Participant Handbook
Customised crash course programme for COVID warriors

Sector
Healthcare

Sub-Sector
Allied Health & Paramedics

Occupation
COVID Frontline Worker
(Sample Collection Support)

Reference Id: HSS/Q0502, Version 1.0
NSQF Level 4

COVID Frontline Worker
(Sample Collection Support)
Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India
COMPLIANCE TO QUALIFICATION PACK - NATIONAL OCCUPATIONAL STANDARDS
is hereby issued by the HEALTHCARE SECTOR SKILL COUNCIL
for SKILLING CONTENT: PARTICIPANT HANDBOOK
Complying to National Occupational Standards of
Job Role/Qualification Pack: “COVID Frontline Worker (Sample Collection Support)”
GP No. “HSS/QL0502, NSQF Level 4”

Date of Issue: 31st May 2021
Valid up to*: 31st May 2022
*Valid up to the next review date of the Qualification Pack or the
‘Valid up to’ date mentioned above (whichever is earlier)

[Signature]
Authorised Signatory
(Healthcare Sector Skill Council)
Acknowledgements

Healthcare Sector Skill Council (HSSC) acknowledges the contribution of all the individuals and organizations who have contributed to the preparation of this book.

We would like to thank Dr Naresh Trehan, Chairman, HSSC for his constant guidance and support.

We would also like to acknowledge the efforts of the HSSC Academic Committee chaired by Dr. Devi Shetty and its eminent members who guided development of the COVID crash courses.

Sincere appreciation is extended to our industry partners and all the experts for providing technical inputs and reviewing the individual modules. The development of this book would not have been possible without their strong support and valuable feedback.

The efforts of Team HSSC is especially appreciated for supporting the development of this book.

HSSC dedicates this book to youth of the country who desire to come forward to fight COVID 19 and learn specialized skills, an invaluable asset for providing the care while making a career in the Healthcare Sector and wish to be part of the most Noble profession of saving lives.
About this Book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.

- Discuss the difference between disease outbreak, epidemic and pandemic
- Identify correct behavioural practices to be followed to prevent self-infection and spread of the disease to a certain extent
- Organize pre-procedural requirements of sample collection such as necessary equipment and supplies etc.
- Perform sample collection following best practices
- Prepare the patient for special procedures.
- Instruct the patients in collection of other types of samples such as urine, stool, sputum, etc.
- Carry out transfer and storage of samples.
- Prepare for site visits while following visit etiquettes.
- Maintain professional behaviour with co-workers, patients and their families.
- Apply the health, safety and security protocols at the workplace such as effective infection control protocols to ensure the safety of self, patient and colleagues.
- Follow Sanitization and Infection Control Guidelines
- Identify COVID specific care facilities, portals and resources for latest updates about COVID protocols and Role of individual in the same

Symbols Used

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1. Introduction to the Program

Unit 1.1 - Objectives of the Program
Unit 1.2 - Introduction to the Healthcare Industry
Unit 1.3 - Departments in a Hospital
Unit 1.4 - Tools, Equipment and Documents
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. State the overview of the program.
2. Identify the code of ethics and therapeutic communication techniques
3. Identify the different departments in a hospital
4. List the medical terminology and abbreviations related to the job role
5. Identify different types of medical instruments and equipment related to the job role
UNIT 1.1: Objectives of the Program

Unit Objectives

After completion of this unit, the participants will be able to:
1. State the overview of the program
2. Learn about ground rules of the job role

1.1.1 Role of COVID Frontline Worker (Sample Collection)

The frontline sample collections workers are also known as phlebotomists. Phlebotomy (a combination of Greek words *phlebo* which means pertaining to a blood vessel, and *tomy* means to make an incision) is the procedure of creating an incision in a vein with the help of a needle. This procedure is known as a venipuncture. A person who performs phlebotomy is called a phlebotomist; a person trained to draw blood from a patient for clinical testing.

A COVID frontline worker (sample collection) facilitates the collection and transportation of laboratory specimens. He or she is often the patient’s only contact with the medical laboratory. He/she should have the following skills as a part of his job role:

**Communication**
- Greet the patient when he/she goes to a patient’s home to collect sample
- Introduce himself by name
- Describe the process to be performed
- Reassure the patient

**Identification**
- Ask the patient to state his/her full name, spell the last name and date of birth
- Verify with the information on the test requisition form

**Sample Collection**
- Follow best practices of phlebotomy
- Make sure there are no Pre- Analytical error during sample collection

**Patient Safety**
- Ensure sample integrity is maintained till the sample is ready for analysis

*Fig. 1.1.1: Role of COVID Frontline Worker (Sample Collection)*
1.1.2 Patient’s Rights and Responsibilities

In order to avoid any problematic situations that may arise in connection with the clinical examination of patients, the examination process is divided into the following three phases:

- **Pre-analytic phase**
  - Deciding to organize the examination
  - Informing the patient and gaining consent
  - Ordering the examination and preparing the patient
  - Collecting the specimen

- **Analytic phase**
  - Preparing the sample
  - Storing the sample
  - Analyzing the results
  - Verifying the results

- **Post-analytic phase**
  - Reporting the results
  - Interpreting the results
  - Informing the patient or relatives of the meaning of the results
  - Applying the results to patient care

*Fig. 1.1.2: Three phases of examination process*

All medical laboratory staff and technicians have a role in maintaining patient’s rights to:

- Have access to care
- Be given respect and dignity
- Be afforded privacy and confidentiality
- Be assured of personal safety and security
- Be given information about their care
- Be allowed to give informed consent
- Be allowed consultation with a specialist
- Be assured transfer and continuity of care
- Be informed about hospital rules and regulations
- Have permission to file a complaint

*Fig. 1.1.3: Patient’s rights and responsibilities*
The laboratory shall have information available for patients and users of the laboratory services.

The information should include:

- The location of the laboratory
- Types of clinical services offered by the laboratory
- Opening hours of the laboratory
- The examinations offered by the laboratory
- Instructions for completion of the request form
- Instruction for preparation of the patient
- Instructions for patient-collected samples
- Instructions for transportation of samples, including any special handling needs.
- Any requirements for patient consent
- The laboratory’s criteria for accepting and rejecting samples

*Fig. 1.1.4: Laboratory information to be made available for patients*
UNIT 1.2: Introduction to the Healthcare Industry

Unit Objectives

After completion of this unit, the participants will be able to:
1. Explain about the Healthcare Industry including diagnostic centre
2. List the medical terminology and abbreviations related to the job role

1.2.1 Hospital Environment

Whenever people think of healthcare, the first image that comes to their mind is that of a hospital. A hospital is a healthcare institution that is built to provide medical treatment to patients suffering from different types of diseases and other healthcare related issues, with the help of trained staff and specialized medical equipment.

Recent times are witnessing a change in the nature of health care services. In addition to hospitals, there are other healthcare facilities such as primary health-care centres, nursing homes, clinics, surgical centres and others.

1.2.2 Types of Care

There are three major types of care that is provided by healthcare organisations.

- Primary Care
- Secondary Care
- Tertiary Care

Primary Care

It is the patient’s first point of contact for any type of medical consultation by a primary care physician, also referred to as a general practitioner or a family physician. They also coordinate and refer a patient to specialists whenever the patient requires secondary care.

Secondary Care

When a patient requires more complicated services which are beyond the scope of primary care physicians, they are referred to secondary care which consists of specialists who have more specific expertise in a particular area. Examples of secondary care specialists include cardiologist, endocrinologists, and so on.
**Tertiary Care**

When a patient needs to be hospitalised as he requires a still higher level of care that can be provided only within a hospital, it is referred to as tertiary care. Example of tertiary care services consist of in-patient treatment of cancer, burns, and various types of surgeries such as cardiac surgery, neurosurgery and other complicated treatments or procedures.

### 1.2.3 Functions of a Hospital

The functions of a hospital can be spilt into three broad sections:

- **Medical**
  - Treatment and management of patients

- **Patient support**
  - Diagnostic, nursing, therapy and laboratory services, pharmacy, dietary

- **Administrative**
  - Finance, personnel, materials and property, housekeeping, laundry, security services

*Fig. 1.2.2: Functions of a hospital*

In addition to these major functions, most hospitals also perform the following functions:

- Providing training and education to doctors, nurses, dieticians and so on
- Conducting health and medical research
- Providing employment to various healthcare professionals

### Common Medical Terminology

The following table lists some common medical terminology that is used in healthcare sector:

<table>
<thead>
<tr>
<th>Medical Terminology</th>
<th>Full form/meaning</th>
</tr>
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<tbody>
<tr>
<td>Sample Accessioning</td>
<td>Assigning a unique identification number to identify a patient</td>
</tr>
<tr>
<td>Antecubital fossa</td>
<td>The area commonly used for venipuncture, the bend of the arm adjacent to the elbow</td>
</tr>
<tr>
<td>TAT</td>
<td>Turnaround time</td>
</tr>
<tr>
<td>RBC</td>
<td>Red blood cell</td>
</tr>
<tr>
<td>WBC</td>
<td>White blood cell</td>
</tr>
<tr>
<td>ESR</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>CBC</td>
<td>Complete blood count</td>
</tr>
<tr>
<td>DLC</td>
<td>Differential leucocyte count</td>
</tr>
<tr>
<td>TLC</td>
<td>Total leucocyte count</td>
</tr>
<tr>
<td>Medical Terminology</td>
<td>Full form/meaning</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>RFT</td>
<td>Renal function test</td>
</tr>
<tr>
<td>LFT</td>
<td>Liver function test</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>HLA</td>
<td>Human leucocyte antigen</td>
</tr>
<tr>
<td>Hb</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>C&amp;S</td>
<td>Culture and Sensitivity</td>
</tr>
<tr>
<td>CLSI</td>
<td>Clinical and Laboratory Standards Institute</td>
</tr>
<tr>
<td>ICSH</td>
<td>International Council for Standardization in Hematology</td>
</tr>
<tr>
<td>ACBI</td>
<td>Association of Clinical Biochemists of India</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>NABL</td>
<td>National Accreditation Board for Testing and Calibration Laboratories</td>
</tr>
<tr>
<td>NABH</td>
<td>National Accreditation Board for Hospitals &amp; Healthcare Providers</td>
</tr>
<tr>
<td>JCI</td>
<td>Joint Commission International</td>
</tr>
<tr>
<td>EPINet™</td>
<td>Exposure Prevention Information Network</td>
</tr>
<tr>
<td>IJCB</td>
<td>Indian Journal of Clinical Biochemistry</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>GOI</td>
<td>Government of India</td>
</tr>
<tr>
<td>BSC</td>
<td>Biological Safety Cabinet</td>
</tr>
<tr>
<td>Ph</td>
<td>Measure of acid and base properties</td>
</tr>
<tr>
<td>UV</td>
<td>Ultraviolet</td>
</tr>
<tr>
<td>HCl</td>
<td>Hydrochloric Acid</td>
</tr>
<tr>
<td>HEPA</td>
<td>High Efficiency Particulate Air</td>
</tr>
<tr>
<td>ELISA</td>
<td>Enzyme Linked Immunosorbent Assay</td>
</tr>
<tr>
<td>DST</td>
<td>Drug susceptibility Testing</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>PCR</td>
<td>Polymerase Chain reaction</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxy ribonucleic acid</td>
</tr>
<tr>
<td>RNA</td>
<td>Ribonucleic acid</td>
</tr>
<tr>
<td>POC</td>
<td>Point of care</td>
</tr>
<tr>
<td>Medical Terminology</td>
<td>Full form/meaning</td>
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<tr>
<td>---------------------</td>
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</tr>
<tr>
<td>GLC</td>
<td>Gas liquid Chromatograph</td>
</tr>
<tr>
<td>CV</td>
<td>coefficient of variation (%)</td>
</tr>
<tr>
<td>INR</td>
<td>International Normalized Ratio</td>
</tr>
<tr>
<td>LBC</td>
<td>Liquid Based Cytology</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions per minute</td>
</tr>
<tr>
<td>RCF</td>
<td>Relative Centrifugal Force</td>
</tr>
</tbody>
</table>

Table 1.2.1: Common Medical Terminology
UNIT 1.3: Departments in a Hospital

Unit Objectives

After completion of this unit, the participants will be able to:
1. Identify the different departments in a hospital
2. List the various services offered within the hospital and diagnostic center

1.3.1 Hospital Management

The structure of senior management in a hospital is as follows:

![Diagram of Hospital Management](image1)

Fig. 1.3.1: Structure of senior management in a hospital

Services Provided by a Hospital

There may be difference in the way different healthcare organizations are structured, but every hospital provides the following important services:

![Diagram of Hospital Services](image2)

Fig. 1.3.2: Services provided by a hospital
In addition to the above services, every hospital also has laboratory services which form part of Allied Health Services.

1.3.2 Medical Services

Hospitals provide a range of services under different departments. The departments are categorised on the basis of medical/surgical specialties, organ systems or procedures offered to the patient. Each department is headed by a Chief Physician.

Specialties and departments include:

![Fig. 1.3.3: Hospital departments]

**Medical Services Staff**

The medical services staff are organised as follows, on the basis of seniority:

![Fig. 1.3.4: Structure of medical services staff]
Nursing Services

The nursing staff consists of degree qualified nurses. The career structure of nurses is based on the following positions:

Charge Nurse → Nurse Unit Manager → Nursing Director

Allied Health Services

The various allied health services provided by hospitals are as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition and Dietetics</td>
<td>Assess nutritional requirements of patients and design special diets for patients</td>
</tr>
<tr>
<td>Diagnostic Imaging / Radiology Services</td>
<td>Use ionizing radiation, fluoroscopic and radiographic X-Ray instrumentation and imaging methods for diagnosing and treating disease</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>Assists the patient in becoming functionally independent within the limitations of the patient’s disability or condition.</td>
</tr>
<tr>
<td>Pathology</td>
<td>Uses specialized instrumentation to analyze blood, body fluids and tissues for pathological conditions. Laboratory results are used in the diagnosis, treatment and monitoring of patient’s health status.</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>Dispenses medications ordered by physicians</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>Assists in restoring physical abilities impaired by illness or injury</td>
</tr>
<tr>
<td>Speech Therapy</td>
<td>Treats communication or speech disorder</td>
</tr>
<tr>
<td>Social work</td>
<td>Concerned with ensuring human needs, of individuals and groups are met within the framework of a society</td>
</tr>
</tbody>
</table>

Fig. 1.3.5: Allied Health Services

Fig. 1.3.6: Diagnostic Services

Fig. 1.3.7: Pharmacy in a hospital
Administration and Support Services

The hospitals patient service departments are supported by large network of administrative services, as shown in the following table:

<table>
<thead>
<tr>
<th>General Administration</th>
<th>Human Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting Services</td>
<td>Engineering Services</td>
</tr>
<tr>
<td>Housekeeping Services</td>
<td>Supply and Purchasing</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Transportation Services</td>
</tr>
</tbody>
</table>

Table 1.3.1: Administration and Support Services

Medical Laboratory Facilities

A clinical laboratory or medical laboratory is a place where tests are carried out on clinical specimens of patients in order help the doctors in diagnosis, treatment, and/or prevention of disease for a patient.

Clinical laboratories lay emphasis on applied science in contrast to research laboratories that concentrate on basic science.

Medical laboratories are not standard; they vary in size and offer a range of testing services.

- In acute-care medical centers and hospitals, 70% of clinical assessments are based on laboratory testing.
- Laboratories in clinics, skilled long-term care and nursing facilities offer basic testing services.
- Commercial medical laboratories offer testing services which are not provided in other settings because of low test volume or complexity.

Pathology Services

Pathology is the branch of medicine that helps in understanding the cause and processes of disease by looking at the changes in the tissues of the body, blood and other body fluids. These changes throw light on the cause or the severity of the disease and are used to follow an effective treatment.
Two basic types of laboratories can be identified:

**Hospital Based**
- Generally government funded
- Provide diagnostic testing service for patients in the hospital
- Provide a clinical service for patients suffering from diseases specific to a particular pathology specialty
- Provide training (teaching hospitals)

**Non-Hospital Based**
- Generally government funded
- Provide diagnostic testing service for patients in the hospital

Fig. 1.3.9: Basic types of laboratories

Traditionally, pathology services developed in association with hospitals or as private practices owned and run by a small number of pathologists. Recently, there has been a trend towards corporatization in the pathology industry. Corporate owners of pathology services have started acquiring smaller pathology practices. This consolidation of ownership has enabled the main companies to improve productivity through economies of scale and more efficient processes.

### 1.3.3 Laboratory Personnel

The pathology laboratory is staffed with the following personnel:

**Medical and nursing staff**

**Laboratory staff**

**Clerical and support staff**

Fig. 1.3.10: Laboratory Personnel

**Medical Staff – Pathologists**

Pathologists are specialist medical practitioners. They carry out tests on various tissues such as blood, body secretions and samples of tissue taken at surgery or as a part of a medical test, to understand the reason of illness. They interpret laboratory test results and provide advisory services to hospital medical staff.
Some pathologists work in laboratories and oversee the testing procedures, others see patients and are even directly involved in the delivery of patient care.

Pathologists often have important management roles with significant decision-making power within the laboratory environment.

**Nursing Staff**

The nursing staff meet prescribed education and clinical competence standards and are trained in nursing. They are responsible for:
- Infection Control (microbiology department)
- Purchase of safety equipment
- Phlebotomy Services (hematology, clinical chemistry departments)
- Care of patients assigned to a laboratory department (eg. hematology)

**Laboratory Staff**

The laboratory staff consists of following personnel:

![Laboratory staff](image)

Laboratory assistants have minimal formal qualifications and are usually trained on-the job. They are in supporting role to technicians and scientists and their primary duties involve sample preparation and reagent preparation.

Laboratory Technicians are Diploma qualified in Science and they perform laboratory testing under the supervision of laboratory scientists.

Laboratory Scientists are degree/ post graduate qualified, responsible for purchasing decisions and report to senior scientist. Senior Scientists are responsible for signing and issuing final laboratory reports and report to the Principal Scientist. Principal Scientists oversee ‘day to day’ operations.

