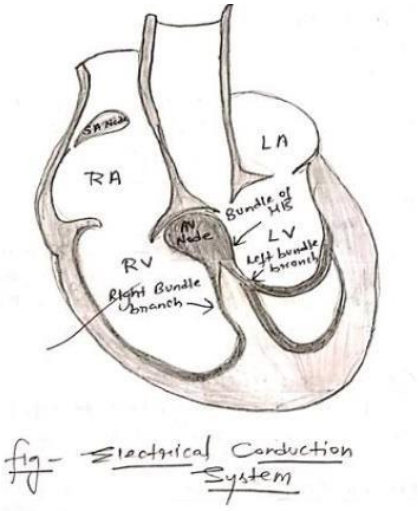
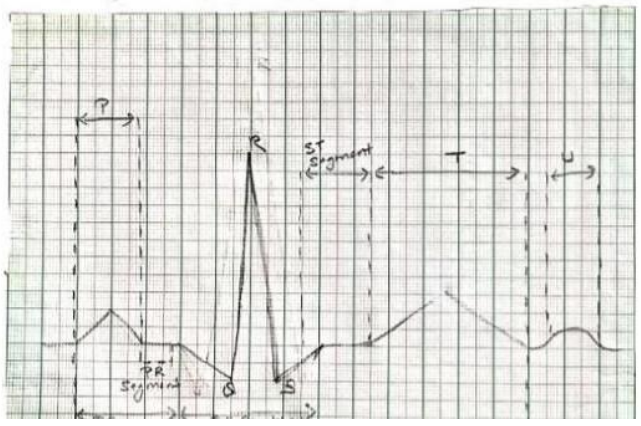


fig- Electrical Conduction System



Practical - 04

Aim: - To Study normal ECG and its interpretation.

- The ECG is a recording of the electrical flows generated through the myocardium when current passes through a positive electrode to a negative deflection occurs. The normal ECG consists of the following components: -
    - The **P wave**, which reflects atrial depolarization.
    - The **PR interval**, which reflects the time for conduction from the SA node to the ventricles.
    - The **QRS complex**, which reflects the depolarization of the ventricles.
    - The **ST segment**, which depicts the time when the entire myocardium is depolarized.
    - The **T wave**, which reflects ventricular repolarization.
    - The **PR interval**, which is the time from one beat to another.

RECORDING LEADS OF ELECTROCARDIOGRAM: -

- The ECG is recorded from various electrodes placed in lead positions on the chest wall. The most common lead positions are standard limb leads (I, II, III), the augmented limb leads (AVR, AVL, AVF), and the precordial leads (V1, V2, V3, V4, V5, V6). The 12 lead ECG is helpful in assessing the electrical conduction of the heart electrical from different angles. By viewing the electrical conduction from different angles, one can discern abnormalities more specifically because some leads are especially collective of certain heart structures.
- An analogy to this is asking yourself how a single lead ECG would look like in your ECG versus often being involved in calculating. All in all, unless you would only look at your damaged ECG on the heart, you will likely not have impacted the heart based on the front, and on the back, and look underneath it, and even on the ECG on a table to examine this. A cardiologist can only be ascertaining a comprehensive view of whether the myocardium is conducting electrical activity normally if it is recorded from a number of angles.

THE STANDARD AND AUGMENTED LIMB LEADS VIEW THE HEART IN THE FRONTAL PLANE: -

- A 12 lead ECG is able to show whether the electrical conduction and pathways in the heart are functioning or blocked.

When the ECG shifts in the frontal direction on deviation, which can happen when the heart is not positioned normally or if it's hypertrophied.
Specific signs of significant abnormalities in frontal leads e.g. Q wave myocardial infarction.

- A normal 12 lead ECG is shown. Note that the P wave in lead II is positive because the electrical conduction is primarily going toward the lead in II, preceding electrode in lead II. In contrast, the P wave in lead NR is small and most of the QRS wave in lead NR becomes negative because the electrical conduction is going away from the Electrode. Further, the P wave in lead AVR increases in amplitude from lead V1 to lead V6 on NS because precordial leads provide reflection from the thinner right ventricle to thicker left ventricle.

- A single set of leads often used during exercise resulting especially when a stable cardiac wall non-cardiac patient in being assessed because the detailed data Conduction information from 12 lead ECG is not warranted in this situation often the limb lead II or V5-V6 because it reflects the electrical activity of the left ventricle.

