The Union
International Union Against
Tuberculosis and Lung Disease

BASIC OCCUPATIONAL SAFETY AND HEALTH FOR RESPIRATORY DISEASES

A desk guide for health facilities

First Edition
2021

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Abbreviations

BMI	Body mass index
CDC	U.S. Centers for Disease Control and Prevention
COPD	Chronic obstructive pulmonary disease
COVID-19	Corona virus disease 2019
DM	Diabetes mellitus
FFP	Filtering face piece
HAI	Health care-associated infection(s)
HEPA	High-efficiency particulate air
IEC	Information, education and communication
IGRA	Interferon-gamma release assay
ILI	Influenza-like illness
IPC	Infection prevention and control
MDR-TB	Multidrug-resistant tuberculosis
NCD	Non-communicable disease(s)
OSH	Occupational safety and health
PPE	Personal protective equipment
SARS-CoV-19	Severe acute respiratory syndrome corona virus 2 (that causes COVID-19)
TB	Tuberculosis
TBI	Tuberculous infection
TST	Tuberculin skin test
The Union	International Union Against Tuberculosis and Lung Disease
UVGI	Ultraviolet germicidal irradiation
WHO	World Health Organization

1 Introduction

- Health care workers are the cornerstone of all health systems and human resources are an important organisational asset.
- Health care workers in low- and middle-income settings often work in challenging conditions with limited resources and minimal attention to their occupational health, safety and infection prevention and control (IPC).
- Ensuring a safe work environment for health care workers contributes to patient safety.
- Training and retraining of health professionals and their support supervision and coaching are investments. Desired impact of these investments will not be realised if well-being of health care workers is not prioritised.
- Workplace exposure to respiratory risks, including infections, may cause more than one in 10 people worldwide to become ill with a range of non-cancerous lung diseases.
- The guidance in this desk guide is based on existing good practice with a specific focus on implementation in settings where resources are scarce.
- The guidance can be adapted to local situations in low- and middle-income countries.
- Where possible, the interventions and approaches in this Desk guide should be evaluated using measurable outcomes.

This Desk guide will outline approaches that encompass a comprehensive approach as it pertains to respiratory health and how they can be adapted and implemented in *health facilities* in resource-limited settings.

This Desk guide is for:

1 Health care workers who provide occupational health services in resource limited settings and their supervisors.

2 Infection prevention and control officers/focal persons and their supervisors at any level in the health system.

3 Health care workers who provide community health services or work in primary or district health services.

4 National Medical and Nursing Associations and Councils and other national associations related to health care workers.

5 Ministry of Health policy makers, officials, programme managers and hospital and clinic administrators.

This guide could also be helpful for decision makers of other ministries, such as labour, and multi-sectoral bodies that are tasked to strengthen occupational health services and ensure sufficient resource allocation for these services.

This Desk guide aims to improve:

1 Understanding of and rationale for occupational health and safety, particularly respiratory protection measures in the daily practise.

2 The prevention of respiratory diseases in health care workers through implementation of infection prevention and control measures.

3 The policies and processes to care for health care workers who become unwell with a respiratory disease in the workplace.

The Desk guide will focus on:

1 Occupational health and resources required.

2 How respiratory infections can be prevented through airborne infection prevention and control measures.

3 How a comprehensive approach to respiratory health in health care settings is implemented.

4 How respiratory health conditions and infections in health care workers can be managed.

This Desk guide does not address infections that are spread through other routes (for example, blood-borne or faecal-oral transmission) or other aspects of occupational health beyond the issues that affect the respiratory system.

When this guide refers to health care workers, the term is used in the broadest sense of the word. It covers *all personnel* (clinical and non-clinical) working in health facilities. This includes staff, such as medical and clinical officers, nurses, nursing assistants, laboratory and radiology staff, staff in training and on attachments, auxiliary and support staff, kitchen, laundry and cleaning staff, porters, messengers etc. and volunteers.

2 What is occupational safety and health?

Occupational health services keep people healthy and safe while at work, both physically and mentally, and manage any risks in the workplace that are likely to give rise to work-related ill health.

The health, safety, and well-being of health care workers is a legal and moral responsibility of governments and employers.

Occupational health is a *right*. The Universal Declaration of Human Rights includes the right of all people to health. This right extends beyond just access to health care; it includes other rights to underlying determinants of health, including healthy *working* and environmental conditions.

Occupational health is more than merely managing the risks of the workplace. It involves a comprehensive approach to health and wellness within the workplace. Occupational health should support healthy behaviours and address other determinants of the health and wellbeing of workers, including health care workers.

This comprehensive approach to occupational health will assist countries reach the Sustainable Development Goals (SDG) with following goals linked to occupational health:

SDG 3.9: "**Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination**" (*implementation of tobacco-free workplaces, protecting employees from hazardous chemicals in the workplace*).

SDG 8.8: "**Protect labour rights and promote safe and secure working environments of all workers**."

SDG 16.6: "**Develop effective, accountable and transparent institutions at all levels**" (*ensuring employees are aware of their rights and have mechanisms to protect them*).

A *comprehensive approach* for occupational safety and health with a focus on maintaining good *respiratory health* among health care workers includes:

- Workplace wellness programmes that include counselling, monitoring and managing risk factors for:
  - Communicable diseases, such as tuberculosis (both tuberculous infection and active tuberculosis disease) and HIV infection.
  - Non-communicable diseases (NCDs), such as hypertension, diabetes mellitus and asthma.
  - Smoking cessation.
  - Stress management and mental health.
  - Others upon need and request.
- Providing prevention services:
  - Vaccination programmes, such as hepatitis B, seasonal influenza and COVID-19.
  - Infection prevention and control measures (administrative, environmental and personal protective equipment).
- Screening, diagnosis and treatment of respiratory illnesses, through person-centred care and support during illness.
- Counselling, information, education and communication activities to reduce stigma.
- Paid sick leave, health insurance and disability cover for any respiratory illness caused by the work environment, including compensation for illness or death.
- Tobacco-free workplaces.

3 What is required for occupational respiratory health in a health facility?

All workers – and particularly those in high-risk occupations, such as health care workers – should have access to occupational health services. Ideally, all health facilities should have:

- Workplace policy on Occupational Safety and Health (OSH).
- Organisational structure that includes roles and responsibilities for OSH within the facility.
- Functional OSH service that is accessible and trusted by staff and has adequate resources, such as human resources, surveillance systems, personal protective equipment, clinical equipment, medicines and vaccines and procedures and guidelines on OSH.
- Monitoring and evaluation mechanisms to improve OSH service delivery.

However, in many health facilities in resource-limited settings there is no established occupational health staff or programme for employees. This does not need to preclude implementing a *comprehensive approach* to occupational respiratory health among health care workers working at the facility.

