الإدارة العامة لمكافحة عدوى المنشآت الصحية

General Directorate of Infection Prevention and Control in Healthcare Facilities

(GDIPC)

Respiratory Protection Program
(RPP)

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وزارة الصحة
Ministry of Health

In the name of ALLAH, Most Gracious, Most Merciful

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Purpose of This Guide

This guide was developed to provide healthcare facilities with a useful tool for developing and implementing effective respiratory protection program, with an emphasis on protecting healthcare workers, patients, and visitors from respiratory infectious diseases.

In addition, this program intended to improve the awareness of respiratory threats in healthcare settings and to inform healthcare workers about the effective means available to protect themselves, patients, and visitors from those hazards.

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Definitions

An Air-Purifying Respirator (APR):

A respirator with an air-purifying filter, cartridge, or canister removes specific air contaminants by passing ambient air through the air-purifying element.

Powered Air Purifying Respirators (PAPRs):

Powered Air Purifying Respirators, or PAPRs, are battery-powered and portable air-filtration systems that allow one to move around while breathing clean air. The system filters out contaminants and particulates in the immediate environment using a battery-operated blower to provide the user with clean air through a hood or a helmet.

Airborne Transmission:

Transmission of infection by microscopic particles (generally <5 microns in size) is generated from an infected individual's respiratory tract during activities such as coughing, sneezing, and during some procedures that can form aerosols that other persons can inhale.

Droplet Transmission:

Transmission of infection by larger particles (generally >5 microns in size) that are expelled when coughing, sneezing, or talking but do not remain suspended in the air and only travel short distances (approximately one meter) from the patient.

Aerosol:

It is a mist composed of tiny, lightweight particles that can remain suspended in the air for long periods and travel long distances. These particles can penetrate the respiratory system and are generally <5 microns in diameter.

Aerosol Transmissible Diseases (ATDs)

Aerosol transmissible diseases are transmitted when infectious agents, suspended or present in particles or droplets, contact the mucous membranes or are inhaled.

Aerosol-Generating Procedures (AGPs):

Procedures are more likely to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing, or breathing as bronchoscopy, collection of lower respiratory tract specimens (including use of hypertonic saline nebulization for collection of respiratory samples), endotracheal intubation, and open airway suctioning of lower airways.

Face Mask:

A face mask is a product that covers the wearer's nose and mouth. Face masks are used as source control by the general public and health care personnel (HCP) and are not personal protective equipment.

Surgical Mask:

A surgical mask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment.

Respirator:

A respirator is a particulate-filtering face piece respiratory protective device designed to achieve a very close facial fit and efficiently filtration airborne particles—the edges of the respirator are designed to form a seal around the nose and mouth.

Surgical Respirator:

A surgical (medical respirator) is recommended only for use by healthcare workers (HCWs) who need protection from both airborne and fluid hazards (e.g., splashes, sprays).

Fit Test:

The use of a protocol to evaluate the fit of a respirator qualitatively or quantitatively on an individual

High-Efficient Particulate Air (HEPA) Filter:

An air filter removes >99.97% of particles ≥ 0.3µm (the most penetrating particle size) at a specified air flow rate. HEPA filters may be integrated into the central air handling systems, installed at the point of use above the ceiling of a room, or used as portable units.

Fit factor:

A quantitative estimate fit of a particular respirator for a specific individual typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Quantitative Fit Test:

A test method uses an instrument to assess the amount of leakage into the respirator to assess the adequacy of respirator fit.

Qualitative Fit Test:

A pass/fail test method relies on the subject's sensory response to detect a challenge agent and assess respirator fit adequacy.

Airborne Infection Isolation Room (AIIR):

It is a room designated for persons with or suspected of infection with organisms spread by airborne droplet nuclei less than 5 microns in diameter that spread through coughing or other ways of suspending droplets of pathogens (e.g., tuberculosis, varicella-zoster virus, measles) into the air.

Air Changes per Hour (ACH):

A measure of how many times the air within a defined space (a room) is replaced per hour.

Air Handling Unit (AHU):

A device used to condition and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system.
An air handler is usually a large metal box containing a blower, heating or cooling elements, filter racks or chambers, sound attenuators, and dampers. Air handlers usually connect to a ductwork ventilation system that distributes the conditioned air through the building.

Introduction

With the emergence of global infectious diseases, such as severe acute respiratory syndrome, influenza, coronavirus disease 2019 (COVID-19), and other highly infectious diseases, which pose a risk to healthcare workers, patients, and their relatives, the need to adopt clinically competent respiratory protection strategies is essential.

This guide is written as a practical manual that can be used by healthcare facilities to establish and maintain an RPP for use in a hospital setting. It can be achieved through the implementation of a systematic approach that incorporates four main elements: (1) the prevention of respiratory hazards through the use of administrative controls, (2) the early identification of respiratory hazards, (3) the prevention of respiratory hazards through the use of engineering controls, and (4) the prevention of respiratory hazards through the use of respiratory protection equipment.

Respiratory Protection Program (RPP):

The Respiratory Protection Program (RPP) was designed by the General Directorate of Infection Prevention & Control in Healthcare Facilities (GDIPC) at the Ministry of Health (MOH). The RPP aimed to provide effective protection from respiratory risks and to ensure that all employees, patients, and visitors are protected from respiratory hazards through the adoption of a systematic approach that incorporates the four major elements with relevant sub-elements (*see* **Table 1**).

Table 1: The Components of the Respiratory Protraction Program

Components of Program		
1	**Prevention of Respiratory Hazards Through Administrative Controls**	**5 elements**
2	**Early Identification of Respiratory Hazards**	**5 elements**
3	**Prevention of Respiratory Hazards Through Engineering Controls**	**3 elements**
4	**Prevention of Respiratory Hazards Through Respiratory Protection Equipment (RPE)**	**2 elements**

Summary of Requirements for Effective RPP Implementation:

To establish a successful RPP, each healthcare facility must implement and comply with the standards set by the GDIPC at the MOH regarding all elements of the RPP (*see* **Table 2**).