- Although in single lead ECG will not have a 3D perspective of electrical conduction through myocardium.
- The heart state and regularity of rhythm.
- Presence of ischemia in some parts of the myocardium.

Practical - 05

Aim - To demonstrate how to use Incentive Spirometer

1. INDICATIONS FOR INCENTIVE SPIROMETRY:- a) There who are high risk, with COST, including patients with restricted mobility.

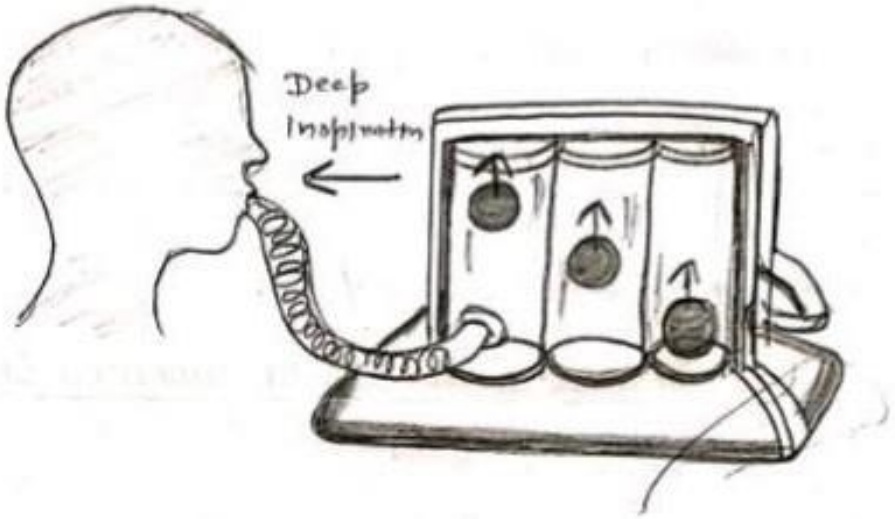
   b) The use of Incentive Spirometry in patients with Sickle Cell Anemia is not sharing to decrease pulmonary Complications.
   c) Routine use of Incentive Spirometry in Congestive, Post-Surgery hospitalized patients in questionable.
   d) Contraindicated in patients with moderate to severe COPD and active Asthma who have an increased respiratory rate and hyperinflation. In these patients, if the Incentive Spirometry technique does not allow the patient to fully expire it should not be used.

2. INSTRUCTIONS FOR THE USE OF INCENTIVE SPIROMETER
   a) Position patient in an Upright sitting position. The Incentive Spirometer has to be positioned upright for the shots to accurately measure volumes and flow.
   b) Instruct the patient to:-
   - Exhale to functional residual capacity.
   - Put the mouthpiece to his mouth & inhale slowly.

3. Using the Flow Meter Type:- "Gable Bottle on the Ball" Stay up in the other as long as possible so that all the balls can change flows note to provide different levels of Challenge. However, the higher flows note are frequently more difficult to achieve a long inhalation.

4. Using the Volumetric Type: - "Gable within a 'cider'" Inhale by keeping flows INDICATOR within the predetermined range while at the same time inhaling deeply as possible.

5. Additional Considerations for Incentive Spirometer:-
   - Select an Incentive Spirometer that measures inspiratory volume & provides feedback on inspiratory flow intake.
   - Position and Compliance with use. Patients should use the Incentive Spirometer at least 10 times every 1 to 2 hours during their working hours.
   - Monitor patient’s effort when using the Incentive Spirometer, including the maximum inspiratory volume before surgery when possible and use it as the target volume after surgery.
   - Allow the patients to be familiar with the Incentive Spirometer by having them practice with the device at home prior to SURGERY.


Deep
Inspiration

Practical - 06

Aim: Understanding the Degree of Heart Block during ECG Conduction Blocks
To understand the different degrees of heart block observed during ECG conduction blocks.

Overview:
Conduction blocks occur when a cardiac impulse is interrupted or terminated along the conduction pathway, which can happen at the sinus node, between the atria and ventricles, or within the ventricular conduction system. These blocks vary in severity and are classified into different degrees based on the extent of the delay or obstruction.