As a minimum, every health facility should have an *Infection Prevention and Control (IPC) plan/programme* that is aligned with the national infection prevention and control programme policies and guidelines (Text Box 3.1 and 3.2). Facilities should also have a dedicated *IPC focal point*. Depending on the size of the facility, the *IPC focal point* may need to be supported by a multidisciplinary *IPC team*. The facility focal points should coordinate activities with other IPC officials in line with the recommendations of the national IPC and occupational health policies.

Given the high prevalence of respiratory infections causing occupational respiratory diseases, the IPC focal points could be the appropriate people to lead the comprehensive approach to occupational respiratory health. The IPC focal points should be supported with the *necessary resources* required to implement the recommendations of the national policies and guidelines for airborne IPC in the facility.

If there is an OSH service available in the facility, the lead person should ensure that a comprehensive approach to respiratory health is adopted.

Text Box 3.1: Core components of facility infection prevention and control programme

1 Designate leadership and authority for the IPC programme with dedicated and appropriately trained staff with clear scope of work, functions and adequate budget.
2 Implement national guidelines at the facility level.
3 Provide basic IPC training for all health care workers, including updates and refresher training.
4 Implement IPC measures to protect staff against biological, chemical and physical hazards.
5 Conduct appropriate surveillance for health care-associated infections in patients and staff, in line with local needs and national objectives, and report to appropriate authorities.
6 Monitor compliance with IPC practices and identify interventions to address gaps with a team-based approach.
7 Identify infectious risks in the environment and implement appropriate interventions.

Text Box 3.2: Aspects of infection prevention and control in a facility infection control plan

1 Procedures for standard precautions.
2 Protocol for bio-medical waste management.
3 Procedures for de-congestion of crowded areas.
4 Airborne infection control protocol.
5 Regular assessment for tuberculosis among all staff, particularly in high tuberculosis burden settings.
6 Infection prevention and control training of all staff.

4 How are respiratory infections spread?

Respiratory infections are among the most frequent causes of ill health in all age groups and in all parts of the world. It follows that health care workers will also fall sick with respiratory infections. These infections can be acquired either in the community or in the workplace.

Especially during outbreaks, respiratory infections lead to health care worker absences due to illness or quarantine, such as during the COVID-19 pandemic.

Respiratory infections can be grouped into upper and lower respiratory tract infections. Upper respiratory tract infections affect the nose, sinuses and throat and the lower respiratory tract infections affect the lower airways and lungs. Lower respiratory tract infections tend to last longer and can be more serious.

Common symptoms of respiratory infections are listed in Table 4.1.

Table 4.1: Symptoms of respiratory infections

Symptoms	
Respiratory symptoms	Runny nose
	Sneezing
	Sore throat
	Hoarse voice
	Cough
	Wheezing
	Rapid breathing (tachypnoea)
	Difficulty in breathing (dyspnoea)
Other	Fever and chills
	Swollen neck glands
	Tiredness/fatigue
	Loss of appetite

Based on severity of the symptoms respiratory infections can be

- Mild: self-limiting conditions that resolve in a few days, for example, a common cold, pharyngitis and other upper respiratory tract infections.
- Moderate: lower respiratory tract infections, such as pneumonia or influenza.
- Severe: life threatening, including pneumonia, acute respiratory distress syndrome that can require oxygen therapy or intensive care.

Different types of micro-organisms that include bacteria, viruses, parasites and fungi cause respiratory infections. Some examples are presented in Table 4.2.

Table 4.2: Examples of respiratory micro-organisms

Type of micro-organism	*Name of micro-organism*	*Respiratory infection*	*Comment*
Bacterium	*Streptococcus pneumoniae*	Pneumonia	Common cause of community acquired pneumonia
	(Methicillin-resistant) *Staphylococcus aureus*	Pneumonia	Common cause of hospital acquired pneumonia
	Bordetella pertussis	Whooping cough	Vaccine preventable upper respiratory tract infection that develops into a persistent cough
	Corenybacterium diphtheriae	Diphtheria	Vaccine preventable illness commonly causing a sore throat with a thick grey coating
	Mycobacterium tuberculosis	Tuberculosis	Major infectious cause of death most commonly affecting the lungs, but can also affect other organs

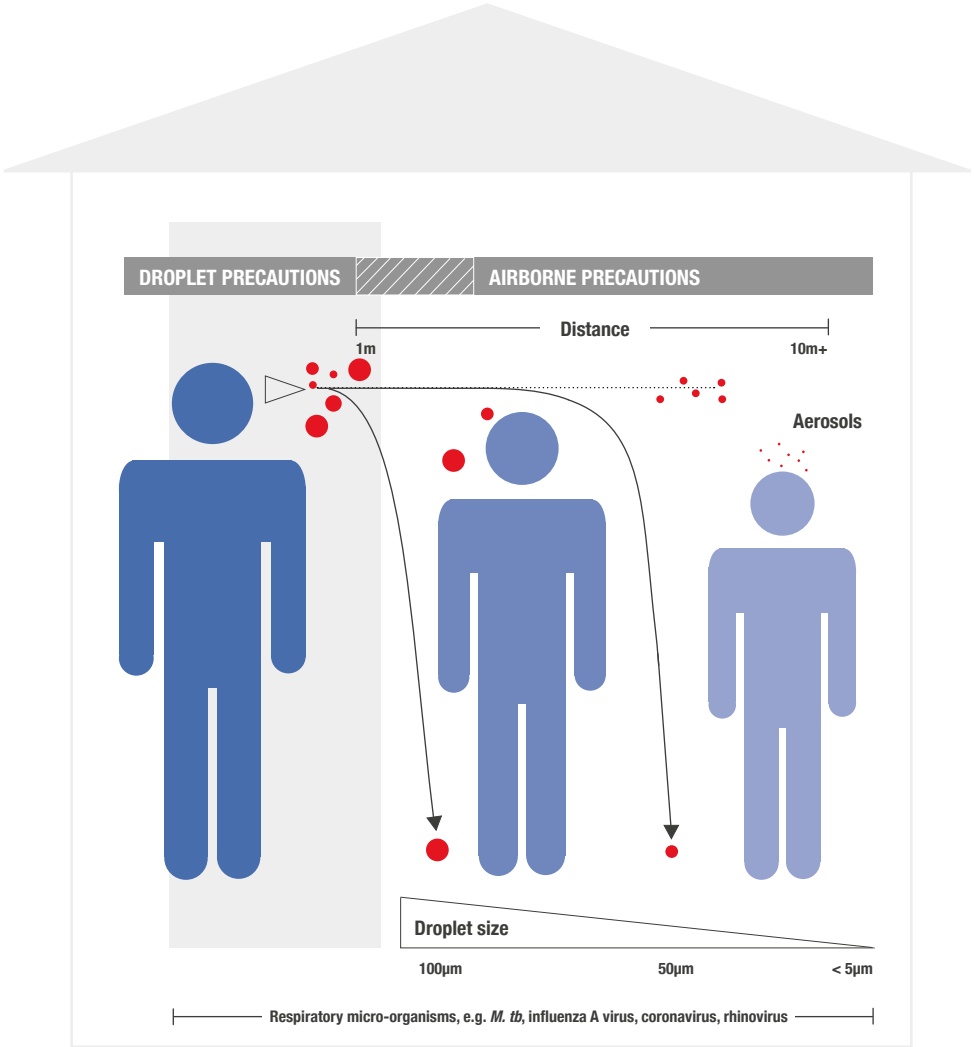
Type of micro-organism	*Name of micro-organism*	*Respiratory infection*	*Comment*
Virus	*Adenovirus, respiratory syncytial virus, rhinovirus*	Common cold	Most commonly affects the upper respiratory tract
	Influenza virus A, B etc	Seasonal influenza	Vaccines are available and can reduce severity, recommended annually for health workers to prevent onward transmission to patients
	Measles virus	Measles (Rubeola)	Tiredness/fatigue
	Varicella zoster virus	Chickenpox (Varicella)	Loss of appetite
	SARS (2002)	Severe acute respiratory syndrome	Atypical pneumonia, symptoms commonly include fever and cough
	SARS-CoV-2	COVID-19	Atypical pneumonia, symptoms commonly include fever, cough and change in sense of smell or taste. Vaccine available.
Parasite	*Pneumocystis jiroveci*	Pneumocystis pneumonia	Common opportunistic infection among immuno-compromised persons, such as people living with HIV with low CD4 counts/high viral loads
Fungus	*Aspergillus*	Aspergillosis	Opportunistic infection that can occur inside old lung cavities, for example, those caused by tuberculosis