Laboratory Managers have scientific background and control budget and recruitment.
Clerical and Support Staff

The clerical and support staff consists of following personnel:

- Administration
- Information technology
- Purchasing
- Cleaning
- Teaching and educational support
- Reagent preparation

*Fig. 1.3.12: Clerical and Support staff*
UNIT 1.4: Tools, Equipment and Documents

Unit Objectives

After completion of this unit, the participants will be able to:
1. Identify different types of medical instruments and equipment required
2. Explain the importance of a Test Requisition Forms (TRF)

1.4.1.1 Tools and Equipment

The following tools and equipment are needed for routine sample collection:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuated Collection Tubes</td>
<td>The tubes are designed to fill with a predetermined volume of blood by vacuum. The rubber stoppers are color coded according to the additive that the tube contains.</td>
<td><img src="image" alt="Evacuated Collection Tubes" /></td>
</tr>
<tr>
<td>Needles</td>
<td>The gauge number indicates the bore size: the larger the gauge number, the smaller the needle bore. Needles are available for evacuated systems and for use with a syringe, single draw or butterfly system.</td>
<td><img src="image" alt="Needles" /></td>
</tr>
<tr>
<td>Holder/Adapter</td>
<td>It is used with the evacuated collection system.</td>
<td><img src="image" alt="Holder/Adapter" /></td>
</tr>
<tr>
<td>Tourniquet</td>
<td>To determine the location of a suitable vein for venipuncture</td>
<td><img src="image" alt="Tourniquet" /></td>
</tr>
<tr>
<td>Alcohol Wipes</td>
<td>It is 70% isopropyl alcohol.</td>
<td><img src="image" alt="Alcohol Wipes" /></td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Image</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Povidone-iodine wipes/swabs</td>
<td>Used if blood culture is to be drawn</td>
<td></td>
</tr>
<tr>
<td>Gauze sponges</td>
<td>For application on the site from which the needle is withdrawn</td>
<td></td>
</tr>
<tr>
<td>Adhesive bandages / tape</td>
<td>Protects the venipuncture site after collection</td>
<td></td>
</tr>
<tr>
<td>Needle disposal unit</td>
<td>Needles should never be broken, bent, or recapped. Needles should be placed in a proper disposal unit immediately after their use</td>
<td></td>
</tr>
<tr>
<td>Gloves</td>
<td>Can be made of latex, rubber, vinyl, etc.; worn to protect the patient and the phlebotomist</td>
<td></td>
</tr>
<tr>
<td>Syringes</td>
<td>May be used in place of the evacuated collection tube for special circumstances</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.4.1: Tools and equipment needed for routine sample collection
1.4.1.2 Collection Tubes used in Phlebotomy

Blood collection tubes are made of a sterile glass or plastic and are also called vacutainers. It has a coloured rubber stopper that creates a vacuum inside the tube. It may contain additives for preserving the specimen.

Collection tubes used in phlebotomy are of various sizes depending upon:

![Figure 1.4.1: Collection tubes](image)

The following table shows the different types of collection tubes:

<table>
<thead>
<tr>
<th>Type</th>
<th>Additive</th>
<th>Mode of Action</th>
<th>Uses</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Top</td>
<td>None</td>
<td>Blood clots, and the serum is separated by centrifugation</td>
<td>Chemistries, Immunology and Serology, Blood Bank (Crossmatch)</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>Gold Top</td>
<td>None</td>
<td>Serum separator tube (SST) contains a gel at the bottom to separate blood from serum on centrifugation</td>
<td>Chemistries, Immunology and Serology</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>Light Green Top</td>
<td>Plasma Separating Tube (PST) with Lithium heparin</td>
<td>Anti-coagulates with lithium heparin; Plasma is separated with PST gel at the bottom of the tube</td>
<td>Chemistries</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>Purple Top</td>
<td>EDTA</td>
<td>Forms calcium salts to remove calcium</td>
<td>Hematology (CBC) and Blood Bank (Crossmatch); requires full draw - invert 8 times to prevent clotting and platelet clumping</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>Light Blue Top</td>
<td>Sodium citrate</td>
<td>Forms calcium salts to remove calcium</td>
<td>Coagulation tests (protime and prothrombin time), full draw required</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>Type</td>
<td>Additive</td>
<td>Mode of Action</td>
<td>Uses</td>
<td>Image</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Green Top</td>
<td>Sodium heparin or lithium heparin</td>
<td>Inactivates thrombin and thromboplastin</td>
<td>For lithium level, use sodium heparin For ammonia level, use sodium or lithium heparin</td>
<td></td>
</tr>
<tr>
<td>Dark Blue Top</td>
<td>EDTA</td>
<td>Tube is designed to contain no contaminating metals</td>
<td>Trace element testing (zinc, copper, lead, mercury) and toxicology</td>
<td></td>
</tr>
<tr>
<td>Light Gray Top</td>
<td>Sodium fluoride and potassium oxalate</td>
<td>Antiglycolytic agent preserves glucose up to 5 days</td>
<td>Glucoses, requires full draw (may cause hemolysis if short draw)</td>
<td></td>
</tr>
<tr>
<td>Yellow Top</td>
<td>ACD (acid-citrate-dextrose)</td>
<td>Complement inactivation</td>
<td>HLA tissue typing, paternity testing, DNA studies</td>
<td></td>
</tr>
<tr>
<td>Yellow - Black Top</td>
<td>Broth mixture</td>
<td>Preserves viability of microorganisms</td>
<td>Microbiology - aerobes, anaerobes, fungi</td>
<td></td>
</tr>
<tr>
<td>Black Top</td>
<td>Sodium citrate (buffered)</td>
<td>Forms calcium salts to remove calcium</td>
<td>Westergren Sedimentation Rate; requires full draw</td>
<td></td>
</tr>
<tr>
<td>Orange Top</td>
<td>Thrombin</td>
<td>Quickly clots blood</td>
<td>STAT serum chemistries</td>
<td></td>
</tr>
<tr>
<td>Light Brown Top</td>
<td>Sodium heparin</td>
<td>Inactivates thrombin and thromboplasti; contains virtually no lead</td>
<td>Serum lead determination</td>
<td></td>
</tr>
<tr>
<td>Pink Top</td>
<td>Potassium EDTA</td>
<td>Forms calcium salts</td>
<td>Immunohematology</td>
<td></td>
</tr>
<tr>
<td>White Top</td>
<td>Potassium EDTA</td>
<td>Forms calcium salts</td>
<td>Molecular/PCR and DNA testing</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.4.2: Collection tubes used in Phlebotomy
1.4.1.3 Types of Needles

Needles are of different sizes. The size of a needle is measured in gauge. The larger the needle, the smaller the gauge number. 21- or 22-gauge needles are mostly used to collect blood samples.

Needles are of different types:
- Single draw needle
  - Can be used only once to fill the syringe to which they are connected

![Single draw needle](image1)

- Multiple draw needle
  - Used with vacuum collection tubes
  - Can be used multiple times

![Multiple draw needle](image2)
- Butterfly needle
  - Used with syringes and for drawing blood from small, fragile veins

*Fig. 1.4.4: Butterfly needle*

**Needles used in Phlebotomy**

The most commonly used needles in phlebotomy, along with their gauge and colour code are as shown in the following table:

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Length (mm)</th>
<th>Colour code</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>25</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>25</td>
<td>Pink</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>25</td>
<td>Cream</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>16</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Gauge</td>
<td>Length (mm)</td>
<td>Colour code</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>22</td>
<td>25</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>16</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>25</td>
<td>Purple</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>13</td>
<td>Orange</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>13</td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>13</td>
<td>Grey</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>13</td>
<td>Red</td>
</tr>
</tbody>
</table>

*Table 1.4.3: Types of needles*
1.4.1.4 Types of Gloves

Gloves are of three types:

- **Latex**
  - Most commonly used
  - Fits well
  - Provides good barrier

- **Nitrile**
  - Fits well
  - Provides good barrier

- **Vinyl**
  - Too loose fitting for sensitivity required to palpate veins
  - May not provide adequate barrier to viruses

Fig. 1.4.5: Types of gloves

1.4.2 Test Requisition Forms (TRF)

A test requisition form should be submitted for every patient. The TRF must contain all the pertinent information that is required to process the specimen. It contains the following information:

- Patient information
  - Patient Name
  - Sex
  - Mailing Address
  - Aadhar Number
  - Date of Birth
  - Daytime Phone Number

- Ordering Physician/Laboratory
  - Physician’s name
  - Office location

- Billing Information
- Mode of payment

- Specimen Information
  - Date of collection
  - Source of specimen

- Test Selection
  - All tests ordered

Fig. 1.4.6: Test Requisition Forms (TRF)
1. Identify which of the following statements are true or false.
   a. Pathology is a branch of medicine that assists the patient in becoming functionally independent.
   b. In-patient treatment of cancer is an example of secondary care provided by healthcare organizations.
   c. Pathologists are specialist medical practitioners.
   d. A test requisition form contains the billing information of the patient.

2. Which of the following is not a function of clerical and support staff?
   a. Purchasing
   b. Nursing
   c. Cleaning
   d. Teaching and educational support

3. List two roles performed by the nursing staff.
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. State the full form of the following acronyms.
   a. DLC____________________________________
   b. RFT____________________________________
   c. ELISA___________________________________
   d. PCR____________________________________

5. List the use of each type of collection tube.

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>7 ml</td>
</tr>
<tr>
<td>Purple</td>
<td>7 ml</td>
</tr>
<tr>
<td>Black</td>
<td>7 ml</td>
</tr>
<tr>
<td>White</td>
<td>7 ml</td>
</tr>
<tr>
<td></td>
<td>Collection Tubes</td>
</tr>
<tr>
<td>---</td>
<td>-----------------</td>
</tr>
<tr>
<td>![Image of a test tube]</td>
<td></td>
</tr>
<tr>
<td>![Image of a syringe]</td>
<td></td>
</tr>
<tr>
<td>![Image of a lanyard]</td>
<td></td>
</tr>
<tr>
<td>![Image of a sharps container]</td>
<td></td>
</tr>
</tbody>
</table>
2. Health & Hygiene

Unit 2.1 - General Practices for an Outbreak/Pandemic
Unit 2.2 - Safety and Sanitisation Guidelines
Unit 2.3 - Other Common Practices & Guidelines
Unit 2.4 - COVID 19 Vaccination
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. Discuss the difference between disease outbreak, epidemic and pandemic
2. Identify correct behavioural practices to be followed to prevent self-infection and spread of the disease to a certain extent
3. Explain social distancing, self-quarantine and self-isolation
4. Identify potential fomites and personal protective equipment (PPE) to be used at workplace
5. Describe common practices and guidelines pertaining to management of waste, measures for dealing with stress and anxiety, and procedure of reporting symptoms
UNIT 2.1: General Practices for an Outbreak/Pandemic

Unit Objectives

After completion of this unit, the participants will be able to:
1. Differentiate between disease outbreak, epidemic and pandemic
2. Explain the rules and guidelines for epidemic/pandemic
3. Distinguish between self-quarantine and self-isolation
4. Discuss norms for maintaining social distance during a pandemic

2.1.1 Disease Outbreaks, Epidemics and Pandemics

What is a Disease Outbreak?

The term ‘outbreak’ means ‘sudden breaking out’ or ‘occurrence’ of a disease, or anything unpleasant. Disease outbreak specifically refers to a sudden occurrence and exponential rise of a disease beyond anyone’s expectation and across any community, geographical area, or a country.

Disease outbreak is often caused by an infection which is transmitted to a person from another person, animal, environment or any other source. It may also be caused due to exposure to chemicals or radioactive materials. However, there are times when the cause of outbreak remains unknown. In fact, there is no certainty about the duration of a disease outbreak, for it may last a few days, weeks, months, or even years.

As per the World Health Organisation (WHO) data, disease outbreak happens every year in the form of influenza or the like in different parts of the world. At times, even a single case of an infectious disease is enough for it to be categorized as an outbreak. This is more so in case of a rare disease or that which has serious public health implications, for example, foodborne botulism.

DDT or mercury related diseases are examples of chemical related outbreaks, for example, Zika outbreak in 2015. Aedes mosquitoes spread the Zika virus in Brazil, America and South East Asia. It caused brain anomalies in the new borns when pregnant women were infected. Most of these infections were asymptomatic.

What is an Epidemic?

Epidemic refers to an infectious disease that spreads actively and substantially across a specific location affecting large number of people within a short span. In fact, epidemics of 21st century are observed to be spreading more rapidly to far off regions than others.
For example, no one had heard of Severe Acute Respiratory Syndrome (SARS) before 2003, but it affected over 8,000 people and killed one out of ten of them. Similarly, epidemic of Middle East Respiratory Syndrome (MERS) across Middle East in 2012-2013, and the Ebola epidemic in West Africa in 2014 caused fear and panic as well as inflicted massive damage to the economy. Ebola epidemic of 2014 was a viral haemorrhagic fever caused by the Ebola virus. It spreads from infected bats and fluids of infected humans. It was located in the Sub-Saharan Africa mainly.

What is a Pandemic?

When an epidemic spreads across various countries, it becomes pandemic. It affects larger number of people across the globe, causing greater number of deaths as compared to an epidemic. In addition to adversely affecting people, it has a drastic impact on the economy at large. Since pandemics pose far greater challenge than disease outbreaks and epidemics, the measures undertaken to deal with them are quite stringent, such as partial or complete lockdown imposed during covid 19 in 2020.

Influenza pandemic have been the most widely reported. There have been five of them in the past 140 years—the most severe was in 1918 (Spanish flu) and the most recent being the swine flu (2009). It happens when a new strain of the influenza virus is transmitted from any animal species to humans.

The following figure shows some key highlights of a pandemic:

- Affects a wider geographical area, often worldwide
- Infects a greater number of people than an epidemic does
- Often caused by a new virus or a strain of virus that has not circulated among people for a long time; humans usually have little or no immunity against it
- Causes higher numbers of deaths than epidemics
- Creates social disruption, economic loss and general hardship

*Fig. 2.1.1: Key highlights of a pandemic*
2.1.2 Rules and Guidelines during Epidemic/Pandemic

As explained earlier, epidemics and pandemics have a tremendous impact on a large population—across a specific location or various countries respectively. The most significant defence against the outspread of disease is rules and guidelines. It is imperative to adhere to these guidelines for prevention and control of disease. However, first one needs to understand how the viruses/pathogens spread in humans though different means.

The spread of viruses/pathogens in humans is shown in the following figure:

**Fig. 2.1.2: Spread of infection**

There are four main guidelines to be followed during an epidemic/a pandemic, as shown in the following figure:

**Fig. 2.1.3: Guidelines to be followed during epidemic/pandemic**

**Personal Hygiene**

Personal hygiene is significant for prevention of infectious diseases and promotion of overall well-being. It refers to self-care practices for maintaining cleanliness at personal level and preserving health. These practices include bathing every day, washing hands with soap, wearing clean clothes, brushing teeth, grooming and so on. Personal hygiene entails maintaining not only cleanliness but also healthy habits as preventive measures for safeguarding oneself from catching any infection. It becomes all the more important to follow these practices during epidemics and pandemics as the nature of the disease is infectious, i.e., it spreads by coming in contact with infected people or things. Therefore, maintaining personal hygiene is not an option but a compulsion to secure oneself from becoming vulnerable to any infection.
Some points for maintaining personal hygiene are shown in the following image:

**WASH YOUR HANDS**
Frequently and thoroughly wash your hands with soap and water or clean them with an alcohol-based hand rub.

**DO NOT TOUCH YOUR FACE**
Do not touch eyes, nose or mouth with your hands as they may have touched contaminated surfaces and picked up viruses.

**MAINTAIN PHYSICAL DISTANCING**
Maintain at least 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing.

**OBSERVE ISOLATION IF SICK**
Stay at home if you are sick or have even slight fever, cough and difficulty in breathing; seek medical attention and call in advance.

*Fig. 2.1.4: Maintaining personal hygiene*

**Hand Hygiene at Workplace**

At work, our hands are exposed to all types of surfaces during the day, as everything we do involves hands in one way or the other—be it when shaking hands with people, eating meals, working on laptop, using mobile phone or common landline phone and so on. This makes them prone to various germs and viruses that can lead to sickness. It is for this reason that proper hand washing is on the top of personal hygiene routine. In fact, it is also one of the simplest and most effective ways to protect oneself and family members from falling prey to illnesses such as cold, cough, flu and gastroenteritis (these can all be contracted or passed on through poor hand hygiene). It is imperative to follow proper hand washing techniques at home and workplace to prevent the spread of diseases.
Some key highlights of maintaining hand hygiene at workplace are shown in the following figure:

<table>
<thead>
<tr>
<th>Wash</th>
<th>Sanitize</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash hands with liquid soap and water at regular intervals to maintain cleanliness</td>
<td>Sanitize hands often, especially after using mobile, laptop or touching any surface</td>
<td>Avoid touching eyes, nose, ears or face unnecessarily</td>
</tr>
<tr>
<td>Follow proper hand washing techniques</td>
<td>Use alcohol based hand rub or sanitizer</td>
<td>Avoid shaking hands</td>
</tr>
</tbody>
</table>

**Fig. 2.1.5: Maintaining hand hygiene at workplace**

**Steps**

The detailed process for maintaining hand hygiene is shown in the following set of images:

**Fig. 2.1.6(a): Maintaining hand hygiene with soap and water**
Respiratory Hygiene

As the name suggests, respiratory hygiene is all about undertaking preventive measures to prevent the transmission of infection via the respiratory tract. It helps reduce the spread of viruses and pathogens, especially during epidemic or pandemic of an infectious disease.

The effective practices to maintain respiratory hygiene at workplace are shown in the following figure:

<table>
<thead>
<tr>
<th>Cough/Sneeze Etiquette</th>
<th>Face Masks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cough or sneeze in the elbow</td>
<td>• Wear appropriate face mask at workplace</td>
</tr>
<tr>
<td>• Use tissues to clean after coughing/sneezing</td>
<td>• Avoid touching face and mask unnecessarily</td>
</tr>
<tr>
<td></td>
<td>• Dispose it off properly in closed bins after use</td>
</tr>
</tbody>
</table>

Fig. 2.1.6(b): Maintaining hand hygiene with alcohol-based sanitizers

Fig. 2.1.7: Maintaining respiratory hygiene at workplace
The cough/sneeze etiquette is shown in the following image:

Fig. 2.1.8: Cough and sneeze etiquette

Guidelines for using face masks are given in the following figure:

- **Clean hands before wearing mask**
  - Use hand rub or sanitizer

- **Use new mask and check it for any defects**
  - Don’t use worn or damaged mask

- **Wear mask to cover nose, mouth and chin**
  - Pull the straps to wear mask

- **Don’t touch the face or mask**
  - Clean hands in case mask gets touched by mistake

- **Clean hands before removing the mask**
  - Remove the mask by pulling out the straps

Fig. 2.1.9: Guidelines for using face masks
Steps

The following image shows steps to wear and dispose a surgical mask:

Fig. 2.1.10 (a): Wearing a surgical mask
Steps

The following image shows steps to wear a non-surgical mask:

1. Wash hands with sanitizer before wearing a mask
2. The colored side should face out and white side should face in
3. Loop the straps around your ear or over the head
4. Fix the metallic strip to fit the shape of the nose
5. Stretch the mask to cover your chin
6. Finish protection guaranteed

Fig. 2.1.10 (b): Wearing a non-surgical mask

Types of Face Masks

Face masks play a significant role in protecting the wearer from catching any kind of infection. There are mainly two types of masks, namely, medical masks and non-medical masks (fabric masks) but there are different styles as shown in the following image

Fig. 2.1.11: Types of face masks

Face masks are worn to protect the wearer and the people surrounding him/her from infection that is carried in the droplets sprayed from coughing, sneezing and talking. They are typically worn to cover the nose and the mouth. There are many types of face masks available and they can be broadly divided into those worn by the healthcare staff and those worn outside a hospital.
Masks worn by non-healthcare givers are largely to protect themselves from dust and microbes. The protection offered depends on the material used and the number of layers. Some common types of masks used by people when they step out of the house are shown in the following images:

Cloth Masks — A simple bandana made of cotton may be fashionably apt but offers virtually no protection from disease bearing droplets. Neck gaiters and balaclavas are effective only if made of cotton. Masks made of synthetic material may lead to more harm than good. There are anecdotal reports of masks made from old T shirts, but these are also equally non-effective. For a cloth mask to be effective it should be made of tightly woven 100% cotton and sewn in three layers. Adding a polypropylene filter (which carries an electrostatic charge to trap small particles) can increase the filtration efficiency of a cloth mask to up to 70%. These are reusable masks and should be washed daily after use.