Types of Conduction Blocks:

1. **Sinus Block:**
   - Occurs when the impulse cannot propagate beyond the sinus node.
   - In such cases, the AV junction takes over as the pacemaker, resulting in a junctional rhythm with absent P waves.
2. **AV Blocks:**

   First-Degree AV Block:
   - Characterized by a prolonged P-R interval (greater than 0.2 seconds), measured from the beginning of the P wave to the start of the QRS complex.
   - The impulse is delayed between the atria and ventricles, but each Atrial impulse still conducts to the ventricles, resulting in a normal QRS complex.
   - Conduction ratio is 1:1 (one QRS complex for each P wave).

- **Second-Degree AV Block:**
  - **Mobitz Type I (Wenckebach Periodicity):**
    - Features a progressively lengthening P-R interval until an atrial impulse fails to conduct to the ventricles, resulting in a dropped QRS complex.
    - The cycle then repeats.
  - **Mobitz Type II:**
    - Characterized by a fixed P-R interval with a consistent pattern of dropped QRS complexes (e.g., every second, third, or fourth P wave fails to conduct).
    - Conduction ratio may be 2:1 or higher (e.g., two P waves for each QRS complex).
  - Both types are considered incomplete heart blocks.

- **Third-Degree AV Block (Complete Heart Block):**
  - Also known as AV dissociation, where the atria and ventricles beat independently.
  - P waves and QRS complexes are unrelated, and a longer rhythm strip may be needed to confirm the diagnosis.
  - P waves may overlap with QRS complexes.
  - An escape rhythm (junctional or ventricular) takes over, often resulting in a slower rhythm.
  - Severe cases can lead to compromised cardiac output due to the lack of coordinated atrial and ventricular contraction, potentially becoming life-threatening.
- First- and second-degree AV blocks are incomplete, meaning some impulses still conduct to the ventricles.
- In third-degree AV block, the independent atrial and ventricular rhythms can significantly impair cardiac function.