Micro-organisms causing respiratory infections are spread from person-to-person through small particles. They are released into the air when a person with a respiratory infection coughs, sneezes or even talks. Another person may then breathe in some of these small particles. This can particularly happen if people gather in congested rooms and spaces or congregate settings with poor ventilation.

Depending on their size, the small particles are called either droplets or aerosols (Figure 4.1). Certain respiratory micro-organisms can also be spread through fomites, that is, through objects or materials. Patient care items and surfaces

in health facilities may become contaminated with fomite spreading micro-organisms which then spread to a (healthy) person when they touch such a surface and then touch their nose, mouth or eyes.

Figure 4.1: Particle size and person-to-person spread (indoors)



Knowing how micro-organisms are spread helps us to understand the rationale for infection prevention and control measures (Table 4.3). Data are accumulating that SARS-CoV-2, the virus that causes COVID-19, is transmitted by both droplets and aerosols.

If fomites (objects or surfaces which may become contaminated by micro-organisms) play a role in the spread of certain micro-organisms, it is necessary to know what chemicals can be used for surface cleaning. For example, adeno or influenza viruses are susceptible to ethanol (62-71%), glutaraldehyde, formaldehyde, povidone iodine and sodium hypochlorite (0.1%).

Table 4.3: Methods of spread for respiratory micro-organisms

Type of spread	*Size*	*Durability*	*Example micro-organism*
Aerosol	5-10 micrometres (very small)	Can remain suspended in the air for long periods	Measles Chickenpox *Mycobacterium tuberculosis* SARS-CoV-2
Droplet	10-100 micrometres	Fall to surfaces quicker, usually within 1m (3 ft)	Common cold Influenza Diphtheria Pertussis SARS-CoV-2

5 What are infection prevention and control measures and how are they implemented?

'Prevention is better than cure" underpins infection prevention and control activities. Infection prevention and control measures are *essential* in all health facilities to prevent transmission of micro-organisms from person-to-person. Infection prevention and control plays a key role in reducing health care-associated infections (HAI) and making health facilities *as safe as possible*. Infection prevention and control measures:

- Protect patients and people attending health facilities.
- Protect health care workers against occupational exposures to various micro-organisms.

Standard precautions should be followed for *all* patients, *all the time* and by *all* health care workers. They are listed in Text Box 5.1 below.

Text Box 5.1: Infection prevention and control standard precautions

- Perform hand hygiene before and after every patient contact.
- Use appropriate personal protective equipment when at risk of body fluid or other exposure.
- Clean shared patient equipment according to the standard operating procedures.
- Observe respiratory and cough hygiene.
- Always use aseptic technique when performing clinical procedures.
- Use and dispose of sharps safely.
- Handle and dispose of waste and used linen safely.
- Perform environmental cleaning.

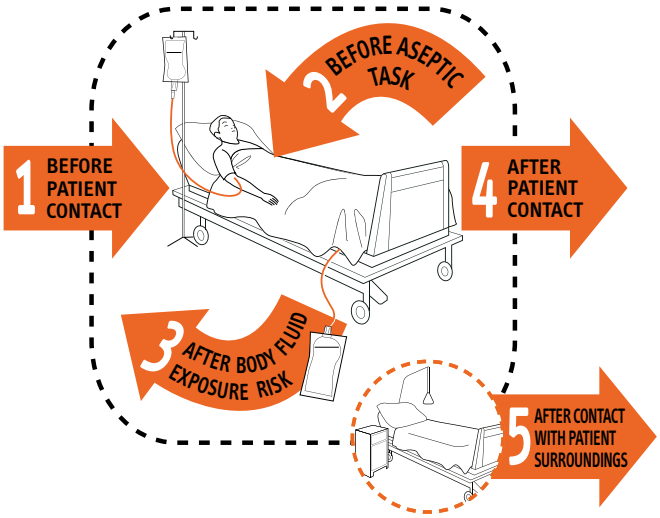
5.1 Standard precautions

Hand hygiene is achieved by:

- Washing hands with soap and water for 40-60 seconds.
- Antiseptic hand wash or rub i.e. alcohol-based hand sanitizer, including foam or gel for 20-30 seconds.
- Surgical antiseptic hand hygiene is an extension of hand washing and it is performed before donning sterile attire (sterile gloves) for surgical procedures.

Hand hygiene should be performed frequently *before*, *during* and *after* a health care worker has carried out a clinical procedure (Figure 5.1).

Figure 5.1: When to perform hand hygiene [1]



More information about hand hygiene techniques can be found in Appendix 1.

Wearing of medical gloves (aseptic technique)

Medical gloves are recommended to be worn to reduce the risk of contaminating hands of health care workers with blood and other body fluids. Gloves also reduce the risk of spreading micro-organisms from health care workers to patients and vice versa.