Surgical Masks — These are flat thin paper like masks which filter out 60% of inhaled particles. It provides barrier protection against large droplets but does not have an airtight seal. They are of single use type and should be discarded after each use. When a middle layer of melt blown yarn and a nose clip is added, they are effective in filtration of approximately 95% of particles.

N95 Masks — These are personal protective devices and are made of melt blown yarn. They are able to filter out 97% of air borne particles. They are tight-fitting masks and have to be worn carefully lest some leakage occurs. People suffering from respiratory distress should not use an N95 mask. They can be reused a number of times provided proper sanitizing methods are used to disinfect the masks. Masks that have a valve protect the user from the air borne particles that are outside but do not protect the people surrounding the user if he/she is infected.

Social Distancing

We come in contact with people at work place who could be asymptomatic carriers of infection, which makes us all vulnerable unknowingly. An asymptomatic person is someone who shows no symptoms is spite of being infected. In certain cases, even the infected person does not know that he or she is infected without symptoms and is a potential carrier of infection.
Something as simple as talking, coughing or sneezing is enough to spread the infection from an infected person to others. It so happens that tiny droplets that are sprayed while talking, coughing or sneezing may contain virus that is transmitted to the person close by.

That is why social distancing becomes all the more important. Social distancing simply means maintaining physical distance of at least 1 meter (3 feet) from others. It is an effective preventive measure to protect oneself from catching any infectious disease from an infected person. This helps to slow down the spread of disease and safeguard those who are not infected.

The following image shows the sitting arrangement ideal for maintaining social distancing:

*Fig. 2.1.13: Social distancing at workplace*

**Workplace Hygiene**

Workplace hygiene is as important as personal hygiene. It has various verticals spanning the work area, meeting etiquette and so on, and has a significant role in prevention of a disease outbreak. It not only helps in keeping oneself safe but also protects others and the environment.
Some key points for maintaining workplace hygiene are given in the following figure:

**Fig. 2.1.14: Maintaining workplace hygiene**

The following figure summarises the do’s and don’ts to be practiced at workplace:

**Do’s**
- Use non-contact greeting methods
- Clean hands at the door and keep washing hands regularly
- Disinfect surfaces such as doorknobs, tables and desks regularly
- Stay home if you are feeling sick
- Stay at home if anyone in your family is sick
- Use video conferencing instead of physical meetings
- Ensure you meet people in well-ventilated rooms and spaces

**Don’ts**
- Shake hands when meeting someone
- Touch your face and leave your mouth uncovered while coughing and sneezing
- Travel unnecessarily
- Get too much stressed if work is not going as planned
- Feel lonely and depressed; instead ensure you talk to people who will uplift your mood

**Fig. 2.1.15: Good practices while moving out of home**
2.1.3 Self-quarantine vs. Self-isolation

Several preventive measures are undertaken during an epidemic or a pandemic to contain the spread of the disease. Self-quarantine and self-isolation are two such effective ways to prevent the transmission of infection from an infected person to non-infected persons. Both of them are based on social distancing on a broader level, for in both the instances an individual needs to separate oneself from others for a certain period. However, although they are similar, there is a difference between the two.

What is Self-quarantine?

Self-quarantine entails isolating oneself at home or any other place for a period of minimum fourteen days or so. It is meant for people who have been exposed to someone infected with the virus, have travelled during an epidemic/a pandemic, have attended any public gathering, or have been amidst a crowd. If a person has been in any of the above or similar situation then it is not an option but mandatory as per the guidelines that he or she should self-quarantine to prevent any infection or disease from spreading further. If any of the symptoms of infection begin to develop, then the person should contact a medical provider on a priority basis and follow the advice.

What is Self-isolation?

Self-isolation also entails isolating oneself at home or any other place for a period of seventeen days or so. However, it is meant for people who have already tested positive for the virus/infection that has led to the epidemic/pandemic. This is the key difference between self-isolation and self-quarantine. In this case, the person has already caught the infection and needs to isolate to contain the spread of the virus and recover from the disease.

Every disease outbreak, epidemic or pandemic has certain signs and symptoms. For example, in case of Covid 19, symptoms entail fever, cold, cough, shortness of breath and so on. It is recommended to go for the test in case of development of any of these symptoms and follow the advice of the medical provider. As long as the symptoms are manageable, it is often advised to self-isolate at home, but in case of severe complications, the individual is admitted to the hospital.

Both, self-quarantine and self-isolation, involve maintaining personal hygiene and adhering to the guidelines as given in the following figure:

<table>
<thead>
<tr>
<th>Stay in a well-ventilated room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrict movement</td>
</tr>
<tr>
<td>No direct contact or face to face interaction with anyone</td>
</tr>
<tr>
<td>Wear face masks to prevent the spread of virus</td>
</tr>
<tr>
<td>Keep your utensils and belongings separate</td>
</tr>
<tr>
<td>Stock up your essentials or go for contactless delivery</td>
</tr>
<tr>
<td>Stay active by doing some exercise or yoga</td>
</tr>
</tbody>
</table>

Fig. 2.1.16 (a): Guidelines for self-quarantine and self-isolation
Guidelines for environmental sanitation during self-quarantine and self-isolation are mentioned in the following figure:

- Clean and disinfect frequently touched surfaces in the room daily with 1% sodium hypochlorite solution.
- Clean and disinfect toilet surfaces daily with regular household bleach solution/phenolic disinfectants.
- Clean the clothes and other linen used by the person separately using common household detergent and dry them properly.

Fig. 2.1.16 (b): Environmental sanitation guidelines for self-quarantine and self-isolation

### 2.1.4 Social Distancing

As explained earlier, social distancing refers to maintaining physical distance of at least 1 meter (3 ft.) between oneself and others. It also entails not going out in crowded areas or public gatherings during a disease outbreak, an epidemic, or a pandemic. Social distancing combined with strict adherence to personal hygiene routine, respiratory hygiene and workplace hygiene is highly effective in containing the spread of infections/diseases.

**Why Practice Social Distancing?**

Social distancing protects those who are not infected, as it limits the opportunities of coming in contact with contaminated surfaces or infected people, especially outside home. It is all the more effective in case the epidemic is caused due to a communicable disease, for in such cases the virus can spread from the infected person to other people through droplets of cough or sneeze. The best defence is to wear appropriate face mask and maintain social distance during all interactions, even at home.
Some tips for social distancing are shown in the following figure:

- Follow Indian style of greeting - *Namaste*
- Shop online for grocery, medicines, etc.
- Choose contactless delivery
- Wear masks properly
- Work or learn (in case of students) from home
- Avoid gatherings at home, friend's place or any other place
- Avoid going out unnecessarily
- Limit or avoid use of public transport

*Fig. 2.1.17: Social distancing tips*

Some practices while meeting people out of home are shown in the following image:

![Greeting while avoiding physical distance](image)

*Fig. 2.1.18: Greeting while avoiding physical distance*
1. If soap and water are not available, one can clean hands with which of the following?
   a. Tissues
   b. Cloth
   c. Sanitizer
   d. Surf

2. Personal hygiene includes which of the following?
   a. Hand hygiene
   b. Workplace hygiene
   c. Social distancing
   d. Work from home
UNIT 2.2: Safety and Sanitisation Guidelines

Unit Objectives

After completion of this unit, the participants will be able to:

1. Discuss personal and workplace hygiene practices
2. Explain potential fomites at workplace
3. Describe appropriate use and disposal of Personal Protective Equipment (PPE)

2.2.1 Personal & Workplace Hygiene Practices

Good personal hygiene is an effective means to protect oneself and others from illnesses in general and catching infection during a disease outbreak, an epidemic or a pandemic. Personal hygiene entails adopting healthy practices to upkeep personal cleanliness and appearance. It is often mistaken to be akin to cleanliness but it is much broader than that as it includes habits required to maintain health and wellbeing. These practices include washing hands, sanitising hands, bathing, oral care, self-care and so on. In case of people who do not adhere to personal hygiene routine on a regular basis, their body becomes a breeding ground for all types of germs and viruses.

Hand hygiene is an essential part of maintaining personal hygiene. Our hands are the potential carriers of viruses as they are exposed to all types of surfaces and used for carrying out all the tasks during the day. In fact, it is no exaggeration to mention that personal hygiene routine begins with hand hygiene. Keeping them clean and healthy is of prime importance as this would safeguard oneself and others from infections and illnesses.

Washing hands is the quickest and simplest way to get rid of viruses, protect oneself and others, and prevent diseases from spreading. Hand hygiene routine has already been explained in detail in the previous unit. Here we shall learn about when and how to wash hands to stay healthy.

The following images show hand washing techniques:

Fig. 2.2.1: Hand Washing Technique
Fig. 2.2.2: Washing hands with soap and water
The following figure shows the steps to wash hands properly:

**Steps**

The Centers for Disease Control and Prevention (CDC) recommend washing hands at certain times, as shown in the following figure:

If soap and water are not available, one must use alcohol-based sanitiser (containing at least 60% alcohol). Although cleaning hands with sanitisers is not a substitute for cleaning them with soap and water, but in case they are not available or one needs to clean hands when not dirty, sanitisers are a good alternative. They help in reducing germs and viruses but don’t eliminate them completely, and thus they are less effective in case of dirty or greasy hands.
The following image shows how to use a hand sanitiser:

![Image of hand sanitiser use](image)

**Fig. 2.2.5: Use of hand sanitiser**

**Steps**

The following figure shows the steps to use sanitiser for cleaning hands:

1. **Apply sanitiser gel or spray sanitiser liquid on the hands**
2. **Rub hands to spread the sanitiser**
3. **Rub until dry**

![Diagram of hand sanitisation steps](image)

**Fig. 2.2.6: Steps to sanitise hands properly**

Personal hygiene should extend to workplace, which is all about keeping the work area clean, tidy and disinfected. This would be required more frequently and regularly during an epidemic or a pandemic. It so happens that often personal hygiene gets priority over workplace place hygiene, whereas both should get equal importance. If required one must modify the setting of the work area to facilitate social distancing and wear necessary PPE as per the profile of the job. In case the work entails meeting the public, then in addition to facemask one must use face shield and sanitiser after any kind of exchange with a person.

In addition to wearing necessary PPE such as masks, gloves and shields, cleaning and disinfecting the work area is also important. It should be carried out with a solution containing 1% sodium hypochlorite disinfectant and a disposable cleaning cloth. Ensure to disinfect the frequently used devices such as laptop, mobile, mouse and so on.
2.2.2 Potential Fomites at Workplace

Fomites refer to all those objects or surfaces that can become contaminated with viruses when touched by an infected person and can further transmit the infection to those who touch the surfaces next. It is all the more important to clean and disinfect fomites as viruses and germs survive for hours or even months on these surfaces, if not cleaned. Example of fomites include doorknobs, light switches, remote controls, elevator buttons and so on.

Fomites are not just pertinent with respect to disease outbreak, epidemic or pandemic but even in normal circumstances these fomites lead to rapid indirect transmission of viruses, leading to spread of communicable diseases. Thus, cleaning and disinfection of these fomites with a disinfectant solution must be carried out on frequent basis for a healthy workplace environment. Any lapse can be a threat to the health of one and all. Moreover, on a personal level, one can ensure not to touch these surfaces directly but to use any disinfectant tissue or wipe and dispose of it immediately in a closed bin.
A list of potential fomites at workplace is shown in the following figure:

<table>
<thead>
<tr>
<th>Potential fomites at workplace</th>
<th>Common areas such as pantry, printing stations, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vending machines, coffee mug handles, etc.</td>
</tr>
<tr>
<td></td>
<td>Conference or meeting rooms</td>
</tr>
<tr>
<td></td>
<td>Door handles or doorknobs</td>
</tr>
<tr>
<td></td>
<td>Electronic devices such as laptops</td>
</tr>
<tr>
<td></td>
<td>Telephone receivers</td>
</tr>
<tr>
<td></td>
<td>Elevator buttons</td>
</tr>
<tr>
<td></td>
<td>Desks or countertops</td>
</tr>
</tbody>
</table>

*Fig. 2.2.8: Potential fomites at workplace*

The following image shows cleaning and disinfection of workstation:

*Fig. 2.2.9: Disinfecting workstation*
Following image shows cleaning and disinfection of mobile:

![Disinfecting mobile](image)

Fig. 2.2.10: Disinfecting mobile

### 2.2.3 PPE to be used at Workplace

PPE refers to protective facemasks, gloves, clothing, helmets, face shields, eye protective wear or other equipment designed to protect the wearer from the spread of infection or illness. PPE should be used in combination with other recommended preventive measures such as maintaining personal hygiene, respiratory hygiene and social distancing, for lack of doing so makes the person vulnerable to viruses and infections.

Let us take an example of Covid 19 pandemic to understand the use of PPE. Covid 19 virus gets transmitted from one person to another through close contact and droplets. Thus, wearing appropriate type of PPE is imperative depending upon the work setting and risk of exposure. The type of PPE used in order to protect oneself is different from the type used when caring for an infected person, as health care workers need extra protection in terms of respirators and fluid resistant gowns. Although PPE is one of the effective means to prevent the spread of virus, it gives benefit only when followed with other preventive measures explained earlier.
Steps

The steps to put on PPE for precaution are given in the following figure:

- **Perform Hand Hygiene**
  - Use soap and water or
  - Use alcohol based sanitiser

- **Wear Gown**
  - Cover yourself properly
  - Wear protective shoes if possible

- **Wear Mask**
  - Medical mask
  - Cover face properly

- **Wear Eye Protection**
  - Face Shield or
  - Goggles

- **Wear Gloves**
  - Overlap on the cuff of the gown for full protection

Fig. 2.2.11: Steps to put on PPE

The guidelines for use of PPE are given in the following figure:

- Extended use of PPE may increase the risk of contamination with viruses, germs, pathogens, etc.
- If mask or any other PPE is inadvertently touched, hand hygiene must be performed immediately.
- If any equipment of PPE gets wet, soiled or damaged, it should be disposed of as per prescribed procedure.
- Mask and gloves should not be reused. Faceshield, gown and eye protection goggles should be decontaminated/sterilized before reuse.
- PPE should be removed safely as per the prescribed procedure.

Fig. 2.2.12: Guidelines for use of PPE
The steps to take off PPE after use are given in the following figure:

Remove Gloves → Remove Gown → Perform Hand Hygiene

Remove Eye Protection → Remove Mask → Perform Hand Hygiene

*Fig. 2.2.13: Steps to take off PPE*

The different PPE required by different professionals is shown in the following set of images:

*Fig. 2.2.14 (a): PPE for healthcare professionals*
COVID Frontline Worker (Sample Collection Support)

Fig. 2.2.14 (b): PPE for grocery, poultry, or other professionals who work with wet products

Fig. 2.2.14 (c): PPE for other professionals, typically working in offices
Let us now learn about the correct methods of taking off PPE as shown in the following set of images:

Fig. 2.2.15 (a): Procedure to remove PPE for healthcare professionals

Take out the plastic set  Take off your face shield  Zip down, remove hood

Fig. 2.2.15 (b): Procedure to remove PPE set, boots, leg cover and gloves

Remove the PPE set and boots  Take off your leg cover  Take off your gloves and wash hands
Fig. 2.2.15 (c): Procedure to remove goggles and masks

Tips

- Washing hands is the quickest and simplest way to get rid of viruses.
- Workplace hygiene entails wearing necessary PPE as well as disinfecting the work area.
- Surface touched frequently become potential fomites capable of spreading the infection.
- PPE should be worn in the following sequence: gown, mask, eye protection and gloves.
- PPE should be removed in the following sequence: gloves, gown, eye protection and mask.
UNIT 2.3: Other Common Practices & Guidelines

Unit Objectives

After completion of this unit, the participants will be able to:

1. Discuss the importance and process of identifying and reporting symptoms to the concerned authorities
2. Explain the importance and mechanism of proper collection, transportation and safe disposal of waste
3. Select different types of waste and various types of colour coded bins/containers used for disposal of waste
4. Discuss the ways of dealing with stress and anxiety and providing support during an epidemic or a pandemic

2.3.1 Identifying and Reporting Symptoms

Identifying and reporting the symptoms of a disease can help a great deal in seeking timely care and taking immediate actions to prevent further spread of the disease. This is one of the best early control measures in case of a disease outbreak, an epidemic or a pandemic. For example, in case of Covid 19, researches across the world have identified the sequence of symptoms, such as fever, cough, sore throat, shortness of breath, fatigue, aches and pains, headaches, runny nose and so on, which help differentiate Covid 19 from common cold and flu.