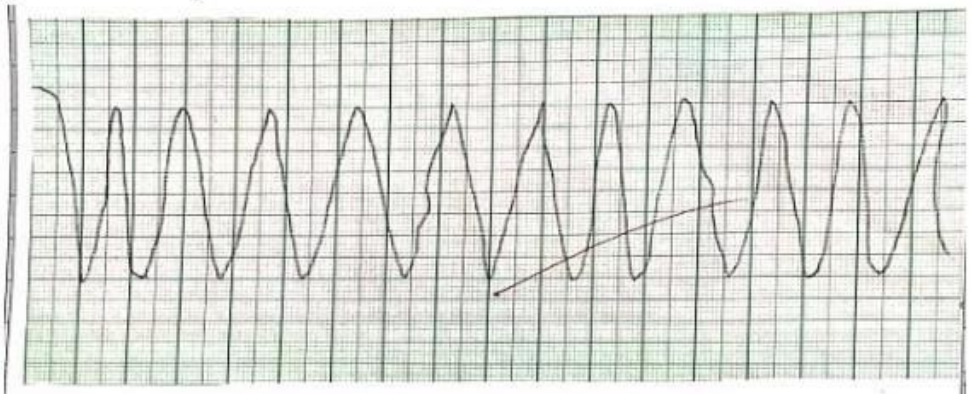


fig- Ventricular tachycardia

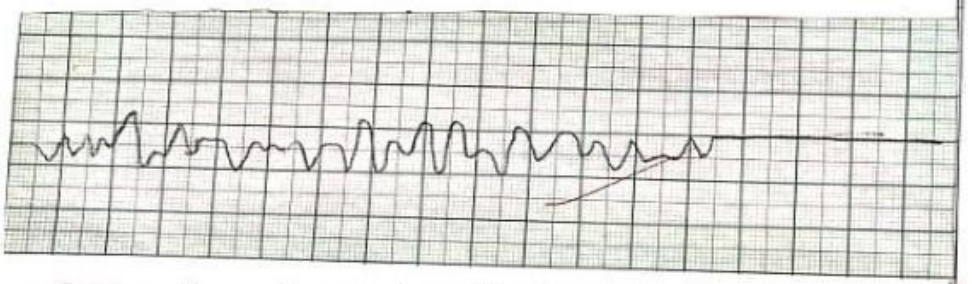


fig- Ventricular fibrillation degenerating into Asystole

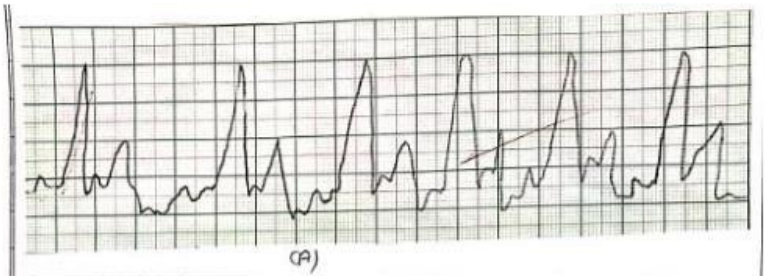
Practical – 07

Aim: Interpretation of ischemic heart disease. Myocardial Ischemia on ECG Infarction.

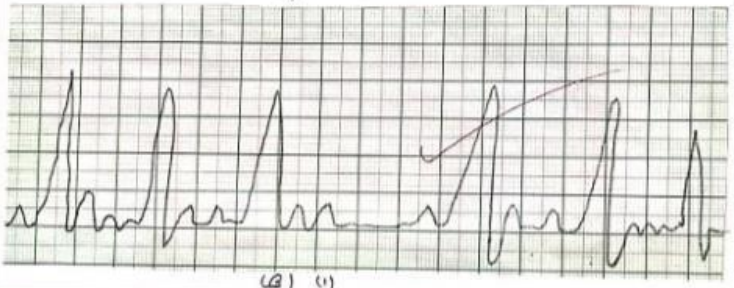
The ECG provides much more information than that gleaned from dysrhythmia analysis. Because physical therapists often treat patients with coronary heart disease information regarding myocardial ischemia on infarction (MI) is also of interest. Although physical Therapists do not medically diagnose myocardial ischemia on MI, they should have a working

Knowledge of its electrocardiographic evidence and the consequences of ischemia. During myocardial ischemia, blood flow to a portion of myocardium is compromised, resulting in alteration of myocardial metabolism. On MI, a portion of myocardium has died, but an Adjacent zone of ischemic myocardial cells endures. These ischemic cells may remain leaky & partially depolarized. A persistent current flows from the injured region to the healthy regions, resulting in a current of injury which is seen as a shift in the ST segment above or below the isoelectric line. ST segment above or shift have significant diagnostic value. For ex- ST segment elevation is associated with Tran's mural MI, whereas ST segment depression is associated with nontransmural or subendocardial MI. Also, the onset of ST segment depression during activity is often considered diagnostic of subendocardial ischemia - for example, exercise-induced ST segment depression observed in one lead during exercise.
Here is a brief discussion of some abnormalities of the ECG observed in coronary artery. Disease (CAD). A prominent Q wave is indicative of a Tran's mural MI. Indeed, non Q wave is synonymous with nontransmural MI. In an addition between an old and an acute event should be based on the clarification of ischemia and MI.

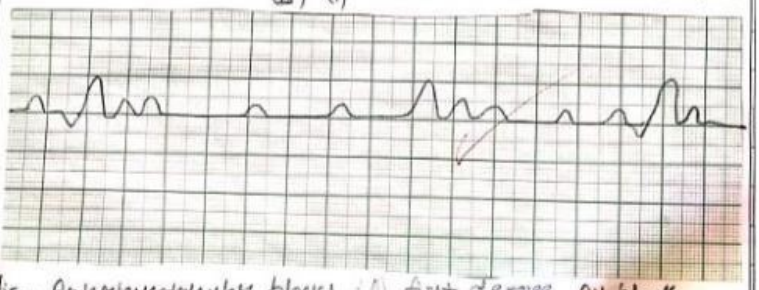
The T wave itself may also undergo changes during myocardial ischemia on MI. During Ischemia, for example, the T wave may invert as a result of proton changes in repolarization. Similarly, during MI, the T wave may become indistinguishable with the infarcted first becoming indistinguishable within an elevated ST segments - then inverting and then perhaps reverting to the original configuration after the passage of time. Although ST Segment changes in the presence of a Q wave are compelling, they must be kept in mind that they are neither too locally sensitive nor too specific.



(A)



(B) (i)



(ii)

fig- Atrioventricular blocks (A) First degree AV block

(B) Second degree AV block - B_1 - Mobitz type I
B_2 - Mobitz type 2.

Practical - 08

Aim: The chest radiograph and its interpretation.

