

Standard Operating Procedure (SOP) for Physiology Practical Equipment

This SOP outlines the proper usage, handling, and maintenance of the equipment commonly used in physiology practicals. Adherence to these guidelines ensures accuracy, safety, and efficiency during experiments.

Purpose

The purpose of this SOP is to establish standardized procedures for conducting practical sessions in the Exercise Therapy Laboratory. It ensures consistency, safety, and optimal learning outcomes for all participants.

Scope

This SOP applies to all faculty, students, and staff involved in the physiotherapy exercise therapy laboratory sessions. It covers the use of equipment, safety protocols, and operational guidelines.

Responsibilities

- **Lab Instructors:**
 - Supervise and guide students during practical sessions.
 - Ensure compliance with safety protocols.
- **Students:**
 - Follow instructions and safety guidelines.
 - Maintain discipline and report any issues to the instructor.
- **Lab Technicians (if applicable):**
 - Ensure all equipment is functional and properly maintained.
 - Assist in the setup and cleaning of the laboratory.

Prerequisites

- Completion of pre-lab theoretical sessions.
- Approval of the session plan by the instructor.
- Proper lab attire.
- Completion of required consent forms if involving patients or external participants.

Ist Semester

Topics:-

1. Collection of Blood.
2. Study of Hemocytometer.
 - Hemoglobinometry.
 - white blood cell count

- red blood count
- Leishman's staining

3. Determination of Blood Group.
4. Bleeding time and Clotting time (BTCT).
5. Spirometry: Lung Volume and Capacity.
6. Measurement of blood pressure.

1. Collection of Blood

- **Purpose:** To obtain a small blood sample for various laboratory tests.
- **Materials:**
 - Alcohol swabs
 - Sterile lancets
 - Gauze pads
 - Collection tubes/slides
 - Gloves
- **Procedure:**
 - **Hand Hygiene:** Wash hands thoroughly with soap and water or use hand sanitizer.
 - **Site Selection:** Choose a suitable site for venipuncture (e.g., antecubital vein) or a fingertip for capillary puncture.
 - **Disinfection:** Clean the chosen site with an alcohol swab and allow to air dry.
 - **Puncture:** Make a quick, firm puncture with a sterile lancet.
 - **Collection:**
 - **Venipuncture:** Collect blood in the appropriate collection tube.
 - **Capillary puncture:** Gently wipe away the first drop of blood with a gauze pad. Collect subsequent drops on the slide or in the collection tube.
 - **Post-Procedure:** Apply pressure to the puncture site with a gauze pad to stop bleeding.
 - **Disposal:** Dispose of all sharps (lancets, needles) in a designated sharps container.
 - **Hand Hygiene:** Wash hands thoroughly again.

2. Hematological Studies

- **a) Study of Hemocytometer:**
 - **Purpose:** To understand the principle and operation of a hemocytometer for cell counting.
 - **Procedure:**
 - Learn the structure and grid pattern of the hemocytometer.
 - Practice loading and observing a sample under a microscope.
 - Calculate cell concentration based on the number of cells counted in the grid.
- **b) Hemoglobinometry:**
 - **Purpose:** To determine the concentration of hemoglobin in blood.
 - **Methods:**

- **Cyanmethemoglobin method:** This is the most common method. Blood is mixed with a reagent that converts hemoglobin to cyanmethemoglobin, which is then measured spectrophotometrically.
 - **Procedure:**
 - Follow the manufacturer's instructions for the specific reagent kit used.
 - Measure the absorbance of the sample in a spectrophotometer.
 - Calculate hemoglobin concentration using the appropriate standard curve or formula.
- **c) White Blood Cell Count:**
 - **Purpose:** To determine the number of white blood cells (WBCs) in a given volume of blood.
 - **Method:**
 - **Manual count:** Dilute the blood sample and load it into a hemocytometer. Count the number of WBCs in the grid and calculate the WBC count per microliter.
 - **Automated count:** Use an automated cell counter for a more rapid and accurate result.
- **d) Red Blood Cell Count:**
 - **Purpose:** To determine the number of red blood cells (RBCs) in a given volume of blood.
 - **Method:**
 - **Manual count:** Dilute the blood sample and load it into a hemocytometer. Count the number of RBCs in the grid and calculate the RBC count per microliter.
 - **Automated count:** Use an automated cell counter for a more rapid and accurate result.
- **e) Leishman's Staining:**
 - **Purpose:** To stain blood smears for microscopic examination of blood cells.
 - **Procedure:**
 - Prepare a thin blood smear on a glass slide.
 - Fix the smear with methanol.
 - Stain with Leishman's stain for a specific time.
 - Wash the slide with buffer.
 - Allow the slide to air dry.
 - Examine the stained smear under a microscope to identify different types of blood cells.