It is mandatory for the workplace to have a formal documentation procedure pertaining to identification and reporting of symptoms as per the organisational policy. The employee must immediately inform the concerned officer in-charge and complete the required documentation accordingly in this context.
In addition to this, one needs to inform the local authorities appointed for the purpose and follow the prescribed procedure as given in the following figure:

<table>
<thead>
<tr>
<th>Be aware of symptoms</th>
<th>Stay informed about the symptoms of the infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report to officer in-charge/local authorities</td>
<td>As soon you identify symptoms, inform the person concerned at workplace and local authorities as per your location</td>
</tr>
<tr>
<td>Follow reporting procedure</td>
<td>Fulfill documentation with complete details required as per workplace reporting procedure and local reporting procedure</td>
</tr>
<tr>
<td>Seek immediate consultation and undergo testing</td>
<td>Consult the appointed medical specialist and undergo the required test to determine the result at the earliest</td>
</tr>
<tr>
<td>Decide on self-isolation or hospitalization</td>
<td>Follow the advice of medical specialist, as per the intensity of symptoms, to either go for isolation at home or admission to the recommended hospital</td>
</tr>
<tr>
<td>Inform your contacts</td>
<td>Let those who have come in contact with you recently know about your test status and advise them to take necessary measures as per the recommendations of medical specialist</td>
</tr>
</tbody>
</table>

*Fig. 2.3.1: Steps to be followed for identification and reporting of symptoms*
2.3.2 Handling Waste

Waste management has a significant role to play in controlling the spread of infection. It entails following prescribed procedures for proper collection, segregation, transportation and disposal of waste. During a disease outbreak, an epidemic or a pandemic, waste from households and organisations can transmit infectious germs and viruses and thus pose risk to the health of people. That is why it is imperative to follow health and safety guidelines for waste management at home as well as workplace.

Steps

The guidelines to dispose of waste outside home during a pandemic, for example Covid 19, are given in the following image:

![Image](https://www.grida.no/resources/13574)

**Fig. 2.3.2: Disposing waste during pandemic**


**Procedure for safe disposal of non-healthcare waste:**

1. Waste should be collected in a plastic rubbish bag and tied properly.
2. The plastic bag should then be placed in a second bin bag and tied properly.
3. Waste should be stored safely in a suitable and secure place until the individual’s test results are known. This is applicable in case any individual at home or workplace is suspected to have caught the infection.
4. Waste should be kept away from children.
5. Waste should not be thrown in communal waste areas until negative test results are known, or the waste has been stored for at least 72 hours.
6. If storage for at least 72 hours is not appropriate, arrange for collection by the local waste collection authority.
Waste management entails the processes as shown in the following image:

![Waste Management Diagram](image)

**Fig. 2.3.3: Steps of waste management**

**Procedure for safe disposal of greywater or water from washing PPE, surfaces and floors:**

1. WHO recommends that after each time utility gloves or heavy-duty, reusable plastic aprons are used, they should be cleaned with soap and water, and then decontaminated with 0.5% sodium hypochlorite solution.

2. Single-use gloves made of nitrile or latex, and gowns should be discarded after each use and not reused as they could have come in touch with infectious waste.

3. Hand hygiene should be performed after PPE is removed.

4. If greywater includes disinfectant used in prior cleaning, it does not need to be chlorinated or treated again.
Procedure for Safe Disposal of Healthcare Waste

The procedure for disposal of healthcare waste may vary according to the state guidelines on disposal of waste. The following figure shows general information for safe disposal of healthcare waste:

- Post Operative Body Parts, Placenta
- Plaster of Paris (POP)
- Pathological Waste
- Cotton Waste and Dressing Materials
- Beddings
- Body Fluid Contaminated Paper and Cloth
- Face Mask, Cep
- Cytotoxic, Expired & Discarded Medicines
- Microbiology, Biotechnology Lab Waste Needles

- Syringe Without Needles
- IV Set/Bottles
- Catheter
- Gloves
- Urine Bag
- Dialysis Kit

**Yellow**
- Needles
- Syringes with Fixed Needles
- Blades
- Scalpels

**RED**
- Glass Such as Ampoules and Lab Slides
- Metal Such as Nails, Metallic Body Implants, Scissors

**WHITE (Translucent)**

**Blue**

*Fig. 2.3.4: Safe disposal of healthcare waste*
During a disease outbreak, an epidemic or a pandemic, health of waste-collection workers is very much at risk, given the nature of their job wherein they are exposed to all types of waste. The following image shows how waste-collection workers can minimise risks during a pandemic, for example during Covid-19:

![Guidelines for waste-collection worker](image)

**Fig. 2.3.5 (a): Guidelines for waste-collection worker**

**Fig. 2.3.5 (b): Guidelines for waste-collection worker**
The following image shows how waste-collection workers can minimise risks during a pandemic, for example during Covid-19:

Fig. 2.3.6: Guidelines for waste-collection worker


2.3.3 Dealing with Stress and Anxiety during a Disease Outbreak

A disease outbreak, an epidemic or a pandemic brings about numerous challenges worldwide. On one hand, we need to deal with the virus and the illness, and on the other hand, we need to deal with the inherent fear, which is the springboard of stress and anxiety. In a way, we need to strengthen both our body and mind to be able to deal with such a challenging situation.

We need to understand the impact of stress and anxiety on our physical and mental health. It poses unnecessary pressure on our body and mind, which lowers our immunity and makes us more vulnerable to viruses and illnesses. To make matters worse, we do not even realise when it begins to build up and overpowers our thinking.

You need to ask yourself certain questions to identify stress and anxiety, such as — Are you fearful and worried about your own health and health of your loved ones? Do you have difficulty sleeping or concentrating? Is your physical and mental health getting worse? Do you constantly fear catching the infection?
If the answer to any of these questions is yes, then you need to change your mindset and take the following practical measures for your safety and security:

People diagnosed with a disease and their family/ neighbours often feel sad, stressed, confused, scared or angry. Such people should:

- Talk to people you know will provide help and listen.
- Share your feelings with close friends and family.

People in self-quarantine or self-isolation should:

- Maintain a healthy lifestyle.
- Take proper diet.
- Ensure a healthy routine, proper sleep, exercise and social contact with loved ones at home and by email and phone with other family and friends.
- Do not smoke or consume alcohol/ other drugs to deal with your emotions.
- Ask for professional counselling if extremely stressed.

People living in contamination zones/ areas most affected should:

- Gather information to analyse the risk and necessary precautions.
- Find a credible source you can trust such as Arogya Setu app, WHO website or a local health authority.
- Restrict watching too much news or media coverage of the pandemic/ epidemic to avoid worry and agitation.
- Focus on personal and inter-personal skills that have helped you to recover from a tragic/difficult experience in the past.

*Fig. 2.3.7: Guidelines for dealing with stress and anxiety*
UNIT 2.4: COVID 19 Vaccination

Unit Objectives

After completion of this unit, the participants will be able to:
1. Differentiate between different types of vaccine
2. Identify the side-effects of vaccine
3. Explain Cold chain management
4. Explain about vaccine safety and security and avoiding misuse

2.4.1 Coronavirus Disease (COVID-19)

Coronavirus disease (COVID-19), is an infectious disease caused by a newly discovered coronavirus (SARS-CoV-2), which has spread rapidly throughout the world. In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. The pandemic has severely ravaged health systems, and economic and social progress globally.

While countries, including India, have taken strong measures to contain the spread of COVID-19 through better diagnostics and treatment, vaccines will provide a lasting solution by enhancing immunity and containing the disease spread.

2.4.2 Vaccines for COVID-19

In order to respond quickly and effectively to the COVID-19 pandemic, a broad range of candidate COVID-19 vaccines are being investigated globally using various technologies and platforms. These include viral-vectored, protein subunit, nucleic acid (DNA, RNA), live attenuated and inactivated vaccines.
2.4.3 Types of COVID 19 Vaccines in India

As per the Indian council of Medical Research (ICMR), the following vaccines are in different stages of clinical trials in India:

**COVAXIN**

COVAXIN™, India’s indigenous COVID-19 vaccine is developed by Bharat Biotech in collaboration with ICMR.

**Covishield**

Covishield is developed by Oxford University in partnership with The Serum Institute of India (SII) and Indian Council of Medical Research.

**ZyCoV-D**

ZyCoV-D is developed by Zydus Cadila.

**Sputnik**

Sputnik is manufactured in Russia but is approved for use in India and is being imported.

*Fig. 2.4.1: Types of COVID 19 vaccines in India*
**COOVAX**

COOVAX is developed by The Serum Institute of India (SII) and Indian Council of Medical Research.

**BBV154 - Intranasal vaccine**

Bharat Biotech is conducting multicenter study to evaluate the reactogenicity, safety, and immunogenicity of an intranasal adenoviral vector COVID-19 vaccine (BBV154).

**mRNA based vaccine (HGCO19)**

mRNA based vaccine (HGCO19) is developed by Gennova Biopharmaceuticals, in partnership with HDT Biotech Corporation.

**Side-Effects of Vaccine**

The common side effects of COVID 19 vaccines in some individuals could be mild fever, pain, etc. at the site of injection. Some of the side-effects of Covishield® and Covaxin® are as follows:

- **Covishield®**
  - injection site tenderness, injection site pain, headache, fatigue, myalgia, malaise, pyrexia, chills and arthralgia, nausea.

- **Covaxin®**
  - injection site pain, headache, fatigue, fever, body ache, abdominal pain, nausea and vomiting, dizziness-giddiness, tremor, sweating, cold, cough and injection site swelling

*Fig. 2.4.2: Side-Effects of COVID 19 vaccines*
2.4.4 Cold Chain Maintenance at Session Site

As there will be no expiry date on the vial of the vaccine, cold chain maintenance is of prime importance. The following points need to be ensured at session site:

- Ensure an extra vaccine carrier with conditioned ice packs for immediate replenishment of ice packs in the vaccine carrier

- Review and check vaccine carrier temperature and records

- Mark date and time of opening vial

- Discard all open vaccine vials need after 4 hours of opening or at the end of session

- Ensure backup vaccine carrier and icepacks at the session site

- Never expose the vaccine carrier, the vaccine vial or icepack to direct sunlight

- Keep the vaccines inside the vaccine carrier with the lid closed

- At the end of the session, vaccine carrier with all icepacks and unopened vaccine vials should be sent back to the distributing cold chain point

- Intact sealed vials returned on the previous session day should be clearly marked and kept separately to be used first on the following session day

*Fig. 2.4.3: Cold chain maintenance at session site*
2.4.5 Vaccine Safety and Security

Safety and security of each dose of COVID-19 vaccine is of paramount importance and adequate safety and security measure must be undertaken at location of vaccine storage, during transport and at session site. State/District administration needs to ensure adequate security arrangement for vaccines at:

- All cold chain points
- During vaccine transport at all levels
- At session site

Stringent vigilance mechanism must be in place to protect pilferage and theft. Any such activity should be immediately reported, and prompt police action should be initiated with clear accountability.
Exercise

1. Identify which of the following statements are true or false.
   a. Disease outbreak, epidemic and pandemic are all same types of infection outbreaks.
   b. Non-surgical mask is a substitute of surgical mask.
   c. Self-quarantine is done at home and self-isolation is done in a hospital.
   d. Hands should be washed after every meal.

2. Which of the following is not one of the processes of waste management discussed in this unit?
   a. Collection
   b. Transportation
   c. Treatment
   d. Disposal

3. List two effective ways of dealing with stress and anxiety.
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. Name the manufacturers of the following vaccines.
   a. COVAXIN _______________________________________________
   b. Covishield ______________________________________________
   c. Sputinik ________________________________________________
   d. ZyCoV-D ________________________________________________
3. Introduction to Human Body- Structure & Function

Unit 3.1 - Structure and Function of Human Body
Unit 3.2 - Physiological Systems of the Human Body
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. Explain the basic structure and functioning of the human body.
2. Identify various human physiological systems.
3. Identify the route of sample collection from human body.
4. Explain the basic structure and functioning of cardiovascular system and integumentary system.
5. Prepare a chart on Cardiovascular system and integumentary system.
UNIT 3.1: Structure and Function of Human Body

**Unit Objectives**

After completion of this unit, the participants will be able to:

1. Explain the basic structure and functioning of the human body.
2. Identify various human physiological systems
3. Identify the route of sample collection from human body

**3.1.1 Structure of Human Body**

The human body structure is organised into various different systems. Each system has a specific function and consists of organs, tissues and cells. The smallest living unit in the body of an organism is a cell. A group of cells is called tissue. Tissues combine together to form an organ. The cells have following characteristics:

![Cells contain][1]

**Central Dogma**

The central dogma of molecular biology describes the two-step process, transcription and translation, by which the information in genes flows into proteins.

DNA → RNA → protein

![Central dogma of molecular biology][2]
3.1.2 Different Types of Tissue

The human body has four different types of tissues:

- Muscular tissue
- Connective tissue
- Epithelial tissue
- Nervous tissue

Fig. 3.1.3: Types of tissues
Muscular tissue

Muscular tissue makes up the muscles of the body. There are three types of muscular tissues:
- Skeletal muscle tissue
- Cardiac tissue
- Smooth muscle tissue

Connective tissue

Connective tissue is the connecting point between tissues. It can be categorized into:
- Cartilage tissue
- Loose connective tissue
- Liquid connective tissue
- Bone tissue
- Dense connective tissue

Fig. 3.1.4: Muscular tissue

Fig. 3.1.5: Connective tissue
Epithelial tissue

Epithelial tissue refers to the upper most tissue covering the body or organs. It can be classified into:

- Simple epithelium
- Stratified epithelium

![Fig. 3.1.6: Epithelial tissue](image)

Nervous tissue

Nervous tissue is present in the entire nervous system including brain and spinal cord. It can be classified into:

- Nervous cell
- Neuroglia

![Fig. 3.1.7: Nervous tissue](image)
3.1.3 Different Parts of the Body

The human body consists of the following different parts:

![Diagram of human body parts](image)

Fig. 3.1.8: Parts of the body
UNIT 3.2: Physiological Systems of the Human Body

Unit Objectives

At the end of this unit, you will be able to:
1. Explain the different physiological systems in the human body
2. Recognize the disorders and syndromes that affect the body’s systems

3.2.1 Human Physiological Systems

The human body is built-up of the following physiological systems:

![Diagram of human physiological systems](image-url)

Fig. 3.2.1: Human Physiological Systems
Vascular System

The cardiovascular system consists of the blood, heart, and blood vessels. The heart pumps blood throughout the body. Blood carries nutrients and oxygen to the cells in the body and removes carbon dioxide and other wastes from the cells and transfers to the excretory organs: kidneys, lungs and skin. The blood vessels comprise arteries, veins and capillaries. Arteries carry blood from the heart to the organs and tissues. Veins carry blood back from the organs to the heart.

Sources of Blood

Depending on its source, blood can be categorized as:

<table>
<thead>
<tr>
<th>Arterial</th>
<th>Venous</th>
<th>Capillary</th>
</tr>
</thead>
</table>
| • Blood leaves heart and passes into arteries.  
  • Arteries branch out into smaller vessels called arterioles.  
  • Arterioles regulate the flow of blood into different tissues. | • Blood returns back to the heart through veins.  
  • This is aided by one-way valves that ensure unidirectional flow of blood. | • Capillaries are the smallest and most numerous of blood vessels.  
  • They function as the site of exchange of nutrients and wastes between blood and tissues. |

Fig. 3.2.2: Vascular system

Fig. 3.2.3: Sources of blood
**Vascular Flow**

Vascular flow is divided into:

- **Pulmonary circulation**
  - within the lungs and associated vessels.
- **Systemic circulation**
  - general, throughout the body.

Pulmonary circulation carries deoxygenated blood (blue) from the right chambers of the heart to the lungs where the red blood cells absorb oxygen ($O_2$) and flush out carbon-dioxide ($CO_2$) from the blood. This oxygenated blood (red) returns to the left chambers of the heart.

Systemic circulation carries the oxygenated blood from the heart to all parts of the body, through the arteries. In capillaries, $O_2$ and nutrients are exchanged for $CO_2$ and other wastes and then carried by the veins to the heart.

![Fig. 3.2.4: Vascular flow](image)

**Arteries and Veins**

Arteries and veins are composed of three layers:

- The outer layer (tunica adventitia), is made up of connective tissue and is thicker in arteries than in veins.
- The middle layer (tunica media) is made up of smooth muscle tissue and elastic fiber and is thicker in arteries than in veins.
• The inner layer (tunica intima), is made up of a single layer of endothelial cells, a connective tissue layer, basement membrane, and an elastic internal membrane.

**Fig. 3.2.5: Arteries and Veins**

**Valve**

Valves stop the backflow of blood in the veins. The valve controls the direction of blood flow. When skeletal muscles are active and contracting, venous return of blood to the heart is facilitated by combination of muscle contraction and valve function. When muscles are resting, blood flow in the venous system is slower.

**Fig. 3.2.6: Valve**

**3.2.2 Musculoskeletal System**

Musculoskeletal system provides the body with support, protection, and movement and at the same time it protects the vital organs in the body. It involves the complex interactions of muscles, bones, and connective tissues.

• The skeleton is the main store of phosphorus and calcium in a human body.
• Muscles contract and expand to help to shift the bones associated with the joint.
• Cartilage prevents the bone ends from rubbing on to each other directly.

Fig. 3.2.7: Musculoskeletal System
3.2.3 Urinary System

The urinary system is also known as the renal system. It is the excretory system of human body. It stores as well as eliminates urine, the fluid waste that is excreted by the kidneys. The kidneys filter extra water and wastes from the blood and produce urine.

![Urinary System Diagram]

**Fig. 3.2.8: Urinary System**

3.2.4 Gastrointestinal System

The Gastrointestinal system consists of organs that break down food into components that our body uses for energy and for building and repairing cells and tissues.
It includes the following:

- Mouth
- Pharynx (throat)
- Esophagus
- Stomach
- Small intestine and large intestine
- Rectum
- Anus

3.2.5 Respiratory System

The respiratory system consists of a series of organs required for breathing in oxygen and expelling carbon dioxide. The oxygen that one breathes goes into the lungs and from there passes into the blood. Via the blood it is conveyed to all the cells in the body through the bloodstream.

It includes:

- Lungs
- Airways
- Blood Vessels
The location of the lungs is in the chest region, shielded by the ribs in the rib cage.
The windpipe, also termed as the trachea, filters the air that is inhaled.
The trachea branches into the bronchi (two tubes that transport air into each lung).
The left lung has two lobes and the right lung has three lobes.

Fig. 3.2.10: Respiratory System
3.2.6 Endocrine System

The endocrine system consists of glands that secrete hormones. These hormones govern growth and energy production in a body. The endocrine system is made up of the following glands:

- Hypothalamus, pituitary gland, pineal gland - Brain
- Thyroid, parathyroid glands - Neck
- Thymus - Between the lungs
- Adrenals - Top of the kidneys
- Pancreas - Behind the stomach
- Ovaries (female) or testes (male) - Pelvic region

Fig. 3.2.11: Endocrine System

3.2.7 Integumentary System

The integumentary system is the largest organ in the human body. It includes:

- Epidermis
- Dermis
- Hypodermis
- Associated glands
- Hair
- Nails
The integumentary system performs the following functions:

- **Barrier Function:** It protects the body from invasion by microorganisms, chemicals, and other environmental factors.
- **Thermoregulation:** It helps regulate the body temperature.
- **Excretion:** Sweat and sebum also have an excretory role for water and fat soluble metabolites.
- **Sensation:** Nerve endings on the skin help in sensing touch, pressure, heat, cold etc.