Initial Inspection:

- The process can interpret interpretive information provided by a chest radiograph or chest X-ray (CXR) can be broken down into several stages. Prior to interpreting Aspects of the anatomy image, an overall inspection by the radiologist should be undertaken.
- This includes checking:
    - The patient's identity
    - The date that the image was taken
    - The projection view
    - Thoracic rotation
    - Quality of film exposure/penetration

Evaluation: Potential pathology - thoracic structures and quality of exposure of the film, the diagnostic evaluation procedure can begin.

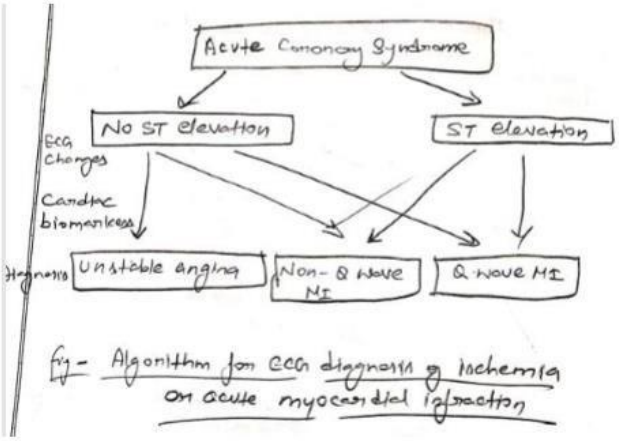


fig- Algorithm for ecg diagnosis of ischemia on acute myocardial infarction

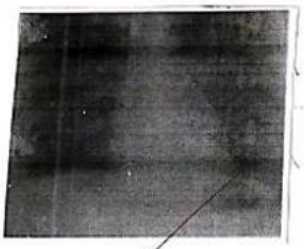


fig- Shown Appropriate penetration

- The image should then be quickly examined for any obvious life-threatening abnormality.

**The image should then be examined for nonpathogenic objects such as pacemaker, tubes, electrical leads and staples. Given exit in the patient's record, it is helpful to compare current films with previous ones.

**The diagnostic evaluation procedures include examination by chest images:

- Bony skeleton (including spine & sternum, clavicle, ribs)
    - Position of the diaphragm consisting of right and left hemidiaphragm
    - Trachea and the main bronchi
    - Lung fields
    - Heart size
    - Mediastinum & great vessels
    - Other disease signs

Bony Skeleton:

- The bony skeleton should be checked for signs of fractures particularly along the margins of ribs.
- Fractures are seen as radiolucent lines within bone or as a disruption of periosteal contour at the edges of the bone.
- Unhealed fragments of bone that are not true anatomical position to one another. Signs of fracture.

Position of the Right and Left Hemidiaphragm:

- The position of the hemidiaphragm should be noted. Structurally, the left hemidiaphragm in visually lower than the right hemidiaphragm because the liver pushes the right hemidiaphragm up.
- In addition to their position, their shapes clarify the appearance of the hemidiaphragm shapes are also important.
- The cardiophrenic angles on either side where each meets the chest wall.
- In areas thin opacity areas of the bone of the chest cavity blood or fluid accumulation inside the chest can be observed on an upright film.
- Such accumulation may affect both lung capacities and thus oxygenation.
- When examining the position of hemidiaphragm the radiologist must also effect the position taken during the X-ray.
- Should be taken radiologist.
- At the time of radiologist, position are asked to take a deep breath inhalation should be made possible to visualize to take both within the allocated cavity.
- If a radiologist is taken during expiration on a deep lung respiratory effort, the ribs will appear close together & the lower ribs will be seen less than the level of diaphragm.
- Pleural abnormality affects the lung marking more in the lower on the same finding often may produce more on the indication of the patient's respiratory activity.

Trachea and the Main Bronchi:

- Another important structure to evaluate in the trachea which should be visible in the upper trachea in the PA projection and the trachea also be visible.

**A subtle trachea from midline can indicate tension within the chest cavity such as that associated with some pneumothorax.

- Nonopaque and any foreign objects in the trachea can cause respiratory obstruction must be evaluated immediately.

**If a patient is intubated with an endotracheal tube position of the tube can be checked on an X-ray.

- The tip of the tube should be at least 2 cm higher than the carina in adults & located at adults T2 to T3 in children.