[1] Modified from *https://www.who.int/gpsc/tools/Five_moments/en/*

Gloves should be used during all *patient-care activities* that may involve exposure to blood and all other body fluids, including contact with mucous membranes and non-intact skin.

Hand hygiene should be performed before and after using medical gloves. Surgical gloves have more precise sizing, are made to a higher standard and are generally sterile.

5.2 Respiratory and cough hygiene

- Cough or sneeze into a clean tissue, *not into your hands.*
- Dispose of the tissue immediately into the nearest waste bin.
- If you have no tissue, cough or sneeze into your elbow/upper sleeve.
- Always clean your hands after coughing or sneezing using any of the hand hygiene techniques explained above (Figure 5.2).

Figure 5.2: Respiratory and cough hygiene[2]

[2] Insert your own text in the space next to the illustrations listed if you wish to use this in your information-education-communication activities.

5.3 Medical waste

- Medical waste management guidelines should be followed for all general and biological wastes, such as sharps, disposable items, including gloves, masks, and all other clinical waste.
- Functional waste bins or containers for general waste, biological waste and sharps should be available at all waste generating places. They should be clearly labelled on the lid.
- Waste bins and containers should be regularly emptied and sent for disposal according to the type (Table 5.1).
- Wastewater treatment should also be available either onsite (for large hospitals) or offsite to ensure that contaminated water is not disposed of without treatment.
- Hospital staff involved in waste disposal should use protective gear and avoid cross contamination.

Table 5.1: Colour coding and disposal mechanisms for medical waste

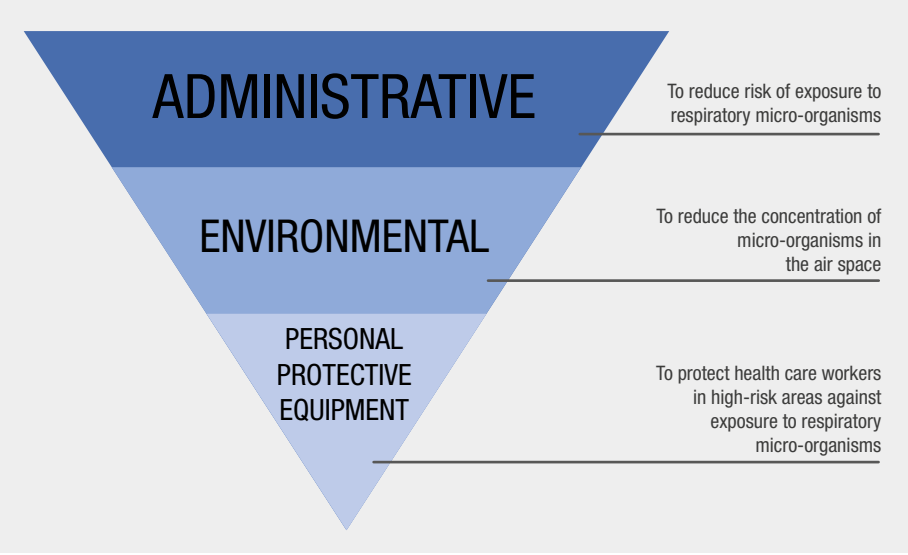
Type of waste	*Colour of container/bag*	*Disposal*
General waste	Blue or black	Land fill
Glassware, such as medicine, antibiotic etc. vials	Blue	Autoclave and recycle
Infected plastics, such as gloves, syringes with no needle	Red/yellow	Secured land fill
Infected waste, such as soiled materials, biological samples, laboratory waste, pharmacy waste	Yellow	Deep burial
Sharps	Yellow/red	Sharp pit

5.4 Transmission-based precautions

In addition to the standard precautions, *transmission-based precautions* may be required. They are essential in the control of highly infectious micro-organisms. They depend on the mode of spread of the micro-organisms. In the context of *respiratory health*, infection prevention and control measures against *respiratory* micro-organisms must be considered.

Airborne IPC measures are arranged in a *hierarchy*. This refers to the order in which they should be carried out even though all three measures are used together to reduce infection risks (Figure 5.3). Each facility should assess the various risks for airborne transmission throughout the facility and apply the hierarchy of the measures to minimise these risks.

Figure 5.3: Hierarchy of airborne infection prevention and control measures



Administrative control measures are the **first priority** in the airborne IPC hierarchy. Their purpose is to *reduce the risk of exposure* to respiratory micro-organisms among health care workers and people seeking health services. They are the essential first step for the implementation of airborne IPC measures. These measures include the managerial and work practices listed in Table 5.2.

Administrative controls are to identify persons with respiratory symptoms, separate them into an appropriate environment, fast track them through the health facility to reduce exposure time to others and diagnose/treat them with minimal delay. At facility level, administrative controls play a *major role* in reducing the risk of airborne infection transmission.

Table 5.2: Administrative infection prevention and control measures

Managerial measures	Maintaining up-to-date facility infection prevention and control (IPC) plan. Ensuring IPC focal person and their support (small facilities). Ensuring functional IPC team / committee (large facilities). Training and refresher training on IPC to *all* facility staff. Monitoring of implementation of IPC measures and addressing gaps and deficiencies. Providing occupational health services/employee health services to facility staff. Surveillance of respiratory infections in facility staff.
Work practices	Identifying persons with symptoms of respiratory illness; also called *triage*. Separating people with cough from others, including in outpatient departments while awaiting review. Ensuring cough hygiene for patients and visitors: provide people who have a cough with tissue paper or surgical mask, if available, or consider normalising mask wearing for patients and visitors in high risk areas. *Fast-tracking* triaged patients with respiratory symptoms to clinical examination and laboratory investigations to minimise time spent in the facility. Rapid diagnosis of respiratory infections. Start patients on appropriate *treatment as soon as possible*. Educating people attending health facilities about IPC measures (symptom screening, separation, cough hygiene, use of masks etc). Making maximal use of outdoor spaces for triaging people with cough and for (sputum) sample collection. Creating directional flows of people through facilities to limit exposure.

Text Box 5.2: Practical considerations for administrative infection prevention and control measures: supplies of personal protective equipment (PPE) and space for separation

- *Supplies of PPE* should be regularly monitored with timely ordering to ensure that *stock outs are avoided.*
- If supplies are low, the administrative IPC plan should include highlighting high-risk areas, staff and patients within the facility that PPE supplies should be prioritised to.
  - This can include coughing patients in triage, staff working in triage and outpatient departments, laboratory staff and staff offering care to people with known respiratory infections.
  - Allocation of supplies that are in short supply should be done in consultation with the staff in the facility.
- When low stocks occur, this should trigger an incidence report that is then reviewed as part of *quality improvement cycle* (see chapter 9).
- During disease outbreaks, there could be more patients with known (respiratory) infections and at risk of having them than *isolation rooms* for separating them from others.
- In these situations, a ward or another suitable area can be set aside for isolation/separation purposes.
  - The area chosen should have maximum ventilation and not be directly linked to areas that have people not at risk of respiratory infections.