![Fig. 3.2.12: Integumentary System](image-url)
### 3.2.8 Chain of Infection

Whenever the body contracts an infection, there is a chain of causes and suitable conditions that lead to infection, such as:

- **Causative Agent**: Microorganism such as virus or bacteria that can spread directly or indirectly from person to person.
- **Reservoir**: A place where the microorganism has all the things it needs to grow and multiply. Human beings make ideal reservoirs.
- **Portal of exit**: For infection to spread, the microorganism has to leave the reservoir through the portal of exit. E.g. skin cells, blood, body fluids.
- **Mode of transmission**: Includes direct or indirect contact (Hands etc.)
- **Portal of entry**: This is how the organism can get into another person.
- **Susceptible Host**: All patients and Healthcare worker are potentially at risk of infections.

![Fig. 3.2.13: Chain of infection](image-url)
Exercise

1. List the different types of tissues present in human body.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. Identify which of the following statements are true or false.
   a. Capillaries function as the site of exchange of nutrients and wastes between blood and tissues.
   b. The cartilages are the main stores of phosphorus and calcium in a human body.
   c. The left lung has three lobes and the right lung has two lobes.
   d. The thymus is located between the lungs.

3. Which of the following is a part of the integumentary system?
   a. Trachea
   b. Hair
   c. Pancreas
   d. Rectum

4. Arteries and veins are composed of three layers. Name them.
   a. ________________________________
   b. ________________________________
   c. ________________________________
4. Pre-procedural Activities of Sample Collection

Unit 4.1 - Basic Sensitization on Pre-procedural Activities
Unit 4.2 - General Hazards in a Laboratory
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. Describe the features of a Phlebotomy room
2. Describe the process of test requisition
3. Explain the various pre-analytical factors
4. Explain the role of COVID frontline worker in reducing errors
5. Explain how to prepare an appropriate site for blood samples
6. Identify the techniques of disinfection and sterilization of laboratory equipment
7. State the laboratory safety practices
8. Enumerate the various hazards in a laboratory
9. Explain the correct methods of dealing with hazards in a laboratory
10. Describe the process of instrument management and inventory management
UNIT 4.1: Basic Sensitization on Pre-procedural Activities

Unit Objectives

After completion of this unit, the participants will be able to:
1. Describe the features of a Phlebotomy room
2. Describe the process of test requisition
3. Explain the various pre-analytical factors
4. Explain the role of COVID frontline worker in reducing errors
5. Explain how to prepare an appropriate site for blood samples
6. Identify the techniques of disinfection and sterilization of laboratory equipment

4.1.1 Phlebotomy Room

Phlebotomy room is a necessity for any medical center. It is a place that holds all the necessary tools for collecting blood samples from patients. It should be designed in such a way that the patient feels relaxed.

It should contain:
- A clean surface with two chairs (one for the COVID frontline worker and the other for the patient)
- A hand wash basin with soap, running water and paper towels
- Alcohol hand rub

4.1.2 Signage in Sample Collection Area

The waiting areas should have the following signage:

- Name(s) and contact information of the person in-charge
- List of services available
- List of services excluded
- Patient preparation guidelines
- Patient-Collected sample guidelines
- Turnaround time

Fig. 4.1.1: Signage in waiting area
The sample collection areas should have the following signage:

- **Order of draw**
- **Bio-hazard sign**
- **List of hazards associated with sample collection**
- **Bio medical waste management guidelines**
- **Instructions for any special collections**

**Fig. 4.1.2: Signage in sample collection areas**

### 4.1.3 Procedure of Test Requisition

The test requisition process for government and private set-up is as follows:

**Government Set-up**
- Patients walk in
- Consultation in the OPD
- Lab reception / phlebotomy room
- Patients admitted in IPD
- Sample sent to the lab from the IPD

**Private Set-up**
- Patients walk in
- Enquire at the reception
- Make payments
- Collect invoice
- Patient carry the slip to the phlebotomy area
- Sample send to the lab from the IPD for admitted patients

**Fig. 4.1.3: Procedure of test requisition**
4.1.6 Role of COVID Frontline Worker in Reducing Errors

A COVID frontline worker plays an active role in reducing errors. These errors are related to the following causes:

**Clerical Errors**
- Incorrect test ordered
- Test ordered in incorrect patient
- Incomplete or incorrect information in the form
- Order not processed
- No requisition
- Duplicate orders
- Not readable / typing error
- Insufficient clinical information

**Phlebotomy Related Errors**
- Patient and Specimen Identification
- Dietary Status, Medications
- Collection time
- Site of Phlebotomy
- Tourniquet (placement, duration)
- Cleansing of the site
- Quality of Phlebotomy (trauma, duration, needle gauge etc.)

Fig. 4.1.4: Causes of errors

4.1.7 Preparation of an Appropriate Site for Blood Samples

The following equipment is needed for collection of blood samples:

**Antiseptic and Disinfectant**

**Antiseptic**
- Inhibits or prevents the growth of bacteria
  - Approved for used on the skin
  - Used to clean venipuncture site
  - 70% isopropyl alcohol—most commonly used

**Disinfectant**
- Kills bacteria and inhibits some viruses
  - Check manufactures label
  - For use on surfaces and instruments, not on skin
  - Used to clean up all blood spills
  - 1:10 hypochlorite (bleach) solution commonly used
**Isopropyl alcohol**
- 70% optimal concentration as antiseptic
- Store in closed container
- Active ingredient evaporates from open container leaving water behind
- Antiseptic properties diminished

**Gloves**
Part of personal protective equipment (PPE) against contact with blood during phlebotomy
- Key element of standard infection control precautions
- Provide a barrier to spread of infection
- A new pair should be worn for each patient and for each new procedure
- Good fit is essential
- Discard after use or clean with alcohol at the end of procedure on each patient

**Safe Waste Disposal Containers**
Needles and holders or needles and syringes should be disposed in puncture proof containers
- Needles should not to be recapped, bent or cut
- Sharp containers should not be overfilled

**Gauze Pads & Bandages**

**Gauze Pads**
- Used to apply pressure on site after needle removal
- Should be clean

**Adhesive Bandages/Tape**
- Used to secure gauze
- Do not apply directly on the site
Standard Precautions

Basic level of infection control precautions which are to be used to reduce the risk of transmission of blood borne and other pathogens.

Hand washing

After touching blood, body fluids, secretions, excretions and contaminated items.

Gloves

For contact with blood, body fluids, secretions and contaminated items.

Environmental cleaning

Routinely care, clean and disinfect equipment.

Note: Exterior of triple-packaged specimen transport containers are not considered contaminated and do not require gloves for routine handling.

Safety Basics: Key Messages

The following safety practices should be kept in mind:

For Transport

- Keep package upright – secure into position
- Keep and transport at compatible condition and in specified time

Follow Standard Precautions

- Use your spill kit and procedures if a spill should occur
- Report problems immediately to supervisors & affected lab

Use Common Sense

- Frequent hand washing is best defence against spreading infection
- Wash your hands often, after work or handling contaminated material

Fig. 4.1.6: Safety Basics
4.1.8 Techniques of Disinfection and Sterilization of Laboratory Equipment

Dependable sterilization depends on contact of the sterilizing agent with all surfaces of the item to be sterilized. The sterilization agent is chosen depending on the nature of the item to be sterilized.

Steam

- Heat kills microorganisms and this process is accelerated by the addition of moisture.
- Pressure, much more than atmospheric, is essential to increase the temperature of steam for thermal destruction of microbial life.
- Living things cannot survive direct exposure to saturated steam at 250°F (120°C) longer than 15 minutes.

Ethylene Oxide (EXO)

- Ethylene oxide is used to sterilize items that are heat or moisture sensitive.
- Because EO is highly flammable and explosive in air, it must be used in an explosion-proof sterilizing chamber in a controlled environment.

Dry heat

- Dry heat in the form of hot air is used to sterilize anhydrous oils, petroleum products, and bulk powders.

Microwaves

- Microwave sterilization uses low-pressure steam with the nonionizing radiation to produce localized heat that kills microorganisms.

Formaldehyde gas

- Formaldehyde kills microorganisms by coagulation of protein in cells.
- It should only be used if steam under pressure will damage the item to be sterilized and ethylene oxide and glutaraldehyde are not available.

Chemical solutions

- The items are immersed in a solution for the required time, as specified by the manufacturer.

Identify policies and procedures for Laboratory Safety

Safety in laboratories therefore includes protection of both the staff and the environment from hazardous materials.
**Risk Assessment**

The risk assessment process consists of the following steps:

1. Determine hazards and evaluate risks
2. Determine controls needed to minimize those risks
3. Document the assessment

**Fig. 4.1.7: Risk Assessment**

Health-Care Personnel are at risk because of their chance of exposure blood borne pathogens while performing procedures and handling of Biomedical Waste.

**Disposing of medical waste materials**

Materials like needles and blood collection tubes must be immediately disposed of in a proper sharps container. Container have to be color-coded red and labeled ‘bio-hazardous.’

**Cleanliness**

As per the guidelines of OSHA, the phlebotomists should wash their hands before and after working with patients, after removing gloves and other personal protection equipment and whenever they are exposed to blood or any other infection causing pathogen.

**Blood disposal**

OSHA regulations mandate that any material exposed to blood or other infectious matter must be disposed of in a container labeled bio-hazardous.

**Personal Protective Equipment**

Personal protective equipment safeguards the medical employees from contact with blood or other infectious or hazardous materials. This includes goggles, latex gloves, gowns and face masks.
Failure to Follow Guidelines

It is critical for COVID frontline workers to follow OSHA regulations to prevent injury or exposure to blood borne illnesses.

A COVID frontline worker must make sure to don appropriate PPE when there is potential blood exposure.
UNIT 4.2: General Hazards in a Laboratory

Unit Objectives

After completion of this unit, the participants will be able to:
1. Enumerate the various hazards in a laboratory
2. Explain the correct methods of dealing with hazards in a laboratory
3. Explain the importance of avoiding splash, agitation, or leakage of samples
4. Identify how to handle lab waste from suspected/confirmed COVID-19 patient specimens as all other biohazardous waste in the laboratory
5. Describe the process of instrument management and inventory management

4.2.1 Types of Hazards

The typical hazards found in a laboratory are as follows:

- Fire
- Breakage of glassware
- Sharps
- Spillages
- Pressure equipment & gas cylinders
- Extremes of heat & cold
- Chemical hazards
- Biological hazards

*Fig. 4.2.1: Hazards in a laboratory*

**Fire Safety**
- Store in special storage cabinet
- Use temperature-controlled heating source, if possible
- Should have a fire extinguisher and easy access to safety showers and fire blankets
- Emergency lab exit and other exits should be clutter free
- Fire Safety training should be given to all lab staff

**Gas cylinders and Electrical Equipment**
- Never use without formal training
- Do risk assessment and preventive checks to prevent accident
- Do a visual check on electrical equipment before use, look for obvious wear or defects

**Sharps Safety**
Sharps include scalpel blades, needles and pins, microscope cover slips and broken glass.

Always dispose of broken glass in a glass bin or sharps bin and not in a general waste bin.
Risk of Blood borne Pathogen Transmission during Blood Collection

The risk of contracting a disease caused by a blood borne pathogen during blood collection is directly related to:

- Amount of blood that is transferred to the HCW
- Virulence of the pathogen

The risk of contracting these diseases depends on:

![Fig. 4.2.2: Risk of blood borne pathogen transmission](image)

**Spillages**

Blood and body substance spills can occur in healthcare setting. The steps of cleaning spillages are as follows:

![Fig. 4.2.3: Spillages](image)
Emergency Spill Kit

As personal exposure takes priority over clean up, spill kit should always be available at workplace. The spill kit contains:

- Disposable gown
- Gloves
- Face / eye protection
- Red biohazard bags
- Disposable absorbent material
- Disposable cloths / paper towels
- Disinfectant

![Emergency spill kit](image)

Biohazard labels

Biohazard labels shall be placed on:
- Surface of all equipment which may be contaminated with biohazardous material.
- Outer surface of the sample transport containers.
- Waste bins
- Bio-medical waste storage areas

4.2.2 Decontaminate Work Surfaces

Laboratory work surfaces should be decontaminated with an appropriate chemical disinfectant after a spill of biohazardous materials and when work activities are completed.

- WHO has classified pathogenic organisms into 4 risk groups:
- Risk groups 1, 2, 3 and 4, based on the infectivity of an organism to cause disease in an individual and/or community (higher risk group indicates higher infectivity).
- Risk group classification takes into account the pathogenicity of the organism, mode of transmission, host factors such as immunity, hygiene etc., local availability of effective preventive and treatment measures.
- Four levels of biosafety laboratories (BSL) - 1, 2, 3 and 4, have been designed for handling biohazardous material.

![Person with mask](image)

After completion of processing, the sample tubes and PPE are autoclaved followed by incineration.
4.2.3 Personal Protection

- Hand Protection
  - Gloves provide protection and must fit properly and made of appropriate material
  - Avoid touching clean area with contaminated gloves
  - Remove gloves before handling telephones, uncontaminated laboratory equipment or doorknobs etc.
- Hand Hygiene
  - Decontaminate hands after touching all potentially infectious material
  - Wash with soap and water
  - Alcohol based hand rub
- Facial protection
- Respiratory protection
- Protective body clothing
- Occlusive bandage

First Aid

All laboratory workers should undergo simple first aid training.

- For all chemical splashes, wash with plenty of water for 10 minutes.
- Control bleeding with direct pressure, avoiding any foreign bodies such as glass.
- After NSI, allow site to bleed.
- Wash with plenty of soap and running tap water.
- Flush any splashes into nose, mouth and skin with clean water.
- Irrigate eyes with clean water or saline.
- Report all accidents to your supervisor or dedicated safety officer.

Fig. 4.2.5: First Aid
4.2.4 Instrument Management and Inventory Management

The laboratory must have a defined and documented procedure for the selection, purchasing and management of equipment. Routine service and maintenance should be scheduled at regular predefined intervals so as to ensure uninterrupted workflow.

After installing the equipment, take care of the following things before putting the equipment into service:

- Implement a written plan for calibration, performance verification, and proper operation of the equipment.
- Make a schedule of daily, weekly, and monthly maintenance tasks.
- Allow only authorized personnel to use the equipment and when it is to be used.
- Ensure that the designated personnel are adequately trained in all important aspects—instrument operation, maintenance and calibration, recordkeeping, quality control, recognizing flags and alerts shown by the instrument, basic trouble shooting etc.
- Assign responsibility to the concerned lab personnel for performing maintenance and operation programs at predefined intervals.
- Each item of equipment shall be uniquely labelled, marked or otherwise identified.
- Maintain records for the use of parts and supplies.
- The laboratory must have a documented process and maintain logs of preventive maintenance which, at a minimum, follows the manufacturer’s instructions.

The laboratories should verify the manufacturers’ performance claims and demonstrate they can get the same results using the kits or equipment in their laboratory, with their personnel.

The tools that are helpful for keeping records on equipment management are:

![Fig. 4.2.6: Tools for keeping records on equipment management](image-url)
The log book should be available for review during the entire life of the equipment.

*Fig. 4.2.7: Log book*

- The laboratory shall have a documented procedure for the reception, storage, acceptance testing and inventory management of reagents and consumables.
- The laboratory shall store received reagents and consumables according to manufacturer’s specifications.
- The laboratory shall verify the performance of examination kits if the reagents or procedure change and in case of a new lot or shipment, before they are used in examinations.
- The laboratory shall establish an inventory control system for reagents and consumables.
- The staff should be trained in maintaining records for each reagent and consumable that contributes to the performance of tests.
These records shall include but not be limited to the following:

- Identity of the reagent or consumable
- Manufacturer's name and batch code or lot number
- Contact information for the supplier or the manufacturer
- Date of receiving, the expiry date, date of entering into service and, where applicable, the date the material was taken out of service
- Condition when received (e.g. acceptable or damaged)

- Manufacturer's instructions
- Records that confirm the reagents or consumables initial acceptance for use
- Performance records that confirm the reagents or consumables ongoing acceptance for use

Fig. 4.2.8: Information in records on equipment management

Where the laboratory uses reagents prepared or completed in-house, the records shall include, in addition to the relevant information above, reference to the person or persons undertaking their preparation and the date of preparation.

They should have an idea of tests done per day and the stocks available in house.
**Exercise**

1. List some pre-analytical variables that can lead to errors.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. List the steps of cleaning spillages.

   [Diagram of steps]

3. Biohazard labels should be placed on:
   a. Surface of all equipment which may be contaminated with bio hazardous material
   b. Outer surface of the sample transport containers
   c. Waste bins
   d. All of the above
5. Procedural Activities of Sample Collection

Unit 5.1 - Basic Sensitization about Blood Sample Collection Process and Method

Unit 5.2 - Sample Collection Process

UNIT 5.3 - Rapid Antigen Test for COVID-19
## Key Learning Outcomes

After completion of this module, the participants will be able to:

1. State the basic sensitization about blood sample collection process and method.
2. Explain the process of sampling of sputum.
3. Explain the process of urine analysis.
4. Explain the process of sampling stool and other body fluids.
5. Explain the importance of assembling all equipment, before patient enters the room.
6. Describe the various factors impacting specimen quality.
7. Explain the process of site selection in arm.
8. Explain the importance of using disposable tourniquets to prevent disease spread.
9. Describe the correct way of positioning a patient for blood sample collection.
10. Explain the importance of sanitizing phlebotomy chair after each use and decontamination of a phlebotomy room.
11. List the steps to be followed for venipuncture procedure.
12. State the recommended order of draw for blood sample collection.
13. Enumerate the correct specimen mixing procedure.
14. Explain the process of blood culture collection.
15. Discuss the importance of assisting the patient before, during and after collection of blood.
16. Explain the correct method of labelling of blood samples.
17. Describe the process of Rapid Antigen Test for COVID-19.
18. List the tools and equipment required.
19. Describe the correct procedure for collecting a nasopharyngeal swab specimen.
20. Describe the correct procedure for collecting a throat/oro-pharyngeal swab specimen.
UNIT 5.1: Basic Sensitization about Blood Sample Collection Process and Method

Unit Objectives

After completion of this unit, the participants will be able to:
1. State the basic sensitization about blood sample collection process and method.
2. Explain the process of sampling of sputum.
3. Explain the process of urine analysis.
4. Explain the process of sampling stool and other body fluids.