Table 2: Required Steps in the Implementation of an Effective Respiratory Protraction Program

Prevention of Respiratory Hazards Through Administrative Controls
• Development of the RPP and Assigning Responsibilities
• Discussing RPP activities in the Infection Prevention & Control Regular Committee
• Development of RPP Policies and Procedures
• RPP Monitoring and Evaluation
• Providing Education & Training in Healthcare Facilities
Early Identification of Respiratory Hazards
• Performing A Respiratory Hazards Evaluation
• Early Identification of Patients with Infectious Respiratory Illnesses
• Early Recognition & Source Control of Patients with Infectious Respiratory Illnesses
• Transportation of Suspected/Confirmed Infectious Respiratory Illnesses Cases
• Collecting & Handling of Respiratory Specimens
Prevention of Respiratory Hazards Through Engineering Controls
• Availability and functioning of Airborne Infection Isolation Rooms (AIIRs)
• Availability and Functioning of Portable HEPA Filters
• Availability and Functioning of Laboratory's Biological Safety Hoods
Prevention of Respiratory Hazards Through Respiratory Protection Equipment (RPE)
• Availability of RPE Including Face Mask, Respirator, and PAPR machines
• Fit Testing is Provided to All Healthcare Workers

1. Prevention of Respiratory Hazards through Administrative Controls

The first key component to a successful RPP is the construction of specific administrative approaches to ensure its effective implementation and administration.

1.1. Development of the RPP and Assigning Responsibilities

Developing and constructing an effective respiratory protection program, with an emphasis on preventing the transmission of respiratory infectious diseases is essential.

1.1.1 GDIPC Respiratory Protection Program Team

The General Directorate of Infection Prevention and Control in Healthcare Facilities (GDIPC) should create a team to lead and supervise the program at

the GDIPC level. The roles and responsibilities of RPP members should be described in a written document(s).

1.1.1.1 Respiratory Protection Program Team Responsibilities at GDIPC level:

- Writing, reviewing, and disseminating all policies, scientific and organizational documents, and the evaluation tools used to implement and evaluate the program in hospitals.
- Implementing an evaluation for the application of the program in hospitals and following up on the results.
- Building effective communication with the program coordinators in infection control directorates in various regions.
- Answering all inquiries and providing scientific and technical advice regarding the program and its application in hospitals.
- Following up with the regional directorates coordinators regarding the implementation of the program and monitoring its key performance indicators (KPIs).

1.1.2 Directorate Respiratory Protection Program Team

RPP coordinator should be assigned by the Infection Prevention and Control Directorate to lead and supervise the program and actively communicate with the GDIPC team.

1.1.2.1 Respiratory Protection Program Coordinator Responsibilities at Directorate level:

- Disseminating all approved policies, scientific and organizational documents, and the evaluation tools used to implement and evaluate the program in hospitals.
- Monitoring the implementation of the RPP in clusters.
- Administration of RPP education and training sessions that targeted clusters' RPP team and requested from them accordingly to initiate an educational and training course for the RPP coordinators in their hospitals.
- Monitoring of the administration of RPP educational and training activities that provided by the clusters teams and supporting the same cluster for any encountered challenging about the RPP educational program.
- Activate the RPP international days and related activities in collaboration with the clusters.

- Establishing effective communication with the GDIPC team to facilitate the dissemination of all required information and submitting the completed evaluation documents from clusters.
- Building an effective relationship with the program coordinators in the infection control departments of participating clusters.
- Answering all inquiries, providing scientific and technical advice regarding the program and its application in clusters, as well as addressing challenging inquiries.
- Following up with the coordinators in the cluster regarding the implementation of the program and monitoring its KPIs.
- Establish RPP required reports and feedback that are requested by the GDIPC RPP team.

1.1.3 Cluster Respiratory Protection Program Team

RPP coordinator should be assigned by the Infection Prevention and Control Department in the cluster to lead and supervise the program and actively communicate with the directorate team.

1.1.3.1 Respiratory Protection Program Coordinator Responsibilities at Cluster level:

- Follow up on the RPP reports and KPIs in the cluster's hospitals.
- Establish the RPP annual plan.
- Monitor the RPP implementation and the correction action plan and measures that required in the hospitals of the same cluster.
- Collaboration with the regional directorate to activate the international RPP days and it is related activities.
- Answering all inquiries, providing scientific and technical advice regarding the program and its application in hospitals, as well as addressing challenging inquiries.
- Administration of RPP education and training sessions that targeted the hospital's RPP team.

1.1.4 Hospital Respiratory Protection Program Team

Each healthcare facility should establish a program for respiratory protection under Infection Prevention and Control Department.

1.1.4.1 Respiratory Protection Program Coordinator Responsibilities at the Hospital level:

- Writing, reviewing, and disseminating all policies, scientific and organizational documents, and the evaluation tools used to

implement and evaluate the program in hospitals based on MOH approved guidelines and its requirements.

- Implementing a comprehensive program for respiratory protection, as per the MOH requirements, at the facility.
- Ensuring that the RPP is well integrated with the occupational health and safety requirements.
- Ensuring that all healthcare workers involved in the RPP are competent in performing their relevant functions; in this context, competency should be measurable as an indicator of each HCW's ability to perform the stipulated RPP duties.
- Ensuring that the infection prevention & control regular committee analyses and identifies solutions to issues that impede the effective implementation of RPP activities and measures and it is recommended that the program related activities are explored as the main topic in this regular committee meeting agenda.
- Initiate the compliance monitoring and evaluation of RPP practices.
- Ensuring the availability of all required resources needed for the effective implementation of respiratory protection practices.
- Establishing educational and training activities to ensure the efficient implementation of RPP for all targeted groups (HCWs, patients, and their relatives).
- Maintaining records (recordkeeping) and documents that are essential for the RPP.
- Monitoring the KPIs of the program.