Environmental controls are the **second priority**. They aim to *reduce the concentration* of micro-organisms in the air shared by people in health facilities decreasing the likelihood that a person in the room will breathe in air that contains micro-organisms. They include ventilation (natural, mechanical and mixed mode), filtration and ultraviolet germicidal irradiation (UVGI). Environmental controls frequently require *engineering* measures. The choice of environmental controls is determined by local factors and resources.

Types of ventilation systems:

- *Natural ventilation* is the process in which outdoor air moves into a room through windows, doors, wind towers, whirly birds and roof ventilators. This is dependent on the climate, building design, safety and air quality/ pollution (Text Box 5.3).
- *Mechanical ventilation* is ventilation created using an air supply (air in) and exhaust (air out) to drive airflow. It includes instruments, such as fans. They can be fixed on either windows or walls to supply air into the room or to exhaust air from the room. For situations where aerosols are generated, ideally negative pressure systems should be used. However, they can be expensive to set up and maintain and are often provided only in referral hospitals.
- *Mixed mode (hybrid) ventilation* combines the use of natural and mechanical ventilation. It can be done, for example, through the installation of an exhaust fan to increase natural ventilation in rooms where there is an increased risk of airborne micro-organisms and when natural ventilation is too low. The fans should be installed where room air can be exhausted outdoors through either a wall or the roof, such as whirly birds or roof turbines.

Text Box 5.3: Practical suggestions for natural ventilation

- Due to need for privacy, doors to consultation rooms should be closed when in use. It follows that windows in these rooms should be kept open. Windows should also be large enough and represent a minimum of 20% of the floor area. When not in use, doors and windows to consultation rooms should be left open depending on the climate. In many settings, interviews with coughing outpatients can be performed outside behind screens.
- Waiting areas in health facilities should be designed or renovated in such a way that they maximise natural ventilation and utilise outdoor spaces where possible. Crowding should be avoided by providing multiple waiting areas.
- In warm climates, patients can produce sputum specimens in designated areas outdoors. In cold climates or multi-storeyed hospitals, appropriately designed sputum booths should be provided for production of sputum specimens.

High-efficiency particulate air (HEPA) filter units and/or **ultraviolet germicidal irradiation** (UVGI) can supplement both natural and mechanical ventilation to provide rapid cleansing of air in high-risk congregate settings. HEPA filter units can theoretically remove dust, pollen, mould, bacteria and any airborne particles with a size of 0.3 micrometres. UVGI uses a type of radiation that kills micro-organisms and works better in rooms with high ceilings. Upper-room UVGI requires air mixing between upper and lower spaces in the room to effectively kill circulating micro-organisms. These interventions can be costly and both require regular cleaning, maintenance and monitoring but may be an option in cooler climates where natural ventilation is harder to achieve.

Personal Respiratory Protection refers to the use of *personal protective equipment (PPE)*. It is the *lowest* priority in the IPC hierarchy though it remains critical. Its impact depends on implementation of the other elements in the hierarchy. Its purpose is to **protect health care workers in known high-risk areas** or during high-risk procedures against exposure to respiratory micro-organisms. No matter how good it may be **PPE cannot overcome weaknesses** in the administrative and environmental control measures.

Respiratory PPE in health settings includes the use of *surgical masks* and *particulate filtering facepiece respirators*. Characteristics of surgical masks and filtering facepiece respirators are summarised in Table 5.2.

During the COVID-19 pandemic, use of cloth masks and facial covers is becoming mandatory in many countries. Their use can be continued by patients and people attending the facility prior to triage and diagnosis and by health workers when travelling to and from work.

Table 5.3: Comparison of characteristics and use of surgical masks and respirators

	Face (surgical) mask	*Respirator (N95 or greater; FFP2 or greater)*
Function	Facial cover to reduce release of micro-organisms from wearer into air space Does NOT prevent breathing in micro-organisms	Particulate filtering face mask to protect wearer from breathing in droplets and aerosols IF administrative and environmental controls are place
Fit testing	Not relevant	A "fit test" tests the seal between the respirator's facepiece and the health care worker's face. It takes about fifteen to twenty minutes to complete and it should be done at least annually. After passing a fit test with a respirator, the exact same make, model, style and size respirator must be used by the health care worker
Duration of use	Until mask becomes wet or 4hrs	Can be re-used as per manufacturer's instructions, often for some days, as long as the respirator is kept clean and dry and the user can still get a good seal around the face
Who should use it	Persons with respiratory symptoms and health care workers in settings where infection control plan recommends use (e.g. out-patient departments)	Health care workers in certain workstations and undertaking certain procedures, such as TB and MDR-TB units, intensive care units, and bronchoscopy, spirometry and sputum induction rooms.

Certain procedures (aerosol-generating procedures) and workstations require additional PPE beyond respirators to protect staff from exposure to high concentrations of aerosol spread micro-organisms. These procedures include intubation, extubation and related procedures, bronchoscopy, sputum induction, autopsy, etc. In these high-risk situations additional PPE may extend to wearing of goggles, face shields, gloves, gowns and boots.

Where a health care worker works in a laboratory or collects samples, additional IPC measures should be followed:

- Sample collection:
  - Should be done in a designated area to avoid people who may be infectious moving around facilities.
    - Certain samples can be collected by patients themselves after explanation, for example, sputum samples.
    - In warm-climate settings, sputum samples should be obtained outdoors, when possible.
    - Otherwise, samples should be produced in a designated sample collection area that is well-ventilated.
  - Health staff should wear appropriate PPE (e.g. respirators/surgical masks) when they collect samples that patients cannot produce on their own.
    - Examples include naso-pharyngeal swabs for SARS-CoV-2 and sputum induction.
  - Health staff should ensure that samples are correctly labelled, deliver them to the laboratory with laboratory test request forms that have been completely filled (again to avoid people who may be infectious moving around facilities).
  - Collection of respiratory samples *should not be conducted* in small, closed, poorly ventilated places, such as toilets or sluice rooms.
- When processing the samples, laboratory staff should follow standard operating procedures for laboratory IPC.
- When using laboratory instruments, such as microscopes, centrifuges, Xpert MTB/RIF machines etc, laboratory staff should disinfect them after usage.

It is also important to know how to put on (donning) and how to take off (doffing) PPE safely (Appendices 2 and 3). The areas where the PPEs are donned should be kept clean and disinfected at all times ensuring adequate place to change and waste bins to dispose the used PPE. Finally, it is important to follow the recommended procedures for safe disposal of PPE (Table 5.1).