5.1.1 Blood Sample Collection Process

Blood samples are collected by trained medical personnel, known as phlebotomists. They use minimally invasive procedures called venipuncture, to draw blood from the blood vessels (capillaries, veins, and sometimes arteries) of patients.

The process of collecting blood sample can be divided into the following steps:

- Interacting with the patient
- Organising the equipment
- Preparing for the procedure
- Sample collection procedure
- Post-collection procedure

Fig. 5.1.1: Steps of collecting blood sample
Interacting with the patient

The COVID frontline worker should calmly approach and greet the patient, speaking in soothing voice to ease the patient’s anxiety. To establish a rapport with the patient, state your name, the purpose of the visit and describe the procedure to be performed.

Organising the equipment

Assemble all the required equipment and organise them at the point of use. Make sure there is adequate lighting in the room. Assess whether patient has the ability to cooperate with the procedure. If not, get help. Ask the patient to avoid any sudden movements during the procedure.

Preparing for the procedure

The steps to be followed to prepare for the procedure are:

- Hand hygiene and gloves
- Clean the venipuncture site

Hand Hygiene and Gloves

Standard Precautions require sanitizing hands and putting on gloves prior to the procedure involving blood / body fluids. Gloves act as a barrier to exposure to blood and body and transmission of organisms through contact. A new pair of gloves should be worn for each client and for each new procedure.

Cleaning of the Venipuncture Site

The steps of cleaning the venipuncture site are shown in the following image:

*Fig. 5.1.2: Cleaning of the Venipuncture Site*
Collection of Blood samples

Three options exist for sampling of blood for analysis:

- Venous: Most common source. Safest, easy access
- Arterial: Required only for special tests such as blood gas analysis as high arterial pressure represents risk of haemorrhage, haematoma
- Capillary: Useful in infants, paediatric and other patients where venous collection is inappropriate or undesirable. Sample volume is limited

Collection of Sputum

Specimen container: Sterile Plastic Container

The steps for collecting sputum are shown in the following image:

Select a wide-mouthed, unbreakable and leak proof sputum container and label it.

Explain to the patient the correct method of sample collection to avoid false negative because of saliva samples.

Rinse mouth with plain water before collecting the samples.

Don’t wipe, blow steam inhalation may help in the expectoration.

Fig. 5.1.3: Collection of Sputum

5.1.2 Urine Analysis

Urinalysis is the process of screening urine sample collected from a patient to help detect cellular material in the urine associated with different metabolic and kidney disorders.

- Performed in doctors’ offices, urgent care facilities, laboratories, and hospitals
- Performed by doing the collection of a urine sample from the patient in a specimen cup
- Urine must be freshly voided and examined within two hours of collection to prevent bacterial overgrowth & cellular deterioration or must be adequately preserved or refrigerated.
Semi-Automatic & Automatic Urinalysis

Macroscopic Examination / Physical Characteristics

- Direct, visual observation of collected urine
- Specific Gravity
- Dipstick Chemical Analysis

Microscopic Examination

![Macroscopic Examination Image](image1)

*Fig. 5.1.4: Macroscopic Examination*

Microscopic Examination

![Microscopic Examination Image](image2)

*Fig. 5.1.5: Microscopic Examination*

C&S specimen collection and testing

![C&S Specimen Collection Image](image3)

*Fig. 5.1.6: C&S specimen collection and testing*
5.1.3 Stool Analysis

A stool analysis deals with a series of tests done on a stool (feces) sample to help in the diagnosis of a disease.

While doing the stool analysis, a stool sample is gathered within a clean container and then it is sent to the laboratory.

Laboratory analysis includes microscopic examination, microbiological tests and chemical tests.

**Stool Sample Collection**
- Wide-mouth container preferably with a scoop/ sterile containers/ swab
- Stool Routine
- Stool Occult Blood
- Stool Culture

The healthcare worker makes the following observations regarding the stool sample:

![Observation parameters in stool sample](Fig. 5.1.7)

**Fecal Occult Blood Test**

This test is used to diagnose conditions that cause bleeding in the gastrointestinal system including colorectal cancer or stomach cancer.

**Microbiology tests**
- Parasitic diseases like hookworm, ascariasis, whipworm and strongyloidiasis can be diagnosed by testing stools with a microscope for the presence of eggs or worm larvae.
- Some bacterial diseases can be caught with a stool culture.
- Toxins from bacteria such as Clostridium difficile (‘C. diff.’) can also be recognized.
- Viruses like rotavirus can also be found in stools
5.1.4 Other Body Fluids

Samples are collected by clinicians and sent to the laboratory for cell counts, cytology, biochemistry and microbiology.

- Sample container: Sterile, leak proof container.
- The samples of these fluids are to be transported to the lab as soon as possible after collection to preserve sample integrity and good quality reports.
- Different body fluid samples that can be submitted for investigation:
  - CSF (Cerebrospinal fluid), Pleural, Pericardial, Peritoneal, Synovial, Abdominal, Amniotic, Ascites, Bile, Paracentesis, Thoracentesis

Proper labeling of the sample with time of collection and any relevant patient history is critical for patient diagnosis.
UNIT 5.2: Sample Collection Process

Unit Objectives

After completion of this unit, the participants will be able to:
1. Describe the various factors impacting specimen quality.
2. Explain the process of site selection in arm.
3. Explain the importance of using disposable tourniquets to prevent disease spread.
4. Describe the correct way of positioning a patient for blood sample collection.
5. Explain the importance of sanitizing phlebotomy chair after each use and decontamination of a phlebotomy room.
6. List the steps to be followed for venipuncture procedure.
7. State the recommended order of draw for blood sample collection.
8. Enumerate the correct specimen mixing procedure.
9. Explain the process of blood culture collection.
10. Discuss the importance of assisting the patient before, during and after collection of blood.
11. Explain the correct method of labelling of blood samples.

5.2.1 Factors Impacting Specimen Quality

Blood is a ‘living organ’ and such it can change significantly between the time when it is collected and the time when it is presented in the laboratory for analysis. This is because the metabolic processes remain active even in the pre-analytical phase.

The extent to which such changes occur will be determined largely by:

- The quality of the specimen collection procedure
- The specimen transportation conditions
- How the sample is handled in the laboratory prior to analysis

Fig. 5.2.1: Factors impacting changes in blood sample
The following factors have an impact on the quality of the specimen sample collected:

![Fig. 5.2.2: Factors impacting specimen quality](image)

### 5.2.2 Procedural Factors within Control

To understand the correct methods of drawing blood specimens from patients, the frontline worker must be aware of a variety of considerations.

**Collection Time**

Basic considerations include:

- **Actual time of collection:** The concentration of analytes such as hemoglobin, cortisol potassium, renin, aldosterone and sodium fluctuates over 24 hrs.

- **Interval from last specimen collection**

- **Interval from last meal**

- **Serum turbidity due to elevation of lipids can interfere with some tests. Ideally, all testing should be performed on specimens from fasting patients.**

- **Timing in context of drug administration and other therapies (e.g., dialysis, transfusion, surgery)**

- **Specimens collected at the wrong time can easily lead to erroneous drug doses**

![Fig. 5.2.3: Impact of collection time on blood sample](image)
**Collection Errors**

The type of sample collection errors include:

- Unlabeled sample
- Mislabeled sample
- Delay in sample collection
- Delay in sample transport
- Incorrect procedure
- Incorrect collection time
- Incorrect patient
- Incorrect sample type
- Sample not sufficient
- Contaminated specimen for blood culture
- Visible hemolysis / clot

**5.2.3 Site Selection in Arm**

Blood samples are generally collected from superficial veins by palpating and tracing the path of the vein with the index finger. Even tough arteries pulsate and are more elastic, they have a thick wall. If veins are thrombosed, they are not suitable for venipuncture as they are cord-like, roll easily and will not be resilient. If superficial veins are not readily apparent, you can force blood into the vein by:

- Tapping the site with index and second finger
- Massaging the arm from wrist to elbow
- Applying a warm, damp washcloth to the site for 5 minutes

Venipuncture should be performed on non-edematous, non-inflamed sites and not ‘downstream’ from any type of infusion.

**Preferred attributes of veins for venipuncture:**

- Large enough to support good flow
- Easily visible
- Close to the skin surface
- Elastic, should not feel hard
- Well anchored in surrounding tissue

*Fig. 5.2.5: Attributes of veins for venipuncture*
The veins of choice, in order of their preference/inappropriateness for venipuncture are:

**Preferred Sites**
- Median Cubital Vein
- Cephalic Vein
- Basilic Vein

**Inappropriate Sites**
- Arms on side of mastectomy
- Edematous areas
- Hematomas
- Scarred areas
- Burns
- Tattoos
- Damaged veins (e.g. thrombosed, non-elastic veins)
- Sites ‘downstream’ (proximal) from an IV line

*Fig. 5.2.6: Site selection in Arm*

**Venous Access Sites**

The veins for venipuncture can be accessed from the following sites:

1. **Antecubital area of arm**
   - The most commonly used site for venipuncture

2. **Dorsal Hand Veins**
   - Used when veins in antecubital area are inaccessible
3. **Foot Veins**
   - The last resort for blood collection is from the foot veins if the arm veins are unsuitable.

![Fig. 5.2.7: Venous Access Sites](image)

**Tourniquet**

A tourniquet is a band that is wrapped / tightened around a patient’s arm to make the veins more visible during blood collection.

The tourniquet should not be applied for more than a minute in order avoid:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heemocentration</strong></td>
<td>Movement of small molecules such as electrolytes and water from capillaries to interstitium (&quot;haemoconcentration&quot;). Macro molecules (e.g., proteins, enzymes) remain in venous stream.</td>
</tr>
<tr>
<td><strong>Platelet Activation</strong></td>
<td>May lead to coagulation testing errors — e.g., a PTT on patients receiving IV heparin therapy.</td>
</tr>
<tr>
<td><strong>Reflux (backflow)</strong></td>
<td>May lead to contamination of specimens with additives from other tubes.</td>
</tr>
</tbody>
</table>

![Fig. 5.2.8: Impact of applying tourniquet for long time](image)

**Usage of Disposable Tourniquets to Prevent Disease**

Using a tourniquet on multiple patients might lead to spread of infection or contamination. To create a safe medical environment, it is often recommended to use disposable, single-use tourniquets.
5.2.4 Positioning a Patient

The patient should normally be seated upright while having blood drawn. However, if the patient has a history of fainting (syncope) during blood collection, such patient should lie down in a supine position while having blood drawn.

Keep in mind the following points when positioning a patient:

- The patient’s arm should be firmly supported and extended with a downward orientation and kept as straight as possible from the shoulder to the wrist.
- Correct arm positioning allows gravity to assist with enlargement of veins and helps to ensure the specimen collection tubes fill from the bottom up to prevent reflux and additive carryover between sample tubes.
- The patient’s hand should be closed. This makes the veins more prominent.
- Patients should not be asked to ‘pump’ their fist.
- The patient must not be allowed to eat, drink, chew gum or have any other foreign object in the mouth during blood collection since these can cause choking.
- The patient is instructed on the importance of holding the arm very still during the procedure.
- Cooperation of children can be gained by having them take an active part in the process, such as holding the gauze pad or adhesive bandage.

Fig. 5.2.9: Impact of collection time on blood sample

Phlebotomy Chair

A phlebotomy chair is a specialized medical chair designed for a patient to sit comfortably and allow the medical personnel to collect blood sample. Outpatients are most commonly seated on special phlebotomy chairs.

Fig. 5.2.10: Phlebotomy chair
As a phlebotomy chair is used in multiple patients, it can be a potential source of infections and contaminations. It should therefore be cleaned and decontaminated before every use.

**Cleaning**

Always wear suitable protective clothing before cleaning process. The steps are as follows:

- **Step 1**: Dip a cloth in soapy solution to carefully wipe the chair from top to bottom
- **Step 2**: Use a clean damp cloth and soap free water to wipe the chair again
- **Step 3**: Dry the chair from top to bottom with clean lint free paper towels

*Fig. 5.2.11: Cleaning a phlebotomy chair*

**Decontamination**

To decontaminate the chair:

- **Step 1**: Dip a cloth in a dilute solution of Hypochlorite and warm water to carefully wipe the chair from top to bottom
- **Step 2**: Use a clean damp cloth and soap free water to wipe the chair again
- **Step 3**: Dry the chair from top to bottom with clean lint free paper towels
- **Step 4**: Discard all cleaning materials in a safe manner and wash hands thoroughly.

*Fig. 5.2.12: Decontaminating a phlebotomy chair*

- Do not use Alkalis or other organic solvents for routine cleaning.
- Always cover the vinyl with paper towelling or chair covers.
5.2.5 Venipuncture Procedure

The following image shows the steps to be followed for venipuncture procedure:

1. Assemble equipment and include needle and syringe or vacuum tube, depending on which is to be used.

2. Perform hand hygiene (if using soap and water, dry hands with single-use towels).

3. Identify and prepare the patient.
4. Select the site, preferably at the antecubital area (i.e., the bend of the elbow). Warming the arm with a hot pack, or hanging the hand down may make it easier to see the veins. Palpate the area to locate the anatomic landmarks. DO NOT touch the site once alcohol or other antiseptic has been applied.

5. Apply a tourniquet, about 4-5 finger widths above the selected venepuncture site.

6. Ask the patient to form a fist so that the veins are more prominent.

7. Put on well-fitting, non-sterile gloves.

8. Disinfect the site using 70% isopropyl alcohol for 30 seconds and allow to dry completely (30 seconds).

9. Anchor the vein by holding the patient’s arm and placing a thumb BELOW the venepuncture site.

10. Enter the vein swiftly at a 30 degree angle.

11. Once sufficient blood has been collected, release the tourniquet BEFORE withdrawing the needle.
12. Withdraw the needle gently and then give the patient a clean gauze or dry cotton-wool ball to apply to the site with gentle pressure.

13. Discard the used needle and syringe or blood-sampling device into a puncture-resistant container.

14. Check the label and forms for accuracy.

15. Discard sharps and broken glass into the sharps container. Place items that can drip blood or body fluids into the infectious waste.

16. Remove gloves and place them in the general waste. Perform hand hygiene. If using soap and water, dry hands with single-use towels.

Fig. 5.2.13: Venipuncture procedure
### 5.2.6 Recommended Order of Draw

The blood collection tubes must be drawn in a specific order to avoid cross-contamination of additives between tubes. The recommended order of draw for plastic vacutainer tubes is:

1. Blood culture bottle or tube (yellow or yellow-black top)
2. Coagulation tube (light blue top)
3. Non-additive tube (red top)
4. Additive tubes in this order: SST (red-gray or gold top), contains a gel separator and clot activator. Sodium heparin (dark green top) PST (light green top). Contains lithium heparin anticoagulant and a gel separator. EDTA (lavender top) Oxalate/fluoride (light gray top) or other additives.

*Fig. 5.2.14: Recommended order of draw*

### Tube Fill Volume

The tubes should be filled until the vacuum is exhausted and the flow stops. The helps in maintaining appropriate blood to additive ratio.

- Pre-mature withdrawal of the tube, before blood has stopped flowing into the tube from the holder, could result in lesser than recommended specimen in the tube.
- Inappropriate volume of blood collected in tubes may lead to alteration in blood to additive ratio which can have an impact on quality of results.
Specimen Mixing

Specimen Mixing is a key component in production of quality specimens. The following image shows the correct specimen mixing procedure:

Correct Number of Inversions

The following table shows the correct number of tube inversions:

<table>
<thead>
<tr>
<th>Closure Cap</th>
<th>Collection Tube</th>
<th>Mix by inverting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blood Culture</td>
<td>8 to 10 times</td>
</tr>
<tr>
<td></td>
<td>Citrate</td>
<td>3 to 4 times</td>
</tr>
<tr>
<td></td>
<td>Serum Gel tube</td>
<td>5 times</td>
</tr>
<tr>
<td></td>
<td>Serum Tube</td>
<td>5 Times</td>
</tr>
<tr>
<td></td>
<td>Heparin Tube EDTA</td>
<td>8 to 10 times</td>
</tr>
<tr>
<td></td>
<td>Fluoride tube</td>
<td>8 to 10 times</td>
</tr>
<tr>
<td></td>
<td>Blood Culture</td>
<td>8 to 10 times</td>
</tr>
</tbody>
</table>

*Table 5.2.1: Correct number of tube inversions*
The correct way to mix different types of specimens is as follows:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Instructions</th>
</tr>
</thead>
</table>
| EDTA     | • Spray dried EDTA is least soluble of all additives.  
           • Inadequate mixing causes platelet clumps, micro-clots or overt clotting. |
| Gel and Plain Tubes | • Ensure faster clotting, better clot retraction and increased serum yield.  
                         • Mix to ensure clot activator and surfactant are evenly distributed through specimen.  
                         • Inadequate mixing may result in the formation of  
                           • Latent fibrin  
                           • Red cell hang-up  
                           • Excessive concentration of surfactant in the serum - potential to interfere with some immunochemistry assays. |
| Citrate  | • Liquid additive means less mixing required.  
           • Mix by gentle inversion to prevent platelet activation |
| Heparin  | • Mix to ensure heparin is dissolved in specimen.  
           • Latent fibrin may result if mixing is inadequate |
| Sodium Fluoride and Fluoride EDTA | • Fluoride EDTA - poor solubility of EDTA |

Fig. 5.2.16: Correct way to mix specimen

**Tube labelling:** Labeling errors can lead to serious preanalytical error.

### 5.2.7.1 Blood Culture

Blood culture specimens are generally collected in special blood culture vials and not BD Vacutainer® tubes. The following key points should be kept in mind when collecting blood culture sample:

- **Timing of drawing blood cultures**
- **Skin disinfection/Aseptic Technique**
- **Number of blood culture sets**
- **Volume of blood to inoculate**
- **How long to incubate blood culture bottles**

Fig. 5.2.17: Blood culture sample
5.2.7.2 Reasons for Negative Blood Culture in Sepsis

Sometimes the blood culture comes negative even when there is a sepsis. This can be due to one of the many reasons, such as the infection is contained locally, poor timing of collection, low blood volume collected, patient might be on antibiotics or due to cellular products such as endotoxin, peptidoglycan, lipoteichoic acid, bacterial DNA and/or cytokines.

Importance of Blood Volume

The single-most critical factor that optimizes sensitivity of blood culture is volume of blood collected. More the volume of blood culture, more is the % recovery of pathogens.

A minimum of 40ml of blood should always be collected at each septic episode. Care should be taken to not overfill the bottles.