Lung Fields:

- Lung fields should be evaluated for uniform density as vascular markings throughout.
- Her hilar areas, where the vascular airway structure coverage is normally denser than peripheral lung fields.
- The signs are important clinically when examining for collapsed lung field.
- The peripheral lung field where the smallest vascular and airway structures are located appear the smallest and least dense.
- Comparing the lung fields side by side for symmetry helps identify abnormal areas.

**Various processes such as pneumonia and lead to consolidation of lung tissue, where the presence of a tumor, effusion, or collapsed lung segments produce a denser appearance than have in healthy lung fields.

Full Expansion:

- A pneumothorax causes part of the lung to collapse creating a less dense joint filled space in the chest mainly near.
- A hemithorax on pleural effusion fills the chest cavity with fluid that in lung causing normal lung tissue.

Heart Size:

- Normally the heart is about one half of width of the chest cavity.
- Measuring the cardiac silhouette & then measuring the width the hemothorax for comparison helps to identify condition such as cardiomegaly hypertrophy caused by heart failure on cardiomegaly.
- Next, the shapes bending of the heart should be examined.

Mediastinum:

- The width of the mediastinum is also important to evaluate.
- The mediastinal structures should be just hidden in the thoracic spine.
- When the dense structures in the area are much wider than expected, e.g. the atherosclerotic aortic aneurysm should be suspected.
- If the aortic arch widens, it progresses higher density shadow on the upper left chest cavity that is visible on the radiograph.

Other Disease Signs:

- On chest radiograph disease states can have typical finding on chest radiographs.
- Chronic obstructive pulmonary disease causes limitless glands including a lowered diaphragm & an overall increased density of pulmonary markings.

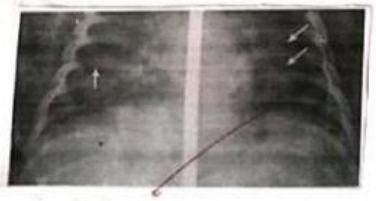


fig - Acute rib fracture

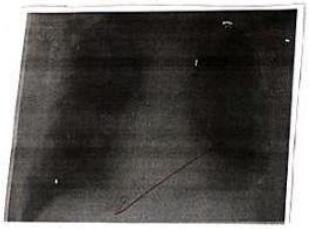


fig- Chest radiography showing a small left pleural effusion

fig- Thoracic aortic aneurism with widened mediastinum

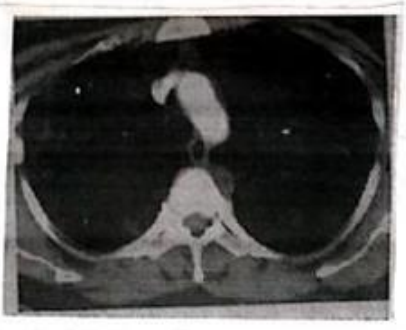


fig- Chest CT showing spine, pulmonary space

Practical-09

Aim: Study and state of perceived exertion and its clinical importance

RATE OF PERCEIVED EXERTION (RPE) –

Rate of perceived exertion is a way to measure the level of exertion a person feels during physical activity

- The scale ranges from 0 to 20, allowing people to give a number rating on how they are feeling. A person can determine their level of exertion on how fast their heart is beating, how hard they are breathing and more

BORG RATING OF PERCEIVED EXERTION SCALE –
This point scale ranges from 6 to 20 with 6 representing no exertion, 8 to 20 indicating the maximum exertion.

- Each point on the scale corresponds to how much exertion a person feels.
- Perceived exertion derives from the physical cues a person or individual may experience. These include
- Increased heart rate
- Increased breathing rate
- Increased sweating
- Muscle fatigue

When using scale, it is important that a person

RATING | HOW THE EXERTION FEELS
0 | Rest
1 | Very easy
2 | Easy
3 | Moderate
4 | Somewhat hard
5 | Hard
7 | Very hard
10 | Maximum exertion

TABLE – MODIFIED RPE SCALE
Takes into account how they feel as a whole rather than focusing on one particular moment.

HOW TO REPORT RPE –

- The table summarizes ratings from the Borg Rating of Perceived Exertion Scale
- When exercising, a person should aim for a rating between 3 to 4, which refers to 'moderate' activity level to reduce the intensity of their exertion to avoid potential injury or overexertion
-

THE MODIFIED RPE SCALE
In addition to feeling physical exertion such as heart rate and an increased breathing rate when exercising a person may also feel pain.