Certain considerations for personal respiratory protection are (Text Box 5.4) recommended as part of an overall IPC and occupational health programme. The IPC focal point / team and hospital management must ensure sufficient resources for a continuous and adequate supply of personal protective equipment, such as masks, respirators, face shields, gloves, gowns and boots.

Text Box 5.4: Considerations for respiratory protection programme

- Selection of respirator styles/models and sizes, when and where they should be used based on a risk assessment
- Training and information, education and communication (IEC) materials on how to use respirators correctly
- Medical evaluation of staff prior to using respirators
- Respirator qualitative fit testing
- Instructions on how to re-use, store and dispose of respirators
- Monitoring and evaluation of the respiratory protection programme and comply with record keeping requirements.

For more information on improving IPC in health facilities, please refer to available national and international guidelines.

6 What is a comprehensive approach to occupational respiratory health in health facilities?

Maintaining good respiratory health in health facilities and among health care workers benefits from a comprehensive approach to respiratory health. Ideally, respiratory health should be part of a *comprehensive approach* to occupational health. This approach requires collaboration and coordination between occupational health, infection prevention and control and other relevant staff. The comprehensive approach to respiratory health requires:

- Identification of respiratory health issues *early.*
- Identification of *risk factors* for respiratory health and where possible managing and mitigating these risk factors.
- Creating a *positive work environment* for lung health. This means ensuring a tobacco-free and stigma-free workplace for all staff.

This comprehensive approach not only supports general wellness and good respiratory health among health care workers and decreases health care associated respiratory infections, it will also create a *safe environment for patients* and other people using the health facility.

6.1 Identifying respiratory health issues early

To be able to establish and monitor the respiratory health of staff, all staff should be offered regular health checks that can assist in:

- Recording a baseline of the employee's general health at the time of the first review, frequently on employment
- Identifying possible risk factors for respiratory health that may occur due to the work environment
- Ensuring that the employee is able to perform the role assigned.

A health check, including respiratory health considerations, could initially be a simple questionnaire completed by the health care worker (Appendix 4) which

identifies respiratory health issues and risk factors to be further addressed. The responses in questionnaires should be discussed during an occupational health consultation and they can guide investigations (laboratory, radiology etc) that are necessary. Subsequently, the questionnaire can be repeated at set intervals during the worker's employment. The proposed questionnaire can complement or add to any existing staff health questionnaires/documentation.

6.2 Examples of respiratory conditions to be identified early

Occupational asthma

- Occupational asthma is breathlessness, wheezing and coughing caused by exposure to substances in the workplace.
- It is often preceded by other allergic symptoms, such as rhinitis, conjunctivitis, and sometimes dermatitis and urticaria. Those who have a history of allergy or asthma are more likely to develop occupational asthma.
- The common substances that can cause occupational asthma in health care settings are the powder from latex gloves and fumes from cleaning and disinfecting products, such as glutaraldehyde. This substance is frequently used as a disinfectant for fibre-optic endoscopes and processing x-ray films.
- Health care workers who develop any symptoms linked to occupational asthma should inform their supervisor as early as possible. The earlier the symptoms are reported and the potential causative agent identified and exposure removed, the less is the chance of developing any long-term lung damage.
- It is necessary to ensure that certain procedures, such as, respiratory protection and ventilation and training, are in place for staff who are using products with a known link to occupational asthma.
- The best treatment for occupational asthma is avoidance of further exposure to the sensitising agent.

Tuberculous infection (TBI)

- Approximately 10 to 30% of individuals exposed to a person with infectious tuberculosis develop tuberculous infection. Of these, 5-10% are likely to develop tuberculosis (disease), usually within two years of infection.

- Risk factors, such as HIV infection, diabetes mellitus, tobacco use and some medications can increase the risk of tuberculous infection developing into tuberculosis.
- Depending on the tuberculosis burden in the country and the type of work, health care workers may be at an increased risk of being exposed to tuberculosis micro-organisms and becoming infected.
- The main protection against tuberculous infection in health staff is implementation of good airborne infection prevention and control policies.

Tuberculosis disease (TB)

- Tuberculosis frequently affects the lungs and people with pulmonary tuberculosis are likely to be infectious. It follows that a health care worker with undiagnosed tuberculosis may become a source of continued spread of TB micro-organisms to their colleagues and patients.
- Respiratory symptoms suggestive of pulmonary tuberculosis include cough (any duration in people living with HIV and a cough for two weeks or longer in others), sometimes productive with sputum, difficulty in breathing, chest pains and coughing up blood.
- A person with tuberculosis may also have systemic symptoms that include loss of appetite, weight loss, fevers and night sweats. These symptoms can develop over a period of weeks to months.
- Occupational health checks should include regular screening for these symptoms among all health staff, particularly in settings with a high tuberculosis burden.
- It is also important that if a health care worker has symptoms suggestive of tuberculosis, particularly pulmonary tuberculosis, that
  - they seek occupational health services *without delay.*
  - their sputum sample is promptly collected and investigated with tests to not only detect TB micro-organisms but also for drug resistance.
  - if they seek diagnosis and care outside the occupational health services, they inform the occupational health services.
- Once the diagnosis is made, the correct treatment (depending on the results of drug sensitivity test) should be started promptly. Once on correct treatment that is taken as prescribed, they will become less infectious.

The necessary *contact tracing* should be implemented (see chapter 8).

Approaches to identifying tuberculosis disease and infection in health care settings (*in decreasing order of impact*) include:

1 Initial screening for symptoms and signs of tuberculosis at recruitment followed by regular screening[3] for all health care workers in the facility.

2 For those with negative symptom screen, screen for tuberculous infection using either tuberculin skin test or IGRA test.

3 Tuberculous infection screening for health care workers who have documented exposure to a person with tuberculosis disease before appropriate treatment was started.

Health care workers with tuberculous infection should be offered tuberculosis preventive treatment (TPT) and those with symptoms of tuberculosis disease should be offered diagnostic investigations and treatment. Both groups should be supported to complete their treatment.

Acute respiratory infections of *public health importance*:

- There are certain respiratory infections that have a short incubation period and do not have a long pre-symptomatic infectious period but are important to identify early as they have a public health importance, for example, COVID-19, influenza, measles.
- Health care workers should report any influenza-like symptoms *early* so that the appropriate steps can be taken (see chapter 8).

[3] This screening can be performed every 2-3 years.

6.3 Identifying risk factors for respiratory health

Diabetes mellitus (DM)
Diabetes mellitus, and especially type 2 diabetes, is increasing rapidly in many parts of the world, particularly in resource-limited settings.