Blood Culture Collection

The steps of collecting blood culture are as follows:

- **Step 1** • Skin Preparation
- **Step 2** • Vial Preparation
- **Step 3** • Blood collection
- **Step 4** • Patient skin care
- **Step 5** • Label Vials
- **Step 6** • Safe Disposal

*Fig. 5.2.18: Steps of collecting blood culture*
Skin Preparation

Thorough skin preparation is essential and for that the correct procedures for cleaning the site prior to collecting blood culture sample should be taken.

Prepare Vials

To prepare vials for blood collection:
- Mark vials with fill level – 10 mL
- Remove caps
- Wipe with alcohol

Volume of Blood Culture

The following table shows the volume of blood to be collected for different bottle types:

<table>
<thead>
<tr>
<th>Bottle type</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>8-10mL</td>
</tr>
<tr>
<td>Anaerobic</td>
<td>8-10mL</td>
</tr>
<tr>
<td>PEDS</td>
<td>1-3mL</td>
</tr>
<tr>
<td>Myco F</td>
<td>1-5mL</td>
</tr>
</tbody>
</table>

Table 5.2.2: Volume of Blood Culture

Best Practices of Blood Culture

Be sure to keep in mind the following points when drawing blood for cultures:
- Aseptic technique is critical.
- Draw blood cultures as close as possible to the episode of chills or fever and ideally before empiric therapy
- Blood Cultures are always drawn FIRST!
- A set comprises of an Aerobic and anaerobic bottle.
- Swab the top of the bottles (septa), after uncapping, with an alcohol swab
- Mark your 10ml filling volume (do NOT overfill)
- Use a wing-set and adapter to collect blood cultures peripherally
- Avoid needle and syringe draws. A wing-set can also be with a syringe to collect blood cultures
- DO NOT inoculate bottles with a needle and syringe. Use a Blood Transfer Device, attached to the end of the syringe
- A minimum of TWO and preferably THREE sets should be drawn on each patient per episode, consecutively from SEPARATE venipunctures
- NEVER draw only 1 blood culture set during the initial evaluation of a septic patient
- A SEPERATE venipuncture is required for each set
5.2.8 Assisting the patient before, during and after collection of blood

Involvement and cooperation of the patient is one of the essential indicators of quality care in phlebotomy and it is mutually beneficial to both the health worker and the patient.

Before the blood specimen is drawn

- Define the indications for blood sampling clearly, either in a written protocol or in documented instructions.
- Introduce yourself to the patient and ask the patient to state their full name.
- To ensure accurate identification, check that the laboratory form matches the patient’s identity.
- Ask the patient about any allergies or phobias they have and also if they have ever fainted during previous injections or blood draws.
- If the patient is anxious or afraid, reassure the person and ask what would make them more comfortable.
- Make the patient comfortable in a supine position (if possible).
- Place a clean paper or towel under the patient’s arm.
- Discuss the test to be performed and obtain verbal consent.

Table 5.2.19: Assisting the patient before collection of blood
While the blood specimen is being drawn

- Ask the patient to form a fist so the veins are more prominent.
- Withdraw the needle gently and apply gentle pressure to the site with a clean gauze or dry cottonwool ball.
- Ask the patient to hold the gauze or cotton wool in place, with the arm extended and raised.
- Ask the patient NOT to bend the arm, because doing so causes a haematoma.

Table 5.2.20: Assisting the patient during collection of blood

After the blood specimen is drawn

- Ask the patient or donor how they are feeling.
- Check the insertion site to verify that it is not bleeding.
- Thank the patient and say something reassuring and encouraging before the person leaves.

Table 5.2.21: Assisting the patient after collection of blood

5.2.9 Correct Method of Labelling of Blood Samples

Barcoding Systems

Barcode is an optical machine-readable representation of data relating to the object to which it is attached.

- Barcodes help reduce labeling errors on specimens during blood collection.
- Barcode readers help in reducing the work of feeding the test data information in an automated analyzer during the sample uploading cycle.
This increases efficiency and has an impact on the TAT

Fig. 5.2.22: incorrect and correct barcoding

The following important points should be kept in mind when barcoding a specimen:

- Paste the barcode sticker appropriately
- Avoid folds on barcode
- Do not change barcode number by hand
- Do not leave unused barcodes in the phlebotomy area

Fig. 5.2.23: Important points of bar coding
Sample Identification

Every sample tube should have a computer generated or hand-written label with the following patient details:

- First and last name
- Patient’s identification number (Medical Record or Hospital Number)
- Date and time of collection
- ID of healthcare practitioner (e.g., Initials or full name/as per facility requirements)

Improper Tube Labeling

Inaccuracies and missing information may result in discarding of the specimens. Serious (life-threatening) errors in patient management may result from test results being applied to the wrong patient.

- DO NOT label tubes before performing the venipuncture / Label as per institutional guidelines
- DO NOT leave an in-patient’s room before labeling the tubes
- DO NOT dismiss an out-patient before labeling the tubes
- DO NOT label the tubes with a pencil
- DO NOT ask someone who has not drawn the blood to label the tubes
• The patient and the patient’s blood specimen must be positively identified at the time of collection.
• If computer generated labels are used (including bar code labels), attach the label according to the facility’s policies and procedures.

![Improper tube labeling](image)

**Fig. 5.2.26: Improper tube labeling**

**Specimen Rejection Criteria**

The following is a list of the criteria that can result in a specimen deemed unacceptable for testing:
• Requisition is received without a specimen
• Requisition or specimen label lacks two patient identifiers
• Requisition and/or specimen mislabeled (Patient identifiers inaccurate)
• Requisition or specimen label information is illegible
• Specimen is received without an approved requisition
• Requisition and specimen label information is not identical
• Incorrect specimen container/tube is used
• Time of collection is not recorded
• Date of collection is not recorded
• Specimen is clotted
• Duplicate test request
• Inappropriate specimen
• Specimen quantity is insufficient
• Specimen is too old for testing
• Specimen container is leaking
• Specimen contamination, dilution or other interfering substances affect specimen integrity; example: haemolysed, lipemic
**Hemolysis – During Specimen Collection**

The following table shows a list of various factors that may result in hemolysis and also the possible consequences of these actions:

<table>
<thead>
<tr>
<th>Possible factor affecting hemolysis</th>
<th>Possible consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venipuncture Procedure</td>
<td>Fragile and easily traumatized veins</td>
</tr>
<tr>
<td>Prolonged tourniquet application</td>
<td>• Hemoconcentration</td>
</tr>
<tr>
<td></td>
<td>• RBC rupture</td>
</tr>
<tr>
<td>Venipuncture site cleansing procedure</td>
<td>Performing venipuncture before alcohol is allowed to dry thoroughly</td>
</tr>
<tr>
<td>Needle Readjustment</td>
<td>Vein trauma</td>
</tr>
<tr>
<td>Needle Gauge:</td>
<td></td>
</tr>
<tr>
<td>• Bore too large compared to vein size (lower gauge e.g., 18G)</td>
<td>• Blood enters tube faster</td>
</tr>
<tr>
<td>• Bore too small compared to vein size (higher gauge e.g., 25G)</td>
<td>• Blood enters under high vacuum pressure resulting in hemolysis</td>
</tr>
<tr>
<td>Syringe Collections</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Too much force applied to the plunger</td>
</tr>
<tr>
<td></td>
<td>• Blood may start to clot in syringe, in large volume syringe</td>
</tr>
<tr>
<td></td>
<td>• Forceful transfer of blood into the tube</td>
</tr>
</tbody>
</table>

*Table 5.2.3: Haemolysis*
UNIT 5.3: Rapid Antigen Test for COVID-19

Unit Objectives

After completion of this unit, the participants will be able to:
1. Describe the process of Rapid Antigen Test for COVID-19.
2. List the tools and equipment required.
3. Describe the correct procedure for collecting a nasopharyngeal swab specimen
4. Describe the correct procedure for collecting a throat/ oropharyngeal swab specimen

5.3.1 Rapid Antigen Test for COVID-19 (Oropharyngeal / Nasopharyngeal swabs)

An antigen test reveals if a person is currently infected with a pathogen such as the SARS-CoV-2 virus. It searches for specific proteins, the 'spike protein', found on the surface of the coronavirus. The body’s immune response recognises these proteins as 'foreign'.

A swab from the nose is collected for this test, where there’s a high likelihood of virus particles being present. The swab is then dipped in a solution that inactivates the virus and then transferred onto a test strip. The test strip contains antibodies that bind to coronavirus proteins and hold them in place as the fluid spreads.

If the sample is positive for coronavirus, coloured lines will show up on the paper strip in 15-20 minutes.

The Rapid Antigen Test Kit contains:

- Test Device
- Specimen Extraction Buffer Tube
- Sterile Swab for sample collection
- Nozzle Cap
- Instructions for Use

Fig. 5.3.1: Rapid Antigen Test Kit
5.3.2 Steps to be followed for Specimen Collection

A rapid antigen test includes:

- Nasopharyngeal swab specimen
- Throat/ Oropharyngeal swab specimen

Fig. 5.3.2: Rapid antigen tests
Collecting a nasopharyngeal swab specimen

**Step 1**
- Gently tilt the patient’s head backwards and steady the chin.

**Step 2**
- Insert the sterile swab into the nostril.

**Step 3**
- Using the gentle rotation, push the sterile swab until resistance is met at the level of the turbinate.

**Step 4**
- Remove the swab from the nostril carefully.

**Step 5**
- Repeat the above procedure in the other nostril.

**Step 6**
- Place the swab specimen into the buffer tube.

**Step 7**
- While squeezing the buffer tube, stir the swab more than 10 times.

**Step 8**
- Remove the swab while squeezing the sides of the tube to extract the liquid from the swab.

**Step 9**
- Press the nozzle cap tightly onto the buffer tube.

*Fig. 5.3.3: Collecting a nasopharyngeal swab specimen*
Collecting a throat/ oropharyngeal swab specimen

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Gently tilt the patient’s head backwards and steady the chin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Ask the patient to open his/her mouth.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Use a disposable tongue depressor to hold the tongue well.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Insert a sterile swab.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Swab both the tonsils and the posterior pharynx vigorously with a rotating motion, till the patient starts to gag.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Remove the swab without touching the tongue.</td>
</tr>
<tr>
<td>Step 7</td>
<td>The swab is then placed in the labelled tube containing VTM.</td>
</tr>
<tr>
<td>Step 8</td>
<td>The applicator stick is broken off at the indicated mark (if provided) or at below the level of the tube opening.</td>
</tr>
<tr>
<td>Step 9</td>
<td>Close and tightly screw cap the tube.</td>
</tr>
</tbody>
</table>

Fig. 5.3.4: Collecting a throat/ oropharyngeal swab specimen
1. List the steps of collecting blood sample.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. Identify which of the following statements are true or false.
   a. When cleaning a site for venipuncture, start at the center of the site and move outwards.
   b. For venipuncture, the dorsal hand vein is the most preferred site.
   c. The non-additive tube (red top) must be used first when collecting blood sample.
   d. For taking sample for blood culture, the site must be cleaned with 70% alcohol.

3. Which of the following can lead to rejection of a specimen?
   a. Incorrect specimen tube is used
   b. Specimen label contains two patient identifiers
   c. Duplicate test request has not been made
   d. Specimen is not clotted

4. Name the three factors necessary for proper packaging and shipping of specimen.
   a. ________________________________
   b. ________________________________
   c. ________________________________
6. Post-Procedural Activities of Sample Collection

Unit 6.1 - Basic Sensitization on Post-procedural Activities
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. Briefly describe archiving protocol emphasizing on storage and retrieval of samples, specimens, data and records.
2. Describe source of error/ interference/ quality of work and initiate corrective action as applicable
3. Establish and monitor quality assurance programs or activities to ensure the accuracy of laboratory working
UNIT 6.1: Basic Sensitization on Post-procedural Activities

Unit Objectives

After completion of this unit, the participants will be able to:
1. Describe the process of specimen preparation before transportation.
2. Explain the correct method of packaging specimens for transportation.
3. Describe the various aspects of the post analytical process in laboratory testing.
4. Explain the correct process of sample handling.
5. Explain the need for Quality Assurance Programs techniques

6.1.1 Need for Specimen Transportation

There are situations when the specimen needs to be transported. This can be due to one of the following reasons:
- When tests are not available at site of specimen collection
- Provides opportunity to the Health Centers for larger number of diagnostic tests
- Referral Tests
- Performing specialized tests at central facility
- Contingency Measure
- May be needed in situations such as equipment breakdown, non-availability of laboratory personnel at the site of collection etc.

Specimen Preparation before Transportation

When preparing specimens for transportation, keep the following in mind:

- Serum / plasma should be separated from cells within 2 hours of specimen collection
- Whole blood samples for Potassium estimation should not be refrigerated – should be kept at room temperature
- Specimen collected for some tests need to be kept in crushed ice immediately after collection, these are: catecholamines, ammonia, lactic acid, pyruvate, gastrin, and parathyroid hormone (PTH)
- Contact time of less than two hours is recommended for samples for potassium, ACTH, cortisol, catecholamines, lactic acid, and homocysteine

Fig. 6.1.1: Specimen preparation before transportation
Transportation Errors

The various sample transportation and processing errors that can occur are:

- Delay in transport
- Lost tube
- Spillage during transport
- Temperature not maintained during transport
- Centrifuged at higher speed and more time
- Incomplete centrifugation
- Tube broken / label lost

Fig. 6.1.2: Sample transportation and processing errors

Packaging Specimens for Transportation:

In order to ensure quality results and the safety of laboratory and courier personnel, it is important to take proper care when packaging and shipping specimen. The three factors necessary for specimen packaging and shipping are:

- Right packaging
- Right temperature
- Right timeframe

Fig. 6.1.3: Factors affecting specimen packaging and shipping

Triple Packaging System

- Primary receptacles shall be packed in secondary packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the secondary packaging.
- Secondary packaging shall be secured in outer packaging with suitable cushioning material.
- Any leakage of the contents shall not compromise the integrity of the cushioning material or of the outer packaging.

Specimen Packaging

Fig. 6.1.4: Specimen packaging
Step-by-Step Specimen Packaging Example

1. Collect specimens in primary containers and gather packaging materials.

2. Place absorbent into bottom of secondary container.

3. Wrap each tube in paper towel to keep specimens separate from one another.

4. Place tubes in secondary container and place biohazard label on container.

5. Put absorbent on top of tubes and screw on cap.

6. Roll lab form around outside of the secondary container. Place in outer container. Screw on cap.

Fig. 6.1.5: Steps for packaging specimens

- DO NOT put any patient information on outer container or secondary containers or lids.
- Biohazard Label should be on Secondary Container and not on Outer Container.
6.1.2 Post Analytical Process

The post analytical phase is the final phase of the laboratory process. It concludes in the production of a final value, result, or in the case of histology, a diagnostic pathology report.

Post analytical phase is divided into the following sub-phases:

- Review of results
- Storage, retention and disposal of clinical samples
- Reporting of results
- Release of results

![Fig. 6.1.6: Post analytical phase](image)

**Review of Results**
- Before releasing the results, readings shall be compared with the internal Quality control.
- Authorized and trained person should review the results before its release.
- There is an established written procedure for evaluation of results and mode of report communication to patients.

**Storage, Retention and Disposal of Clinical Samples**

**Sample Storage**

Written policies must be established that include:

- Description of what samples should be stored
- Retention time
- Location, consider ease of access
- Conditions for storage, such as atmospheric and temperature requirements
- System for storage organization, one method being to store samples by day of receipt or accession number

![Fig. 6.1.7: Sample storage policies](image)
Specimen Handling

When storing samples, avoid exposure of specimens to temperature extremes. This may induce:

- Haemolysis (elevated K+)
- Platelet activation (erroneous aPTT)
- Cell morphological artifact
- Partial loss of temperature sensitive analytes
- Storage at 4ºC can affect assay of electrolytes due cell respiration

Note that the gel tubes require special attention:

---

Gel-analyte interactions are time, temperature and specimen volume dependent. Some therapeutic drugs are particularly sensitive to improper handling conditions.

Keep the gel tubes upright. Cellular debris on gel surface, cells and fibrin from inside the cap may contaminate the specimen.

Careful attention should be given to storage time limits for analytes.

---

Sample Retention

Set a laboratory policy for retention of each type of sample. Some samples can be quickly discarded and others may need to be retained for longer periods. Monitor stored samples, and do not keep for longer than necessary, as refrigerator and freezer space may be limited.

Monitor the freeze/thaw cycles of the samples, as samples may deteriorate over time.

If samples need to be stored for a long-term, plan and organize a computer tracking system for these samples. Perform a periodic review of the inventory of stored samples to determine when and if they need to be discarded.
Sample Referral

When referring samples to other laboratories for testing:

**Ensure that the sample is**

- labeled correctly
- in the correct container
- accompanied by a requisition form that specifies the required test(s)
- includes the sending laboratory’s contact information

**Obtain a laboratory handbook**

- with detailed procedures from each laboratory

**Carefully monitor samples**

- record and report results received for each referred sample
- keep a record of all tests / samples referred, date of referral, name of person referring the test
- monitor TAT and record any problems encountered

*Fig. 6.1.10: Sample referral*

Sample Disposal

The laboratory is responsible for ensuring that disposal of all laboratory waste is handled in a safe manner. To ensure proper disposal of patient samples:

**Develop a policy for sample disposal**

**Apply local, as well as country regulations for disposal of medical waste**

**Establish and follow procedures to disinfect samples prior to disposal**

*Fig. 6.1.11: Sample disposal*
Reporting of Results

The results of each examination shall be reported accurately and clearly in accordance with any specific instructions in the examination procedures. The laboratory should:

- Define the format and medium of the report (i.e. electronic or paper) and the manner it is to be communicated to the end user.
- Ensure the correctness of transcription (say, Typological errors) of laboratory results
- Notify the requester in case of delay in the examination that could compromise the patient care.

6.1.2 Quality Assurance (QA) Programs

The Clinical and Laboratory Standards Institute (CLSI) recommends that individuals carrying out the quality assurance program should not be involved with the review of actual laboratory testing. They should be entirely independent of the laboratory management and free of any influence or pressures that could impact the performance of their duties.