1.2. Discussing RPP Activities in the Infection Prevention & Control Regular Committee

As each facility should have a multidisciplinary regular infection prevention & control committee, it is preferred to explore the activities of the RPP as the main aspect in the same committee agenda to ensure the continuity and proactivity of the program.

1.2.1 Suggested RPP Committee Approaches:

There are some RPP aspects that could be discussed in the infection prevention and control regular committee:

- Review RPP activities and ensure their effectiveness.
- Being aware that the RPP activities are multifaceted and include planning, monitoring, and evaluating the RPP at the facility.
- Coordinating and supervising RPP activities and communicating with all departments to ensure the continuity and proactivity of the program.

- Ensuring that the committee analyses and identifies solutions to any issues with the potential to impede the effective implementation of RPP activities and measures.
- Constructing scientific preventive approaches to ensure that HCWs, patients, and visitors are in a safe environment and are protected against exposure to respiratory pathogens.

1.3. Development of Policies and Procedures

In terms of the development of policies and procedures, each healthcare facility should establish comprehensive internal policies and procedures to manage the RPP effectively. The following criteria must be performed to ensure the successful implementation of RPP policies and procedures:

- The facility must establish comprehensive and approved policies and procedures that govern all aspects of the RPP.
- RPP policies and procedures should be developed according to the MOH guidelines and regulations.
- Hospital staff must have access to the RPP policies and procedures.

Other aspects that must be considered during the designing of the RPP policy and procedure lead to the effective implementation of the RPP as follows:

1.3.1. Staff Vaccination

Each healthcare facility should have a system in place for vaccination of staff at considerable risk for acquiring or transmitting respiratory diseases including COVID-19, influenza, measles, mumps, rubella, pertussis, and varicella.

Specific considerations for staff vaccinations:

- Written policies and procedures for an employee's health program (i.e., pre-employment counseling and screening, immunization, post-exposure management, and work restrictions) must be available.
- A special clinic for employees' health that provides pre-employment counseling and screening, immunization, post-exposure management, and work restrictions must be available.
- The staff must be vaccinated, and a vaccination record should be available in the facility.
- The immune status of newly hired staff against measles, mumps, rubella, varicella, and COVID-19 must be determined by documented

vaccination, serological evidence of immunity and documented clinical/laboratory evidence of disease with lifelong immunity.

- Appropriate vaccines must be administered to those who are susceptible.
- The influenza vaccine must be administered annually to targeted HCWs or as per MOH recommendations.
- Newly hired contract staff must be screened for tuberculosis using a purified protein derivative-based (PPD) tuberculin skin test (TST).
- The test must be repeated annually for those who are non-reactive and the PPD-based TST conversion rates should be monitored and calculated.
- A system for reporting, following up, and managing exposure to open pulmonary tuberculosis, coronaviruses, chickenpox, measles, mumps, and rubella must be implemented.
- Exposed HCWs must be isolated when needed (either via home isolation in staff accommodation or identified rooms in the hospital).
- Updated medical records (or copies) must be accessible for supportive services personnel (i.e., kitchen, laundry, housekeeping, and waste management).

1.3.2. Respiratory Protection Program Recordkeeping

The RPP requires several types of records to be maintained. Written RPP policies and procedures, fit testing records (Basic Infection Control Skills License [BICSL]), RPP aspects that discussed in the regular committee minutes of meeting documents, respiratory protection equipment supplies, and airborne infection isolation room maintenance form must be available and accessible.

1.4. Program Monitoring and Evaluation

Program monitoring and evaluation are required, and the following approaches should be adopted:

- Regular program monitoring and evaluation are required by RPP team for successful implementation of the program.
- Each healthcare facility should monitor and evaluate the activities of the program to determine whether they are working in the safe practice and to identify any potential weaknesses and risk areas.
- The hospital departments and infection control departments must collaboratively monitor and evaluate the effectiveness of the program to ensure compliance with the MOH guidelines and regulations.

- The performance measurement tools that contribute to the unique characteristics of the healthcare facility should be used for all program activities (such as the progress pertaining to respirator fit testing coverage).
- All documents must be available for all processes.

1.5. Respiratory Protection Program Education & Training

Respiratory protection training is a critical component of an effective RPP, but it requires significant time and resources. Tailored education and training methods are required to improve the knowledge and the competencies of HCWs, patients, and their families of respiratory protection against respiratory infectious agents. Consequently, training is a main resource in addressing practice, compliance, and knowledge of respiratory protection.

Main Objectives:

- Consider appropriate approaches and project management strategies to support RPP development and implementation.
- Develop teaching methods that satisfy diverse learners.
- Increase awareness and knowledge of HCWs, patients, and visitors of all components of the respiratory awareness program based on their requirements and those referred to in the key concepts.

2. Early Identification of Respiratory Hazards

2.1. Respiratory Hazard Evaluation

Each healthcare facility should conduct a respiratory hazard evaluation to identify and evaluate the potential exposure of individuals to hazards, the extent of exposure, and the consequent selection of measures required for respiratory protection. The evaluation should determine the likelihood of occurrence and the level of exposure, which means that appropriate respiratory protection measures can subsequently be implemented. For further explanation, (See **Appendix A)**.

2.2. Early Identification of Patients with Acute Infectious Respiratory Illnesses

Patients who present at the Emergency Department (ED) and Hemodialysis Department (HD) must be triaged for acute infectious respiratory illnesses, including Middle East Respiratory Syndrome and Coronavirus COVID-19.

2.2.1 Respiratory Triage & Respiratory Pathway

Respiratory triage:

- It is a simple screening method for the early detection of patients with respiratory symptoms.