- Diabetes is a risk factor for a number of respiratory illnesses, including tuberculosis and COVID-19. High body mass index (BMI) and obesity are one of the biggest risk factors for developing type 2 diabetes (Text Box 6.1).
- A screening programme for health care workers can start with a questionnaire to detect people with risk factors (Appendix 4). Those reaching the risk threshold on the screening questionnaire are eligible for a fasting blood glucose after an overnight fast of 8–14 hours.
- Those with symptoms of diabetes (frequent urination, increased thirst or fatigue) should also be offered a fasting blood glucose test.
- If a fasting venous sample is not available, point of care ("finger stick") glucometer devices can be used for fasting glucose values in capillary plasma. If point of care tests are used, the test is recommended to be repeated on different days to confirm the result.
- Diabetes is defined as (venous) fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dl), random plasma glucose ≥ 11.1 mmol/l (200 mg/dl) and / or glycated haemoglobin (HbA1c) ≥ 6.5%.
- Screening can occur every 3-5 years for those who have had an initial negative screening.

Text Box 6.1: Risk factors for diabetes mellitus

- Overweight / obesity (BMI 25-30 kg/m^2 overweight, >30 kg/m^2 obese)
- Physical inactivity
- Age (those over 45 years at higher risk)
- Family history of diabetes in close relatives
- In females, history of gestational diabetes

HIV infection

- HIV weakens the functioning of the immune system, particularly if it is not diagnosed early and/or a person is not taking antiretroviral treatment. It is a key risk factor for respiratory infections, such as pneumonia (different types), opportunistic infections and tuberculosis.
- There are a number of rapid diagnostic tests available for HIV and all health care workers should be encouraged to know their HIV status.
- Health care workers living with HIV should be supported to continue their HIV care and receive counselling and management, including antiretroviral treatment, regular monitoring and tuberculosis preventive treatment (if they have no tuberculosis disease and other contraindications).

Tobacco use

- Tobacco smoking, vaping and using e-cigarettes are harmful to the lungs and increase the risk of developing a number of respiratory infections, including tuberculosis and COVID-19.
- Additionally, tobacco product use directly damages the lungs causing respiratory symptoms after long-term use.
    - Conditions, such as emphysema, bronchiectasis and constructive-obstructive pulmonary disease (COPD) are frequent among tobacco product users. Certain lung cancers are also more frequent among tobacco product users than non-users.
- Health care workers who use tobacco products should be supported to stop, for example, through the ABC approach (Text Box 6.2) or other nationally recommended strategies.

Text Box 6.2: What is ABC for tobacco cessation?

A **Ask** the health care worker about their smoking status and document this.

B Provide **Brief advice** to stop smoking regardless of their desire or motivation to quit.

C Make an offer of, and refer to or provide **Cessation support**.

6.4 Preventing respiratory diseases

Influenza vaccination

- Influenza-like illness (ILI) is caused by over 200 micro-organisms.
- Only 10% of ILI are due to influenza viruses.
- Since 2012, the WHO has recommended that countries use the influenza vaccine to prevent severe illness and death in high-risk individuals, including health care workers.
- Offering annual influenza vaccination for health care workers, particularly those working in outpatient or triage settings, can be beneficial.
- There are a number of key barriers to implementation of this recommendation in resource-limited settings and they include:
  - National policies and programmes for influenza vaccination do not exist.
  - Lack of nationally approved/registered influenza vaccines.
  - Cost and supply chain issues.
- The vaccination record of health care workers should be reviewed to ensure vaccinations have been received for other vaccine preventable illnesses.
  - Vaccines, such as hepatitis B, measles, mumps and rubella, diphtheria, pertussis, tetanus, meningococcal and yellow fever (depending on location) vaccine should be prioritised.
  - The record should also include new vaccines, such as COVID-19.

Tobacco-free workplace

- Passive smoking occurs when non-smokers involuntarily inhale the smoke produced by a tobacco user around them and it is associated with lung and cardiovascular damage.
- To protect all people using the health facilities, staff and community, a tobacco-free work environment should be implemented (see Appendix 5).

7 How is a positive work environment for respiratory health created?

A positive work environment means a workplace that promotes employee health, safety and well-being. It includes also measures to reduce stigma and discrimination and provision of information, education and counselling.

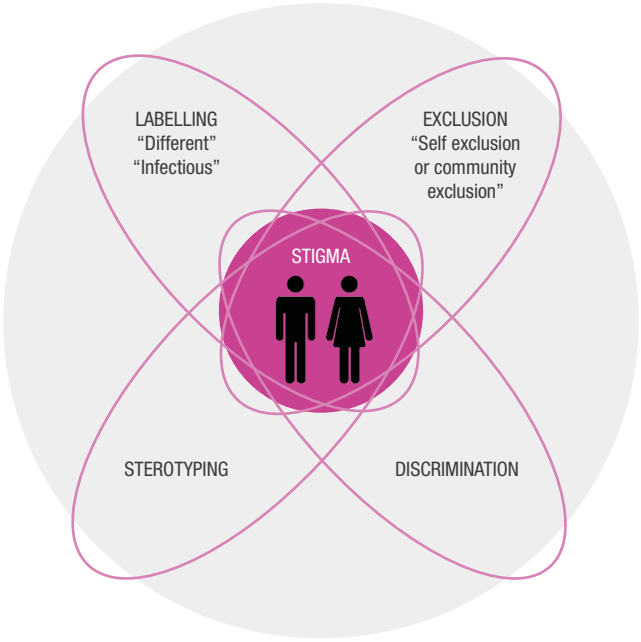
7.1 Stigma reduction

- Stigma refers to *exclusion*, *rejection* or *devaluation* by others against the affected person based on beliefs of social unacceptability or inferiority.
- Respiratory illnesses can be associated with considerable stigma, particularly respiratory infections due to fear of transmission. A good example is stigma associated with tuberculosis and COVID-19 in many settings.
- Stigma does not affect only community members. It may also affect health care workers.
  - Due to stigma attached to, for example, tuberculosis, health staff may be reluctant to seek services at the occupational health clinic in their workplace. This is likely to be the case if confidentiality offered at this clinic is not trusted or if services are not offered with maximum privacy.
  - In addition to *patients*, health care workers may also stigmatise their *co-workers*.
- Stigma reduction efforts include:
  - Educating health care workers on the respiratory conditions associated with stigma.
  - The impact of stigma on the lives of individuals.
  - Discussing the issues driving stigma and ways to overcome stigma (Figure 7.1).
- Workplaces, including health facilities, should develop policies and practices that promote a stigma-free environment and include discussion on how stigma influences patient care. This can include:

- Discussions with, for example, tuberculosis survivors (who could be patients or health staff) for suggestions on how to promote tuberculosis awareness without contributing to stigma.
- Ensuring *stigmatising language is not used* when referring to conditions and affected people.
- Ensuring that screening and diagnostic services for respiratory conditions, including tuberculosis, and the use of personal respiratory protection become *part of the routine services,* that is, *normalising* them.
- Ensuring confidentiality for staff when they disclose health conditions;
- Ensuring that health staff with a respiratory health concern are not discriminated against.