3. Determination of Blood Group

- **Purpose:** To determine an individual's ABO and Rh blood group.
- **Method:**
 - **Agglutination test:** Mix a drop of blood with specific antisera (anti-A, anti-B, anti-D) on a slide or in microtiter wells.
 - **Observe agglutination:** If agglutination occurs, it indicates the presence of the corresponding antigen on the red blood cells.
 - **Interpret results:** Determine the blood group based on the agglutination patterns.

4. Bleeding Time and Clotting Time (BTCT)

- **Purpose:**
 - **Bleeding time:** To assess the integrity of small blood vessels and platelets.
 - **Clotting time:** To assess the intrinsic and common pathways of the coagulation cascade.
- **Methods:**
 - **Bleeding time:**
 - **Ivy method:** Make a standardized skin incision and measure the time it takes for bleeding to stop.
 - **Clotting time:**
 - **Lee-White method:** Collect blood in a series of tubes and observe the time taken for clot formation.
- **Procedure:**
 - Follow the specific instructions for each method.

5. Spirometry: Lung Volume and Capacity

- **Purpose:** To measure various lung volumes and capacities, such as tidal volume, vital capacity, inspiratory reserve volume, expiratory reserve volume, and residual volume.
- **Equipment:**
 - Spirometer: A device that measures the volume of air inhaled and exhaled.
- **Procedure:**
 - Have the subject perform specific breathing maneuvers according to the instructions.
 - Record the volumes and capacities displayed on the spirometer.

6. Measurement of Blood Pressure

- **Purpose:** To measure the systolic and diastolic blood pressure.
- **Equipment:**
 - Sphygmomanometer (blood pressure cuff)
 - Stethoscope
- **Procedure:**
 - **Prepare the patient:**
 - Have the patient sit or lie down quietly for a few minutes.
 - Ensure the arm is supported at heart level.
 - **Inflate the cuff:**
 - Wrap the cuff around the upper arm.
 - Inflate the cuff to a pressure above the estimated systolic pressure.
 - **Listen for sounds:**
 - Place the stethoscope over the brachial artery.
 - Gradually release the pressure in the cuff.
 - Note the pressure at the first appearance of sounds (systolic pressure) and the disappearance of sounds (diastolic pressure).

General Safety Precautions

- **Hand Hygiene:** Always maintain proper hand hygiene before and after any procedure.
- **Sterile Technique:** Use sterile equipment and maintain aseptic technique whenever necessary.

- **Sharps Safety:** Dispose of all sharps properly in designated sharps containers.
- **Biohazard Precautions:** Treat all blood and body fluids as potentially infectious.
- **Equipment Maintenance:** Regularly inspect and maintain all equipment according to manufacturer's instructions.

Record Keeping

- Maintain accurate and complete records of all procedures and results.
- Follow the laboratory's guidelines for data recording and reporting.