- There is a modified RPE scale called Borg Category Ratio Scale (CR10) that accounts for this
- The CR10 is similar to the original scale but also considers persons' perception level of pain
- Studies give 0 to 10 study suggest that the Borg CR10 scale is a reliable indicator of both physical exertion and how hard the person feels

WHY IS RPE A USEFUL MEASUREMENT?

The Borg RPE scale is simple and easy to use tool that allows a person to gauge the intensity of exercise quickly

- Gives individuals reports a high rating while feeling breathless & fatigue them would be putting themselves at risk of injury. This indicates they should slow down to reduce intensity
- It can also be a valuable tool for people who are often trained to change. A person may notice that certain period of time running or cycling at some speed feels lower RPE score.
- RPE is particularly reliable for individuals whose heart rate does not reflect the amount of exertion they feel
- People taking beta-blockers or other medication that allow their heart rate to be managed in a unique way to manage their physical exertion

Rating	Perceived Exertion
6	No exertion
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

20 POINT BORG SCALE

10 POINT BORG SCALE

Practical-10

Aim – To analyze blood gas.

Blood Gas Test –

A blood gas test measures the amount of oxygen and carbon dioxide in the blood. It may also be used to determine the pH of blood or how acidic it is.

The test is commonly known as a blood gas analysis or arterial blood gas (ABG) test.

Our red blood cells transport oxygen and carbon dioxide throughout the body. These are known as blood gases.

As blood passes through your lungs, oxygen flows into the blood while carbon dioxide flows out of the blood into the lungs. The blood gas test can determine how well your lungs are able to move oxygen into the blood and remove carbon dioxide from the blood.

Imbalance in the oxygen, carbon dioxide, and pH levels of your blood can indicate the presence of certain medical conditions.

These may include –

- Kidney failure
- Heart failure
- Hemorrhage
- Chemical poisoning
- Shock

Why is a blood gas test done?

A blood gas test provides a precise measurement of the oxygen and carbon dioxide levels in your body. This can help your doctor determine how well your lungs and kidneys are functioning.

This test is done to determine the pH, commonly used in hospital setting to determine the management of acutely ill patients.

Showing symptoms of pH or oxygen, CO2 or pH imbalance –

- Shortness of breath
- Difficulty breathing
- Confusion

A blood gas test is done if suspected following conditions –

- Lung disease
- Kidney disease
- Metabolic disease

It helps you and doctor monitor treatment for certain conditions such as lung disease and kidney disease.

A blood gas test is often ordered along with other tests such as blood glucose test to check blood sugar level and creatinine blood test to evaluate kidney function.

When is the blood gas test done?

Since a blood gas test doesn't require a large sample of blood, it is considered a low-risk procedure.

However, you should always tell your doctor about any medical condition that may make you bleed more easily.

You should also tell them if you are taking any over-the-counter or prescription medication such as blood thinners that may affect your bleeding.

Possible side effects associated with blood gas test –

- Bleeding or bruising at the puncture site
- Feeling faint
- Blood accumulating under the skin

How is a blood gas test performed?

A blood gas test requires collection of a sample of blood. Arterial blood can be obtained from an artery in wrist, arm or groin or pre-existing arterial line.

You are currently hospitalized. A healthcare provider in hospital uses a sterile needle to take the sample. The arterial line with an anticoagulant once they find an artery, they will insert a needle into the artery, a small blood sample might feel a slight prick. When the needle goes in arteries hence some smooth muscle layers in vein and some may find an arterial blood gas more painful than blood drawn from a vein.

After the needle is removed the technician will hold pressure for a few minutes before putting a bandage on the puncture wound.

The blood sample will then be analyzed by a portable machine or in an on-site laboratory, an analysis will supply the results of a blood gas test can help your doctor diagnose various diseases or determine how well treatments are working for certain conditions including lung diseases. So blood gas test can show whether or not your body is compensating for the imbalance.

The test measures –

1. **Arterial blood pH** – It indicates amount of hydrogen ions in blood. A pH of less than 7.0 is called acidic, and a pH greater than 7.0 is called basic or alkaline. A lower blood pH may indicate the pH of your blood is more acidic because of pH imbalance.
2. **Bicarbonate** – It's a chemical that helps prevent the pH of blood from becoming too acidic or too basic.
3. **Partial pressure of oxygen** – It is a measure of pressure of oxygen dissolved in the blood. It determines how well oxygen is able to flow from lungs into blood.
4. **Partial pressure of carbon dioxide** – It is a measure of the pressure of CO2 dissolved in blood. It determines how well CO2 is able to flow out of body.
5. **Oxygen saturation** – Measure of the amount of oxygen being carried by the hemoglobin in red blood cells.