- It is a triaging scoring system applied to alert healthcare workers in an emergency (ED) and hemodialysis units for the possibility of occurrence of respiratory infections with a particular pathway for those patients.
- Respiratory triage and respiratory pathway are intended to be applied mandatory for healthcare facilities receiving patients with suspected or confirmed infectious respiratory disease.
- Includes healthcare facilities providing either inpatient or outpatient services.
- Respiratory triage and pathway should effectively prevent the transmission of respiratory diseases to patients, healthcare workers (HCWs), and visitors through using simple clinical symptoms and clinical history needed for rapid identification and isolation of suspected cases with infectious respiratory diseases.
- Developed based on current national and international experiences with respiratory viruses and updated as more information becomes available.
- Respiratory triage is not a substitute for ordinary triage and is never combined.

Purpose:

The objectives of respiratory triage are to ensure the early detection and proper placement of patients likely to be infected with the respiratory pathogens of concern and to minimize the risk of infection among HCWs, patients, and visitors.

Placement:

The respiratory triage area should be located in an appropriate and prominent place. The desk is placed at each entry before the reception area of the Emergency Department (ED) and Dialysis Unit. It should be in a manner that every patient is screened at the respiratory triage point before entry to the ED/Dialysis Unit.

Criteria:

- A certified trained HCW should operate the respiratory triage point, and they must be able to communicate with patients in both Arabic and English.
- The area should be manned by HCWs continuously (24/7).
- An informative poster should be erected in the respiratory triage area on the mandatory steps that are required before passing through it.

- HCWs should use the most updated version of the respiratory triage screening tool.
- Medical masks and alcoholic hand rub solution should be available at the respiratory triage desk.
- Patients identified with infectious respiratory illness should be asked to perform hand hygiene and wear a face mask.
- Those with respiratory symptoms must be immediately directed to the respiratory pathway (i.e. the respiratory waiting area) without first opening a patient file; staff members or caregivers can perform the registration in the reception instead.
- The one-way flow of patients should be ensured at all times.

2.2.2 Respiratory Pathway:

Waiting Area:

The waiting area for the respiratory pathway should be a well-ventilated separate area that is only used for suspected infectious respiratory cases. The respiratory waiting area should be kept free of excessive equipment or furniture and equipped with chairs that are easy to clean and fix, with a safe social distance of 1.2 m between chairs. Educational materials (posters and screens) about respiratory hygiene and cough etiquette must be available, together with hand hygiene supplies, tissues, and ordinary waste receptacles.

Respiratory clinic:

Patients with respiratory symptoms should be screened in the respiratory clinic (i.e., as part of the respiratory pathway) according to the respiratory triage process. The respiratory clinic should provide hygiene supplies (alcoholic hand rub solution and a handwashing facility with accessories).
After the clinical assessment, the physician must decide whether the patient meets the case definition for any particular disease. Accordingly, the patient will be directed to an Airborne Infection Isolation Room (AIIR) so that a respiratory specimen can be performed; if an AIIR is not available, a single room with a portable HEPA filter should be used. Portable chest X-rays must be available for chest imaging and to minimize the transfer of patients around the hospital.

2.3. Early Recognition and Source Control of Patients with Acute Infectious Respiratory Illnesses

Each healthcare facility should have a mechanism for the early recognition, screening, testing, and evaluation of respiratory infectious diseases, particularly those transmitted through droplets and airborne routes. Patients with symptoms suggestive of an infection transmitted in these ways should be investigated in a timely manner and contact tracing should be performed and managed correctly.

Application of transmission-based (Airborne and Droplet) Precautions

Droplet Precautions:

Droplet-related precautions should be taken with respect to patients known to be or suspected of being infected with pathogens transmitted by respiratory droplets generated by a patient while coughing, sneezing, or talking as follow:

- Source control should be exercised by putting a mask on the patient.
- Ensure appropriate patient placement (in a single room if possible).
- If a single room is not available at an acute care hospital, the recommendations for alternative patient placement must be utilized.
- In long-term care and other residential settings, decisions regarding patient placement must be made on a case-by-case basis, while considering the risk of infection to other patients in the room, as well as available alternatives.
- In ambulatory settings, patients who require droplet-related precautions should be taken to an examination room or cubicle as soon as possible and instructed to follow respiratory hygiene/cough etiquette protocols.
- A color-coded isolation sign should be used in the patient isolation room or cubicle (*see* **Appendix B**).
- PPE should be used appropriately.
- A mask should be donned upon entry to the patient's room or space.
- Transporting and moving patients outside the room should be limited to what is necessary medically.
- Color-coded Transportation Card should be used during patient transportation (see **Appendix C**).

Airborne Precautions:

Airborne precautions should be taken for patients known or suspected to be infected with pathogens transmitted via an airborne route (e.g., those with open pulmonary tuberculosis, measles, and chickenpox) as follows:

- Source control should be exercised by putting a mask on the patient.

- Ensure appropriate patient placement in an airborne infection isolation room (AIIR) constructed according to the Guideline for AIIR specification.

> **Note:**
> - For more information, refer to Guideline for Maintenance of Negative Pressure Isolation Rooms (GDIPC,2021)

- In settings where AIIR is not available, masking the patient and placing the patient in a private room with the door closed will reduce the likelihood of airborne transmission until the patient is either transferred to a facility with an AIIR or returned home.
- A color-coded isolation sign should be used in a patient isolation room (*see* **Appendix D**).
- Restrict susceptible healthcare personnel from entering the room of patients known or suspected to have measles, chickenpox, disseminated zoster, or smallpox if other immune healthcare personnel are available.
- Use personal protective equipment (PPE) appropriately, including a fit-tested approved respirator for healthcare personnel.
- Limit transporting and moving patients outside the room to what is necessary medically, and if transportation or movement outside an AIIR is necessary, instruct the patient to wear a surgical mask, if possible, and observe respiratory hygiene/cough etiquette.
- Color coded transportation cards should be used during patient transportation (*see* **Appendix E**).
- Healthcare personnel transporting patients who are on airborne precautions do not need to wear a mask or respirator during transportation if the patient is wearing a mask and infectious skin lesions are covered.
- Immunize susceptible persons as soon as possible following unprotected contact with vaccine-preventable infections (e.g., measles, varicella, or smallpox).