IIInd Semester

Topics:-

1. Elicit superficial and deep tendon reflexes.
2. Determine muscle tone
3. Cranial nerves

1. Eliciting Superficial and Deep Tendon Reflexes

- **Purpose:** To assess the integrity of the reflex arc, which involves sensory neurons, spinal cord interneurons, and motor neurons.
- **Materials:**
 - Reflex hammer
 - Tongue depressor
- **Procedure:**
 - **Deep Tendon Reflexes:**
 - **Biceps reflex:**
 - Position the patient's arm with slight elbow flexion.
 - Place your thumb over the biceps tendon in the antecubital fossa.
 - Strike your thumb with the reflex hammer.
 - Observe for elbow flexion.
 - **Triceps reflex:**
 - Support the patient's arm at the elbow.
 - Strike the triceps tendon above the olecranon process.
 - Observe for elbow extension.
 - **Brachioradialis reflex:**
 - Support the patient's forearm on your hand with the wrist slightly pronated.
 - Strike the radius about 2 inches above the wrist.
 - Observe for forearm pronation and slight flexion at the elbow.
 - **Patellar reflex:**
 - Have the patient sit with legs dangling freely or cross one leg over the other.

- Strike the patellar tendon below the patella.
 - Observe for knee extension.
- **Achilles reflex:**
 - Have the patient kneel on a chair with feet dangling.
 - Dorsiflex the foot slightly.
 - Strike the Achilles tendon.
 - Observe for plantar flexion of the foot.
- **Superficial Reflexes:**
 - **Plantar reflex:**
 - Stroke the lateral aspect of the sole of the foot from heel to toes.
 - Observe for plantar flexion of the toes (normal) or dorsiflexion of the big toe with fanning of other toes (Babinski sign, abnormal).
 - **Abdominal reflexes:**
 - Stroke the abdomen lightly and quickly above, below, and laterally to the umbilicus.
 - Observe for contraction of the abdominal muscles and movement of the umbilicus towards the stimulus.
 - **Cremasteric reflex:**
 - Stroke the inner thigh of the male patient.
 - Observe for elevation of the ipsilateral testicle.

2. Determining Muscle Tone

- **Purpose:** To assess the resistance of a muscle to passive movement.
- **Procedure:**
 - **Passive Range of Motion (PROM):**
 - Gently move the patient's limbs through their full range of motion.
 - Note any resistance or rigidity.
 - **Grading of Muscle Tone:**
 - **Hypotonia:** Decreased muscle tone, feels "flaccid."
 - **Hypertonia:** Increased muscle tone.
 - **Spasticity:** Increased muscle tone with velocity-dependent resistance to passive stretch.
 - **Rigidity:** Increased muscle tone with continuous resistance to passive stretch throughout the range of motion ("lead-pipe" or "cogwheel" rigidity).

3. Cranial Nerve Examination

- **Purpose:** To assess the function of the 12 cranial nerves.
- **Procedure:**
 - **I. Olfactory:**
 - Test each nostril for the ability to identify familiar odors.
 - **II. Optic:**
 - Test visual acuity, visual fields, and pupillary reflexes.
 - **III. Oculomotor, IV. Trochlear, VI. Abducens:**
 - Assess eye movements in all directions (six cardinal fields of gaze).
 - Check for pupillary constriction and accommodation.

- **V. Trigeminal:**
 - Test facial sensation (light touch, pain, temperature).
 - Assess jaw strength (clench teeth).
 - Check for corneal reflex.
- **VII. Facial:**
 - Observe facial symmetry at rest and with facial expressions (smile, frown, wrinkle forehead, puff cheeks).
 - Test taste on the anterior two-thirds of the tongue.
- **VIII. Vestibulocochlear:**
 - Test hearing acuity.
 - Assess balance and coordination (Romberg test).
- **IX. Glossopharyngeal, X. Vagus:**
 - Observe the position of the uvula.
 - Test the gag reflex.
 - Assess swallowing.
- **XI. Accessory:**
 - Test shoulder shrug and head turning against resistance.
- **XII. Hypoglossal:**
 - Observe tongue movements (protrusion, lateralization).

General Safety Precautions:

- **Patient Comfort:**
 - Explain the procedures to the patient and ensure their comfort throughout the examination.
 - Obtain informed consent when appropriate.
- **Infection Control:**
 - Wash hands before and after each patient encounter.
 - Use appropriate personal protective equipment (PPE) when indicated.
- **Equipment Maintenance:**
 - Keep the reflex hammer clean and in good working order.

Record Keeping:

- Document all findings clearly and concisely in the patient's medical record.