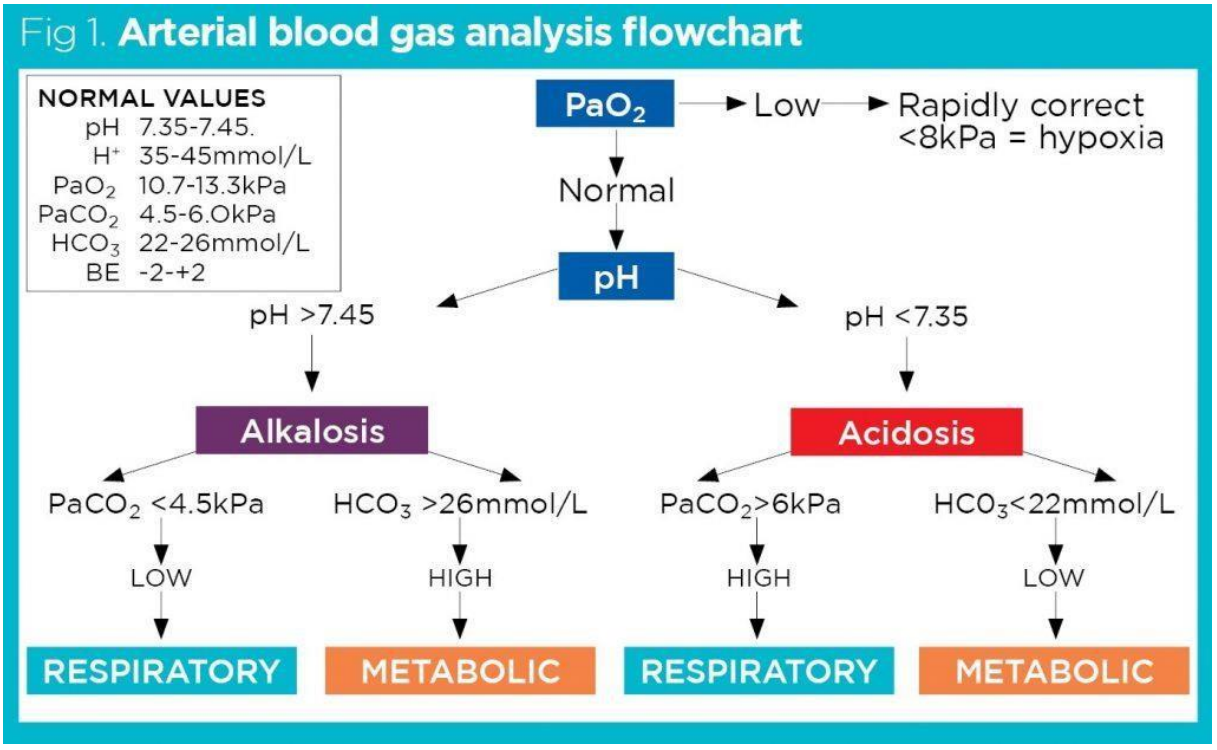
Table – Abnormal results of a blood gas test:

Blood pH	Bicarbonate	Partial Pressure of CO2	Condition	Common Causes
Less than 7.4	Low	Low	Metabolic acidosis	Kidney failure, shock, diabetic ketoacidosis, chronic vomiting, low blood pressure
Greater than 7.4	High	High	Metabolic alkalosis	Long disease including pneumonia, COPD
Less than 7.4	High	High	Respiratory acidosis	Breaking too fast, pain or anxiety

In general normal values include –

1. Arterial blood pH – 7.38 to 7.40
2. Bicarbonate – 22 to 28 mill equivalents per liter
3. Partial pressure of carbon dioxide – 38 to 42 mm Hg
4. Oxygen saturation – 94 to 100 percent

- The normal values will have a slightly different range if they are from a venous or a capillary sample.
- Abnormal results can be sign of certain medical conditions, often in the table.
- Normal lab reference range of blood gases can vary depending on the lab because some use different methods to analyze blood samples.



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