2.4. Transportation of Suspected/Confirmed Infectious Respiratory Illnesses Cases

The following protocols should be followed during patient transportation:

- Avoid moving and transporting patients out of their rooms unless medically necessary.
- Use designated portable chest imaging (i.e., chest x-ray) equipment.
- If patient transport is necessary, use pre-determined transport routes with less traffic to minimize exposure for staff, other patients, and visitors

- During transportation, the patient should be asked to wear a surgical mask, if clinically possible, and follow respiratory hygiene and cough etiquette instructions.
- Colored coded transportation cards should be used during transportation.

2.5. Collecting & Handling of Respiratory Specimens

Respiratory samples are nasopharyngeal, oropharyngeal, or sputum samples. These samples should be done in a negative pressure room or single room with a portable HEPA filter.

Specimen Collection Methods:

- **Collection of Upper Respiratory Tract Specimens:**
  1. Oropharyngeal (OP) and nasopharyngeal (NP) swabs.
  2. Nasopharyngeal wash/aspirate.

- **Collection of Lower Respiratory Tract Specimens**

  Sputum, tracheal aspirate, bronchi alveolar lavage (BAL) fluid, or pleural fluid.

  Area Requirements for the Collection of Upper/Lower Respiratory Specimens

  - Preferably, upper/lower respiratory samples should be performed in a negative pressure room or a single room with a portable certified HEPA filter.
  - The door must be closed at all times while in use.
  - The floor should be made of material that can be cleaned easily, preferably vinyl, and without cracks.
  - Ideally, the furniture should be made of steel or another material that is easy to clean and disinfect.
  - Hand washing basins equipped with liquid soap and paper towels are preferred or alcoholic hand rub dispensers.
  - Personal protective equipment should be accessible and available.
  - Environmental disinfectant spray or wipes should be available.
  - Medical waste containers with medical waste bags should be available inside the respiratory specimen's collection room.
  - All HCWs should be trained about the proper use of PPE and various techniques of respiratory sample collection.

3. The Prevention of Respiratory Hazards Through Engineering Controls

3.1. Availability and functioning of Airborne Infection Isolation Room (AIIR)

The required number of airborne infection isolation rooms (AIIR) should be predicted in each hospital based on the facility's risk assessment or based on the nationally approved standard.
The risk assessment should be based on the following variables (should be clearly described in the risk assessment):

- Demographic trends of the population in the catchment area.
- Trends (incidence rate) of the infectious airborne diseases in the same facility in the last 3years' period.
- Healthcare facility scope of service, and any further projected changes to the current service.
- OR the predicted number based on nationally approved criteria for the required – number of airborne infection isolation rooms (AIIR).

Airborne Infection Isolation Room (AIIR)

- AIIR is a single-occupancy patient-care room used to isolate patients with a suspected or confirmed airborne infectious disease.
- Airborne isolation rooms should be fully meet MOH requirements
- Environmental factors are controlled in AIIRs to minimize the transmission of infectious agents that are usually transmitted from person to person by droplet nuclei associated with coughing or aerosolization of contaminated secretions.
- Well clearly labelled AIIRs should provide (-2.5) Pascal negative pressure in the room as a minimum which is continuously monitored by the fixed audio-visual monitor for an airflow rate of 12 air changes per hour (ACH) as a minimum and direct exhaust of air from the room to the outside of the building after being passed through HEPA filter with 100% fresh air supply all the time (*see* **Figure 1**)
- Bathroom ventilation exhaust should pass through HEPA filter.
- An anteroom is not required, but it is preferable if it is possible.
- Negative pressure isolation room walls, floors, and ceiling surfaces should be easily cleanable and highly durable to withstand frequent cleaning and disinfection with an approved disinfectant.

Note:
For additional details, refer to Guideline for Maintenance of Negative Pressure Isolation Rooms (GDIPC,2021)

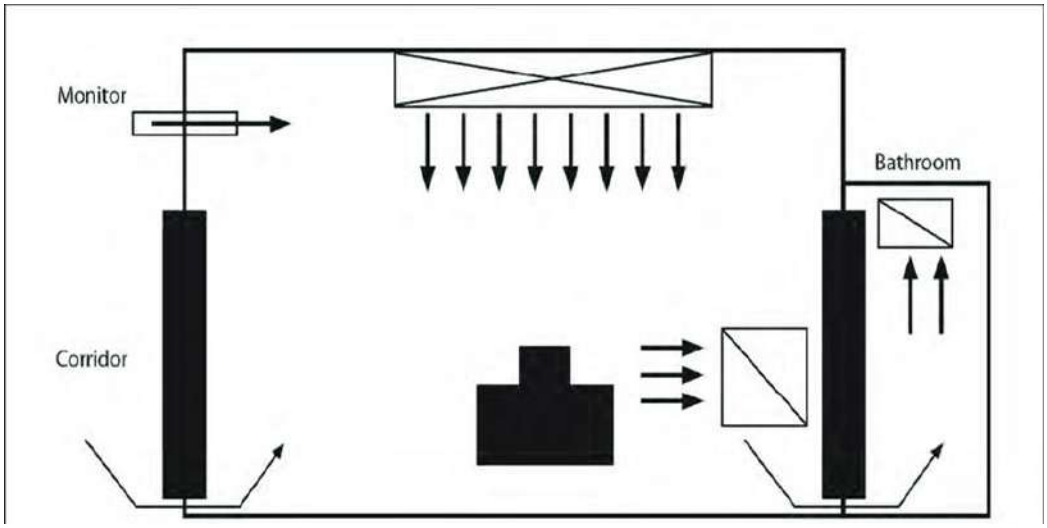

Figure 1. Simplified drawing for airflow direction in a negative pressure isolation room (*Source: CDC, 2003*)