A quality assurance department accomplishes its objectives by:

<table>
<thead>
<tr>
<th>(QA) Programs</th>
<th>Setting up standard operating procedures (SOPs) for all stages of the laboratory testing, starting from managing incoming samples to authorizing study reports and test certificates for the client.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monitoring workers compliance with SOPs and mandating administrative requirements, such as record keeping, data evaluation and performing internal audits.</td>
</tr>
<tr>
<td></td>
<td>Probing deviation and non-compliance, and specifying corrective actions and assigning responsibilities for their implementation.</td>
</tr>
<tr>
<td></td>
<td>Sustaining a high level of staff involvement.</td>
</tr>
</tbody>
</table>

Fig. 6.1.12: Quality assurance program objectives

It is vital that the quality assurance program covers all aspects of the laboratory’s operations.
Exercise

1. List the sub-phases of post analytical phase.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. Identify which of the following statements are true or false.
   a. The individuals carrying out the quality assurance program should be involved with the review of actual laboratory testing.
   b. When referring samples to other laboratories for testing, ensure that the sample is labelled correctly.
   c. There is an established written procedure for evaluation of results and mode of report communication to patients.
7. Quality Assurance and Documentation

Unit 7.1 - Reporting and Documentation
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. Explain the importance and method of observing and reporting while dealing with patients during sample and report collection
2. Describe quality assurance process during report delivery
3. Explain the importance of verbally informing the person in authority
4. State the guidelines for reporting the test results.
5. Explain the importance of documentation
6. State the uses and importance of records in laboratory set up
7. Explain the essential requirement of records
UNIT 7.1: Reporting and Documentation

Unit Objectives

After completion of this unit, the participants will be able to:
1. State the guidelines for reporting the test results.
2. Explain the importance of documentation

7.1.1 Quality Management System (QMS)

A QMS or a quality management system can be described as “coordinated activities to direct and control an organization with regard to quality”. The International Organization for Standardization (ISO) and the Clinical and Laboratory Standards Institute (CLSI) both use this definition. Both groups are internationally recognized laboratory standards organizations.

- QMS is expressed as organizational structure, policies, procedures, processes and resources needed to implement quality management and total quality assurance in medical testing laboratories.
- It includes the manuals, procedures and reference standards focused at implementing the quality policy and objectives.
- Each of the procedures and processes performed in the laboratory should be performed correctly in order to assure accuracy and reliability of testing.
- An error in any part of the cycle can produce a poor laboratory result.
- Develop a method that detects errors at each phase of testing to ensure quality.
- ISO standards group laboratory processes into three categories:
  - Pre-examination
  - Examination
  - Post-examination
- Types of processes in laboratory:
  - Pre-analytic processes
  - Analytic processes
  - Post-analytic processes

Fig. 7.1.1: Quality assurance cycle
QMS Requirements in Medical Laboratories

A quality management system consists of policies, procedures, SOPs and records, that provide goals, assign responsibility, describe how to perform these responsibilities and provide evidence of past accounts or occurrences of compliance.

QMS requirements are of two types:
1. Management requirements
2. Technical requirements

Management requirements consist of:

Fig. 7.1.2: Management QMS requirements

Technical requirements consist of:

Fig. 7.1.3: Technical QMS requirements
Quality Assurance (QA)- Roles and Responsibilities

QA is a part of quality management focused on providing confidence to laboratory that all the quality requirements are fulfilled.

Management requirements

- Establishing and reviewing the service agreements
- Selection and evaluation of referral laboratories and consultants.
- Involving in the purchase of external services, equipment, reagents and consumable supplies
- Managing and record maintaining of feedbacks and complaints from both internal and external customers
- Identifying and managing the nonconformities in all stages of QMS
- Identifying, indexing, storage, reviewing, maintaining and disposing quality and technical records

Technical requirements

- Personnel management and maintaining of personnel records
- Selection, purchasing and management of equipment including calibration and preventive maintenance planner adherence
- Establishing the inventory control system for reagents and consumables
- Establishing the procedures and information for Pre-examination activities
- Validation and documentation of examination procedures
- Verification of examination results with the validated methods
- Establishing the quality control for release of patient results
- Maintenance of confidentiality of patient information at all times

7.1.2 List of Required Documents and Records

Documents

- Quality Manual
- Quality system procedures
- SOPs
- Work instructions
- Instrument manuals
- SOPs supported by forms, Annexure, logbooks, reports

Records

- Supplier selection and performance
- Staff qualification, training and competency records
- Test request form
• Records of receipt of samples in the lab
• Reagents and material used information (Package inserts, CoAs)
• Laboratory work books and work sheets
• Instrument printouts and retained data
• Examination results and reports
• Instrument maintenance and records
• Calibration functions and conversion factors
• QC records
• CAPA records
• Risk management records
• Nonconformities and corrections
• Record of internal and external audits
• Inter laboratory comparisons
• Minutes of meetings of QMS meetings
• Records of management reviews

**Uses and importance of records in laboratory set up**

Records are laboratory information, either computer printed or written by hand. These records are permanent, and are not modified or revised. In case new information needs to be added to a record, it should be noted as an addition, with a date, and signature or initials.

Records should be complete, legible and carefully maintained, as they are used for many purposes, such as:

| Tracking of samples | Well-kept records allow for tracking of samples throughout the entire testing process; this is essential for troubleshooting, looking for sources of error in testing, and investigating identified errors |
| Continuous monitoring | Without access to all the data collected as a part of a quality system process, continuous monitoring cannot be accomplished |
| Management | Good records serve as a very important management tool |
| Evaluating problems | Well-kept equipment records will allow for thorough evaluation of any problems that arise |

*Fig. 7.1.4: Uses and importance of records*
Abbreviations and Symbols used by Phlebotomists

To save time, space and paperwork, it is common for healthcare professionals to use abbreviations and symbols to shorten words and phrases. Numerous abbreviations are used in the medical field to represent terms, names of organizations or common medical phrases.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.c.</td>
<td>before meals</td>
<td>cm</td>
<td>centimetre</td>
</tr>
<tr>
<td>Ad lib</td>
<td>as desired</td>
<td>CPR</td>
<td>cardiopulmonary resuscitation</td>
</tr>
<tr>
<td>ASAP</td>
<td>as soon as possible</td>
<td>DOA</td>
<td>dead or alive</td>
</tr>
<tr>
<td>bid</td>
<td>twice a day</td>
<td>DOB</td>
<td>date of birth</td>
</tr>
<tr>
<td>BP</td>
<td>plod pressure</td>
<td>Dx</td>
<td>diagnosis</td>
</tr>
<tr>
<td>Bx</td>
<td>biopsy</td>
<td>ECG/ETG</td>
<td>electrocardiogram</td>
</tr>
<tr>
<td>Cc*, cm3</td>
<td>cubic centimetre</td>
<td>ED</td>
<td>emergency department</td>
</tr>
<tr>
<td>g, gm</td>
<td>gram</td>
<td>pre-op</td>
<td>before surgery</td>
</tr>
<tr>
<td>h</td>
<td>hour</td>
<td>PRN</td>
<td>as needed</td>
</tr>
<tr>
<td>h.s.</td>
<td>at bedtime</td>
<td>Pt</td>
<td>patient</td>
</tr>
<tr>
<td>Hx</td>
<td>history</td>
<td>q</td>
<td>every</td>
</tr>
<tr>
<td>IM</td>
<td>intramuscular</td>
<td>ONS</td>
<td>quantity nonsufficient</td>
</tr>
<tr>
<td>IV</td>
<td>intravenous</td>
<td>R/O</td>
<td>rule out</td>
</tr>
<tr>
<td>m</td>
<td>kilogram</td>
<td>R/R</td>
<td>recovery room</td>
</tr>
<tr>
<td>mcg</td>
<td>microgram</td>
<td>Rx</td>
<td>prescription/treatment</td>
</tr>
<tr>
<td>mg</td>
<td>milligram</td>
<td>stat</td>
<td>immediately</td>
</tr>
<tr>
<td>ml</td>
<td>millilitre</td>
<td>Sx</td>
<td>symptoms</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
<td>TPN</td>
<td>total parenteral nutrition (iv feeding)</td>
</tr>
<tr>
<td>m</td>
<td>meter</td>
<td>TPR</td>
<td>temperature, pulse, respiration</td>
</tr>
<tr>
<td>NB</td>
<td>new born</td>
<td>Tx</td>
<td>treatment</td>
</tr>
<tr>
<td>NPO</td>
<td>nothing by month</td>
<td>Wd</td>
<td>wound</td>
</tr>
<tr>
<td>OP</td>
<td>outpatient</td>
<td>Wt</td>
<td>weight</td>
</tr>
<tr>
<td>oz</td>
<td>ounce</td>
<td>y/o</td>
<td>years old</td>
</tr>
<tr>
<td>post-op (p/o)</td>
<td>after surgery</td>
<td>pp</td>
<td>postprandial</td>
</tr>
</tbody>
</table>

Table 7.1.1: Abbreviations and Symbols used by Phlebotomists
Guidelines for documentation

What is Good Documentation Practice?

- A document is information (meaningful data) and its supporting medium, in the form of paper, CD, Computer file, microfilm, X-ray film etc.
- Documents provide information or evidence or may serve as an official record.
- Record is a document stating results achieved or provide evidence of activities performed.
- Guidelines are a document that provide recommended practices and instructions.
- Policy is a plan or adopted course or principle of action intended to influence and determine the decisions or actions of an organization.

Any document should be clear, concise and logical.

Contents of a document should include:

**Fig. 7.1.5: Contents of document**

Role of QA in Sample collection

Quality assurance shall establish the following procedures and shall control it during report delivery.

- Sample collection should have a separate reception
- Allocate space for privacy of the patient, if required
- Sample collection procedure should not affect the quality of sample
- First aid boxes and spill kits with material should be available at sample collection

**Fig. 7.1.6: Quality Assurance in sample collection**
Pre-examination processes

- Laboratory staff collects adequate information for proper identification of the patient.
- Patient is informed about the purpose of sample collected.
- TRF must have sufficient space to capture information to identify the patient and requestor.
- Information for patients and users includes, primary sample volumes, special precautions and turn-around-time (TAT).
- Instruction for completion of request form, preparation of the patient.
- Instruction for transportation of samples.
- Any requirement for patient consent.
- Sample acceptance and rejection criteria.
- Laboratory’s complaint procedure.

Test Request Form (TRF)

The TRF should include the following information:

- Patient identification, including:
  - Gender
  - Date of birth
  - Contact details of patient
  - Unique identifier
- Name or other unique identifier of clinician, healthcare provider, destination for report and contact details
- Type of primary sample, examination requested
- Fasting status
- Date and time of primary sample collection
- Date and time of sample receipt

Quality Assurance Process in Report Delivery

Quality assurance shall establish the following procedures and controls it during report delivery:

```
The results of each examination shall be reported accurately, clearly, unambiguously
```

```
The results shall be reported in a controlled format (Electronic/Paper)
```

```
Report shall include interpretation of the examination results.
```

Fig. 7.1.7: Quality assurance process in report delivery
Report contents

As an HCW, you need to understand the importance and method of observing and reporting during sample and report collection. Keep in mind the following:

- Clear identification of the examination procedure
- Identification of the laboratory issuing the report
- Patient ID and location on each page
- Identification of the test requester
- Date of primary sample collection
- Examination report units (e.g. SI units)
- Diagrams/graphs that supporting the clinical values
- Result interpretation
- Identification of the person reviewing the results
- Date and time of the report release
- Page numbers

Release of Results

- Results are legible, without mistakes in transcription, and report shall be shared to the authorized to receive and use it.
- If the quality of collected blood sample is unsuitable, same should be indicated or mentioned in the report.
- When the results are shared in the interim report, final report is always submitted in the end.
- There is an established procedure to ensure the results distributed by telephonic or electronic means reach only authorized receipts.
- Oral reports are recorded separately and shall be communicated with written report.
Exercise

1. List some information that a test request form (TRF) should have.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. Identify the full form of the following abbreviations.

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Full form</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.c.</td>
<td></td>
</tr>
<tr>
<td>Ad lib</td>
<td></td>
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<tr>
<td>Bx</td>
<td></td>
</tr>
<tr>
<td>Hx</td>
<td></td>
</tr>
<tr>
<td>IM</td>
<td></td>
</tr>
</tbody>
</table>
8. Etiquette for Site Visits

Unit 8.1 - Punctuality and Phone Etiquette
Unit 8.2 - Visiting the Patient Site
Key Learning Outcomes

After completion of this module, the participants will be able to:

1. State the importance of being on time.
2. Explain phone etiquette to be followed with the patient while organizing a site visit.
3. Explain the process of confirming the availability of patient and the respective tests for sampling.
4. State the importance of making the necessary preparations using checklist before a site visit.
5. Describe the process to be followed in case of delay in reaching patient site.
6. State the importance of establishing the patient’s needs and expectation to ensure good quality service at the site.
7. Discuss the importance of maintaining privacy of the patient.
8. Describe the importance of carrying identification documents and introducing oneself to the patient on arrival.
9. Perform billing after the procedures are carried out.
10. Discuss the process of addressing delays, accidents or errors to ensure patient satisfaction.
UNIT 8.1: Punctuality and Phone Etiquette

Unit Objectives

After completion of this unit, the participants will be able to:

1. State the importance of being on time.
2. Explain phone etiquette to be followed with the patient while organizing a site visit.
3. Explain the process of confirming the availability of patient and the respective tests for sampling.

8.1.1 State the Importance of Being on Time

Time is the most constrained resource in today’s times and the key to completing work on time is punctuality. It is one of the most important work etiquettes and a sign of professionalism. It shows that you prioritize your work and commitments. It also establishes your reputation as a responsible and trustworthy person.

The following image lists some advantages of being on time:

- Sufficient time to complete work
- Eliminates stress and anxiety
- Creates a good impression on superiors and colleagues
- Frees time for personal self and family
- Improves judgement and decision-making

Fig. 8.1.1: Advantages of being on time

8.1.2 Phone Etiquette when Calling Patients

One of the most frequently used mode of communicating with patients is over the phone. A phone call can leave a positive or a negative impression on the patient. One of the most important tools of patient care is good phone etiquette. When calling a patient to organise a site visit, be sure to follow proper phone etiquette.
The following image shows the correct telephone etiquette while calling or receiving a call from a patient:

8.1.3 Phone Etiquette when Calling Patients

Once the appointment for site visit has been scheduled, confirm the availability of patient before visiting the patient. Perform the following steps to confirm the availability of the patient:

- Call the patient
- Identify yourself
- Reconfirm the tests requisitioned
- Inform the patient of the time of the site visit
- Take confirmation of the patient’s availability
- Reconfirm the patient’s identity
- Avoid placing callers on hold for more than one minute
- Answer the call within three rings
- Answer the call with courtesy and kindness in your voice
- End the call with a polite ‘Thank-you and Goodbye’
UNIT 8.2: Visiting the Patient Site

Unit Objectives

After completion of this unit, the participants will be able to:
1. State the importance of making the necessary preparations using checklist before a site visit.
2. Describe the process to be followed in case of delay in reaching patient site.
3. State the importance of establishing the patient’s needs and expectation to ensure good quality service at the site.
4. Discuss the importance of maintaining privacy of the patient.
5. Describe the importance of carrying identification documents and introducing oneself to the patient on arrival.
6. Perform billing after the procedures are carried out.
7. Discuss the process of addressing delays, accidents or errors to ensure patient satisfaction.

8.2.1 Making Necessary Preparations

Checklists are an important tool for organising work requirements. A detailed and organised checklist of the tools and equipment needed before a site visit helps in ensuring that the visit goes as planned and there are no setbacks in performing the blood collection task.

The following checklist will help ensure that all necessary preparations for collecting blood specimen from a patient are done:

- Assemble equipment required for collecting sample
- Assemble equipment for preventing infections
- Assemble forms and documents required to be filled
- Assemble materials for packaging samples

Fig. 8.2.1: Preparation checklist
8.2.2 Process for Delay in Reaching Patient Site

The first step towards sample collection is to plan and visit the patient site. Site visit helps in preparing the action plan. A well-planned action list is useful while reaching there, collecting equipment/instruments required and helps avoid uncertainties.

8.2.3 Patient’s Needs and Expectations

Establishing and fulfilling patient’s needs and expectations is crucial to providing good quality service. Patients’ expectations refer to the beliefs of the patient regarding the healthcare service being provided to him. Understanding patient’s needs and expectations leads to patient satisfaction. The general expectations of patients can be listed as:
8.2.4 Need for Maintaining Privacy of Patients

Every patient has a right to maintain privacy and it is the responsibility of the healthcare workers to respect that. Privacy is directly associated with an individual’s dignity, respect and the ability to make personal decisions. Any breach of privacy may affect a patient’s dignity and might even cause harm. Ensuring privacy can help in promoting a sense of comfort and trust in the patient.

The following steps can help in maintaining privacy of the patient:

- Knock and ask permission to enter
- Seat the patient on a comfortable couch/chair with an arm rest
- Ask if the patient wants to close door/curtains

Fig. 8.2.4: Maintaining privacy of the patient

8.2.5 Carrying Identification Documents

Personal identification documents include a person’s name, birth date (DOB), employee reference number, organisation name, designation, etc.

Showing a patient your ID card or personal identification card as issued by the hospital or medical institution/diagnostic centre informs the patient about the following:

- The employer’s name (or hospital or medical institution/diagnostic centre logo)
- An expiration date for the card
- A full-faced image of the person the card is assigned to
- A unique identification number
- The employee’s full name

Fig. 8.2.5: Information on ID card

This helps the patient in:
- Identifying impostors and inform them that there is a security plan in place
- Comparing the badge photo to the person holding the badge
- Establishing restrictions for people with lower security clearance or access
- Identifying other employees quickly
8.2.6 Perform Billing Processes

After the process of specimen collection is complete, perform the following steps of the billing process:

1. Insurance validation
2. Charge capture
3. Medical coding
4. Claims submission
5. A/R follow-up
6. Denial management
7. Remittance processing
8. Third-party follow-up
9. Patient collections
10. Reporting & data analysis

Fig. 8.2.6: Billing process
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https://www.mohfw.gov.in/pdf/SocialDistancingAdvisorybyMOHFW.pdf


https://www.mohfw.gov.in/pdf/MindingourmindsduringCoronaeditedat.pdf


https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf?sfvrsn=6d3578af_2


https://www.who.int/


https://hr.uw.edu/coronavirus/return-to-on-site-work/covid-19-employee-symptom-attestation/


https://www.ncbi.nlm.nih.gov/books/NBK143067/

Customised Crash Course Programme for COVID Warriors

Skill India

Corporate Office:
Healthcare Sector Skill Council
520-521, 5th floor, DLF Tower A, Jasola District Center
New Delhi - 110025, India
Tel: 011-41017346, 40505850
Email: info@healthcare-ssc.in
Website: www.healthcare-ssc.in

Registered Office:
Healthcare Sector Skill Council
23, Institutional Area, Lodi Road,
Tha Mantosh Sondhi Centro,
New Delhi – 110 003 (India)