Monitoring of Airborne Infection Isolation Rooms:

- Maintenance and monitoring of environmental conditions (pressure, temperature, and humidity) should take place, together with follow-up of periodic maintenance of the low-pressure insulation rooms.
- Environmental conditions (temperature, relative humidity [RH%], and ACH should be monitored, as well as room pressure in relation to the outer corridor.
- The pressure from the monitoring device installed at the entrance to the AIIR should be recorded daily in the log designated for that purpose by the responsible nursing staff in the department.
- Temperature and humidity should be monitored and recorded in the isolation rooms on a daily basis.
- Any difference in negative pressure value should be monitored using a pressure meter, daily if patients are present and weekly if patients are absent.
- In the event of deviation from the specified engineering specifications (setpoints), a maintenance request should be submitted to the maintenance department.
- Routine follow-up of the AIIR pressure difference and air change per hour (ACH) should be carried out by qualified engineers from the maintenance department monthly and the reading should be recorded in the log designated for that.
- All HEPA filters are changed from 6 to 12 months, depending on the visual inspection or according to the manufacturer's recommendations

Note:
For additional details, refer to Guideline for Maintenance of Negative Pressure Isolation Rooms (GDIPC,2021)

- In the event of needing to change the HEPA filters, appropriate PPE measures should be taken, together with their disposal, as medical waste, in coordination with the infection control department at the facility.

3.2. Availability and Functioning of Portable High-Efficiency Particulate Air Filter (HEPA filter)

Portable HEPA Filter:

A portable HEPA filter can theoretically remove at least 99.97% of dust, pollen, mold, bacteria, and any airborne particles with a size of 0.3 microns (µm).

Indications of Use:

1. During aerosol-generating procedures (AGPs), e.g., nasopharyngeal swabbing in case of AIIR is not available.
2. The HEPA filter is used to improve the air quality in infectious respiratory patients in the waiting areas, and chest clinics.
3. In the autopsy room if the AIIR is not available.

Special Considerations of HEPA Filter:

- The portable HEPA filter is not needed and is not a part of droplet and contact precautions.
- The portable HEPA filter device is considered a part of environmental surfaces that should be cleaned and disinfected from its outer surface as a part of the terminal cleaning process of the patient room after patient discharge or transfer.
- The portable HEPA filter device should be operated during the occupancy of the room or area.
- It is enough for a certified regular patient room to use one portable HEPA filter device, and there is no need to use more than one.
- If the portable HEPA filter device has adjustable airflow, the airflow should be selected that is appropriate to the size of the room to give the desired air changes per hour.
- Portable HEPA filters require proper preventive maintenance for their effective continued operation.
- The filter should be replaced according to the manufacturer's recommendation.

- Only trained personnel are allowed to replace these filters and should be instructed by infection control about the proper use of personal protective equipment.
- Used replaced filters should be discarded as infectious medical waste.
- The maintenance procedure should be performed in an area safely away from any patient locations.
- The unit should be placed as close to the expected source of the contamination as possible to increase effective capture of the infectious/hazardous agents, so the distance from the patient impacts the ability to filter out droplet nuclei.
- The use of the portable HEPA filter within the facility should be guided by a written policy that is created using the information in these guidelines and should be customized specifically for the hospital with appropriate reviews and approvals from infection control, administration, maintenance, and the departments in which the units will be used.

Note:
For further information, refer to the Policy of High Efficacy Particulate Filters Replacement in Portable HEPA Filter Equipment (GDIPC, 2021).

3.3. Availability and Functioning of Laboratory's Biological Safety Hoods

Hazardous biological material should be safely contained and/or removed from the laboratory to protect individuals and the environment from respiratory hazards.

- Biological safety hoods (appropriately classified HEPA filters) must be used as per the MOH requirements.
- Laboratory staff must process cultures that are suspected or confirmed to contain mycobacterium tuberculosis in a Biosafety Level 3 laboratory (as a minimum requirement).
- The manipulation of infectious materials that may generate aerosols must be properly contained or performed in a biological safety cabinet (Class II-B).

4. Prevention of Respiratory Hazards Through Respiratory Protection Equipment (RPE)

4.1. Availability of RPE Including Face Mask, Respirator, and PAPR Machines

Each healthcare facility must ensure that all RPE are available for staff protection.

Proper Selection and Use of Respiratory Protection Devices Guide:

Respiratory protection devices such as masks, respirators o powered air-purifying respirators are examples of personal protective equipment used to protect the wearer and others from acquiring infections. It is important to recognize proper

selection and understand the differences between various types of these equipment.

Medical / Surgical Face Masks:

- A face mask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment.
- Face masks are not to be shared and may be labelled as surgical, isolation, dental, or medical procedure masks.
- They could come with or without a face shield.
- Face masks are made in different thicknesses and have different abilities to protect health care workers from contact with liquids. These properties may also affect how easily HCW can breathe through the mask.
- If worn surgical/medical mask properly will help block large-particle droplets, splashes, sprays, or splatter that may contain germs (viruses and bacteria), keeping them from reaching the wearer's mouth and nose. It also helps reduce exposure of wearer saliva and respiratory secretions to others.
- While a face mask could be effective in blocking splashes and large-particle droplets but does not filter or block tiny particles in the air that may be transmitted by coughs, sneezes, or certain medical procedures.
- Face masks do not provide complete protection from germs and other contaminants because of the loose fit between the surface of the mask and your face.
- Face masks are not intended to be used more than once.
- If the mask is damaged, wet, or soiled, or breathing through the mask becomes difficult, it should be removed, discarded safely, and replaced with a new one; hand hygiene should be practiced accordingly.
- Medical/Surgical face mask is considered to be contaminated once it has been used and should be discarded immediately. Mask should be removed by the edges or the ties rather than the front panel.

Different Protection levels / Types of the surgical/medical mask according to EN 14683 standard, ASTM F2100, and intention of use of each Level/Type:

Level 1/Type I

For general purpose medical procedures, where the wearer is not at risk of blood or body fluid splash or to protect staff and the patient from droplet exposure to microorganisms (e.g., patient with upper respiratory tract infection visits clinic).

Level 2/Type II

For use in emergency departments, dentistry, changing dressings on minor wounds, or healing wounds where minimal blood droplet exposure may possibly occur (e.g., endoscopy procedures).

Level 3/Type III

They are used for all surgical procedures, major trauma first aid, or in any area where the health care worker is at risk of blood or body fluid splash (e.g., orthopedic, cardiovascular procedures).

Medical / Surgical Mask Standards:

General standards:

- Single-use.
- It has a flexible, bendable nose bridge.
- Latex-Free, non-allergic, Fiberglass free.
- Fluid Resistant.
- Three Ply (layers) construction.
- Have 3 pleats of folds to allow the user to expand the mask, covering the area from the nose to the chin.
- Mask secured with an ear loop to be placed behind the ears or tied behind the head.

Specific Standards & Performance Requirements (Complies with EN 14683 standard, ASTM F2100 standard):

#	Standard/Level	Level 1/Type I	Level 2/Type II	Level 3/Type III
1	BFE (Bacterial Filtration Efficiency)	≥ 95%	≥ 98%	≥ 98%
2	PFE (Particulate Filtration Efficiency)	≥ 95%	≥ 98%	≥ 98%
3	Delta P (Differential Pressure)	< 4.0	< 5.0	< 5.0
4	Fluid Resistance to Synthetic Blood	80 mmHg	120 mmHg	160 mmHg
5	Flame Spread	Class I	Class I	Class I
6	Barrier	Low	Moderate	High

Note:

- For more details regarding the consequences of the BICSL Components refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline, (GDIPC, 2023).

Respirators Mask:

A respirator is a respiratory protective device designed to achieve a very close facial fit and efficient filtration of airborne particles. Note that the edges of the respirator are designed to form a seal around the nose and mouth.

Surgical Respirator

- A surgical respirator (also referred to as a medical respirator) is recommended only for use by healthcare workers (HCWs) who need protection from both airborne and fluid hazards (e.g., splashes, sprays, droplets).
- These respirators are not used or needed outside of healthcare settings.
- Minimum requirements for (Fluid resistant respirator) surgical respirators are NIOSH approved (42 CFR Part 84) and FDA cleared as a surgical N95 respirator, EN 149 -2001 as FFP2 and EN 14683 standard.

Respirator Facts:

- Respirators reduce the wearer's exposure to airborne particles, from small particle aerosols to large droplets.
- Respirators are tight-fitting that filter out at least 95% of particles in the air, including large and small particles.
- An adequate seal to the face is essential. It is required that all healthcare workers undergo an annual fit test and conduct a user seal check each time the respirator is used.
- When properly fitted and worn, minimal leakage occurs around the edges of the respirator when the user inhales, and almost all of the air is directed through the filter media.
- The respirators are used as a part of personal protective equipment used while caring for a patient under airborne isolation precautions or during some aerosol-generating procedures to a patient diseased or suspected to be diseased with droplet transmitted disease.

Note:

- For more information, refer to the rational use of personal protective equipment in health care facilities 2nd Edition 2021-04.

Respirator Types According to the Level of Filtration and Approved Standards

No	Standard	Filtration Effectiveness		
1	**The U.S. NIOSH (42 CFR 84) & FDA clearance**	N95	N99	N100
		0.3Micron ≥ 95%	0.3Micron ≥ 99%	0.3Micron ≥ 99.97%
2	**European EN 149-2001 EN 14683**	FPP1	FPP2	FPP3
		0.3Micron ≥ 80%	0.3Micron ≥ 94%	0.3Micron: 99%

Notes: NIOSH = National Institute for Occupational Health and Safety

Note:

- For more information regarding to the sequences of surgical and respirator masks Donning and Doffing, refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).

Differences Between a Medical/Surgical Mask and Respirator

Item	Surgical Mask	Respirator
Photo (example)		
Intended Use and Purpose	Fluid is resistant and protects the wearer against large droplets, splashes, or bodily or other hazardous fluid sprays. Protects the patient from the wearer's respiratory emissions.	Reduces HCW's exposure to particles, including small particle aerosols and large droplets (only non-oil aerosols).
Use	As a part of PPE used during care of the patient under droplet isolation precautions, surgical procedures, or as source control	As a part of PPE used during care of the patient under airborne isolation precautions
Fit	It fits loosely, leaving gaps between the mask and your face. Does not require fit testing or user seal checks.	They are designed to fit tightly, creating a seal between your face and the respirator. It requires fit testing and user seal checks.
Testing	Tested for Particle Filtration Efficiency (PFE) and Bacterial Filtration Efficiency (BFE), plus fluid resistance, differential pressure, and flammability.	Tested for Particle Filtration Efficiency (PFE) and Bacterial Filtration Efficiency (BFE), plus fluid resistance, differential pressure, and flammability

4.2. Respirator Fit Testing

Frequency of Fit Testing:

- Fit testing must be performed before using a respirator and must be repeated on the national regulations needed' frequency or when required.
- Fit testing must be conducted when there are changes of respirator or a facial change; [examples of conditions that would require additional fit testing of an employee include but are not limited to; weight loss, cosmetic surgery, facial scarring, the installation of dentures, or absence of dentures that the individual wears typically].

General Instructions of Fit Testing:

- Prepare different models and sizes of different respirators.
- Fit testing must not be conducted for staff who have facial hair (e.g., beard that prevents the proper fitting of the respirators). Therefore, wearers must be cleanly shaven to fit with a respirator properly.
- The trainer should explain the fit test steps verbally at the beginning of the session.
- The trainer should fill out the required forms that include the following:
  a) Medical Assessment form before the test
  b) Fit test Completion form for qualitative fit test only.

Note:
- For additional Information, refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).

Types of Fit Test:

There are two types of Respirator Fit tests:

A. **Qualitative fit testing** is a pass/fail test that uses a sense of taste, smell, or reaction to an irritant to detect leakage into the respirator face piece.

B. **Quantitative fit testing** uses a machine to measure the actual amount of leakage into the face piece. It does not rely on a sense of taste, smell, or irritation to detect leakage, and it produces a numerical result called (Fit Factor) and the fit factor of at least 100 is required for half-mask respirators.

Remember:
- Quantitative fit testing is better, more accurate in results, and is preferable to use if both types are available in the facility.

Qualitative Fit test:

Qualitative fit testing is a pass/fail method used on half-masks that relies on senses - such as taste and smell - to detect air leakage from a respirator.

Procedure:

a) Confirm that the participant does not eat, drink (except water) and smoke or chew gum for 15 minutes before the test.
b) Ask the test person to put the hood on and collar assembly without a respirator.
c) Ask the participant to breathe through their mouth with tongue extended out
d) Use nebulizer no.1 with Sensitivity Test Solution; after injecting the aerosol into the hood through the hole in the hood window.
e) The nebulizer should be held in an upright position with the nozzle directed away from the mouth and nose of the test person.
f) Inject 10 squeezes of the bulb.
g) Ask the participant to report during the test if they can detect the sweet taste of the solution and remind him during the procedure.
h) The trainer should note the number of squeezes as 10 once the test person reports the taste regardless of compressions (1- 10).
i) Inject an additional shot of 10 squeezes of the aerosol into the hood if not tasted in step one, and noted as 20 once the test person reports the taste regardless of compressions (11-20).
j) If still not tasted, the trainer should inject additional 10 squeezes, and he should be noted as 30 once the test person reports the taste regardless of the compressions (21-30).
k) Write the sensitivity test results as no. of squeezes required for the participant to detect the taste as 10, 20, or 30.
l) Remove the test hood, and give the test person instructions to rinse his/her mouth with water and wipe his/her face and wait for a few minutes to clear the taste from his/her mouth.

Note:

- For more information, refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).

Quantitative Fit Test:

Quantitative fit tests involve attaching a specific instrument to the respirator to measure the amount of leakage occurring at the face seal.

Procedure:

a) Connect the parts of the equipment correctly according to the manufacture's recommendations.
b) Perform the daily check of the equipment in a logbook.
c) Enter the new personal and respirator data on the system.
d) Prepare the tested respirator correctly.
e) Perform the testing process and follow up on all test steps.
f) Follow the machine's instructions and observe the participant throughout all exercises.

Note:
- For more information, refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).

Powered Air Purifying Respirator (PAPR)

PAPR is equipment that protects the user by filtering out contaminants in the air and using a battery-operated blower to provide clean air through a hood or a helmet. PAPRs equipped with high-efficiency particulate air (HEPA) filters provide 99.97% particulate filtration efficiency.

Uses of PAPR:

- The employee has facial hair (e.g., beard) or facial deformity that interferes with respirator use.
- The approved respirator is unavailable or unknown fittest.
- The employee has failed fit testing with all available respirators.
- Used as a part of respiratory protection when handling a patient with suspected or confirmed disease transmitted through an airborne route or applying aerosol-generating procedures to patients with suspected or confirmed infectious respiratory disease.

Each PAPR Unit Include:

- Hood, helmet, or headpiece (according to the manufacturer).
- Breathing tube.
- PAPR blower/filtration unit with battery pack and belt.

Pre-use confirms the following:

- Maintenance of all parts.
- The battery is fully chargeable (All PAPRs must be charged according to the manufacturer's instructions).
- Most types of batteries require a minimum of 16 hours to attain a full charge.
- Airflow is adequate (typically 6 CFM).

Note:

- For more information, refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).
- For additional details regarding the Cleaning and Disinfection of PAPR refer to Basic Infection Control Skills License (BICSL) Trainer's Guideline (GDIPC, 2023).

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Appendix A: Respiratory Hazards Evaluation Checklist

Respiratory Hazards Evaluation Checklist

Assessment of risk of transmission should include consideration of the following elements that can contribute to an increased risk of transmission		
No	**Elements**	**Sub - Elements**
1	**Current prevalence and transmission of the respiratory illnesses in the population**	
2	**Patient specific factors**	Duration of care (care that takes longer than 15 minutes)
		Distance that less than 2 meters.
		Intensity of exposure (symptoms such as sneezing or coughing, screaming, shouting).
		Individual patient/client/resident's ability to wear a surgical mask.
		Patients with cognitive or behavioral issues (e.g., dementia, confused or aggressive).
3	**Procedures/ activities specific factors**	Performing a respiratory Aerosol Generating Procedures (AGPs) on a patient with suspected or confirmed acute respiratory infection (e.g., COVID-19, measles, TB) or undertaking clinical work within this space.
		Cleaning & disinfecting a room or zone within 30 minutes of a respiratory AGP on a suspected or confirmed respiratory infection or communicable diseases with potential for airborne transmission.
		Laboratory operations involving aerosol transmissible pathogens for which biosafety plan requires respiratory protection.
4	**Setting-specific factors**	Levels of ventilation or air handling (e.g., room size, air changes per hour, use of air filter, cleaning and maintenance).
		Availability of Airborne Infection Isolation Rooms (AIIR) in the facility based on the risk assessment.
		Multiple patients with upper respiratory tract infection cohorted in one area/zone or ward.
		Healthcare workers compliance to respiratory protection measures and BICSL coverage ratio.

Appendix B: Droplet Precautions

Appendix C: Transportation Card Droplet Precautions

Appendix D: Airborne Precautions

Appendix E: Transportation Card Airborne Precautions

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