• Similar to health education, a facility with staff who are aware of the impact of stigma and work actively to reduce it will have a *positive impact* on the people attending the facility with respiratory health conditions.

Figure 7.1: Issues driving stigma



7.2 Health information, education and counselling

- In addition to implementing a screening and treatment programme for the common risk factors for respiratory health, it is important to include health information, education and counselling into the comprehensive occupational health approach.
- Health education plays a key role in *prevention*. Educating health care workers on what they can do to prevent becoming unwell not only protects them from future health problems, it can also help pass health education *messages to the communities* they treat and interact with. Knowing more about diseases and their causes promotes also a stigma-free work environment.
- Health care workers who become unwell with a respiratory condition should be supported during their illness, be given information on their condition and its treatment and if required be offered counselling (see next chapter).

8 How are respiratory health conditions and infections managed among health care workers?

The aim of comprehensive occupational approaches to respiratory health is to promote measures to protect against and prevent respiratory health conditions in health care workers. Although prevention is key, there needs to be a comprehensive approach to identification, diagnosis and treatment when a health care worker develops symptoms of a respiratory health condition to ensure they return to health and to protect them and their contacts.

This section reviews the steps to be implemented when a health care worker reports symptom(s) of respiratory illnesses.

8.1 Reporting respiratory symptoms

When a health care worker becomes unwell with respiratory symptoms, it is important to establish if a respiratory infection may be the cause and if additional infection prevention and control measures need to be taken to prevent further infections among other staff and patients.

Health care workers should be aware of the national and/or facility policies regarding reporting illnesses, when and how to report and when to seek occupational health services.

A knowledge of circulating respiratory infections in the community, region or country is helpful to gauge the risk of infection and the potential infections at a given time. Weekly epidemiological reports may contain this type of information. This information is useful to guide additional infection control measures and decisions on when disease-specific precautions should become standard precautions.

8.2 Support during investigation and treatment

- If it is unlikely that the respiratory symptoms are linked to an infection, the occupational health nurse / doctor should discuss with the health care worker if they can continue working in their current role while their symptoms are being investigated. If not, do they need to be off work or can they perform another role within the health facility?
- If the symptoms are linked to a respiratory infection, the following needs to be considered while they are being investigated.
    - *Contact tracing*: depending on the possible causative micro-organism, contacts need to be identified and investigated. They may include family and community contacts as well as co-workers.
    - *Quarantine / isolation*: the health care worker should not continue to expose others to the possible causative micro-organism. This usually means they should take sick leave.
- Support should be given to refer the health care worker to the necessary health services for investigation and treatment if they are not provided through occupational health services.
- *Confidentiality should be maintained at all times*. This includes record keeping: occupational health nurse /doctor should keep records in the health care worker's file regarding the exposure, symptoms and the result of the investigations. They should work with the IPC focal point to identify where the health care worker works (ward, clinic, area, etc) and investigate the IPC measures or other OSH issues without compromising confidentiality.
- While the health care worker is experiencing respiratory symptoms and undergoing investigation and /or treatment, it is important that they can access psychosocial support if necessary.

8.3 Reporting an occupational illness

- Certain respiratory illnesses, particularly respiratory infections, such as tuberculosis, may be notifiable diseases according to the national requirements. Occupational health staff are responsible for making the report and if not available, the supervisory staff should make the report. Confidentiality of the staff member with the notifiable condition should be maintained strictly.
- Staff working in occupational health services should be aware of national regulations on prevention of occupational diseases and compensation that may be available.
- A respiratory illness or infection contracted as a result of work could be considered as a work or employment injury. Under International Labour Organisation conventions persons with such illnesses can be entitled to health care and, to the extent that the person is unable to work, to cash benefits or compensation, depending on national laws.

8.4 Risk assessment for respiratory infections

The facility IPC focal person / team and occupational health staff should undertake a *regular risk assessment* to identify areas or procedures where risk of exposure to infection might occur and introduce appropriate infection prevention and control measures to reduce that risk.

When a health care worker has been exposed to a respiratory risk or micro-organism (usually an infection through contact with a patient presumed or confirmed to have a respiratory infection) the level of risk of exposure needs to be assessed.

Levels of risk for respiratory infections can be stratified by:

- *High risk*: Prolonged (>15 min) exposure to source of respiratory infection without any respiratory PPE.
- *Medium risk*: Prolonged (>15 min) exposure to source of respiratory infection with surgical mask.

- *Low risk*: Indirect contact with or without wearing PPE or contact wearing a N95 respirator and other appropriate PPE.

Depending on the risk category, appropriate measures need to be followed and the health care worker informed. The action depends on the likely respiratory micro-organism, incubation period and preventive treatment options available.

8.5 Job security and income protection

- There should be clear national policies on absence due to sickness, income support during sick leave and employment protection during illness in line with the labour laws.
- All staff should be aware of these policies and procedures that should be followed.
- Job security is essential in promoting early presentation of symptoms if health staff develop a respiratory illness whilst at work.
- Job security is also required to create a stigma-free work environment.

8.6 Critical respiratory health incidences

When diagnosed early, most respiratory conditions, particularly respiratory infections, respond well to treatment. However, there are occasions when a health care worker may become incapacitated or die due to a respiratory condition contracted in the workplace. When this happens, it will have a considerable impact on the rest of the workforce.

- Communication regarding the situation should be provided early and in a sensitive way, ideally in person.
- Staff should be informed of available support, including bereavement and trauma counselling services.
- Measures to prevent similar events happening again should be taken, if possible.

9 How are respiratory health conditions and infections monitored in health facilities and among health care workers?

9.1 Keeping occupational health records

Occupational health services should maintain records that document the details of attendances by health care workers. Only staff providing occupational health services should have access to these records. The records contain confidential information and must be kept in locked filing cabinets. In addition, the 'staff clinic' should maintain a register that facilitates collection of basic data on the number and type (new / repeat, acute illness / injury / periodic health check) of daily attendances and the age, sex, occupation and area of work of the health care workers who are evaluated.

Using the information in this register, for example, the following indicators can be calculated and assessed for different time periods in order to strengthen occupational health and safety.

- Number (and proportion) of health staff screened for risk factors, exposures to infection, hazardous agents and other risks.
- Number (and proportion) of health staff with (occupational) respiratory conditions, infections etc.
- Number (and proportion) of health staff absences due to (occupational) respiratory conditions and infections.

9.2 Monitoring adherence to facility infection prevention and control plan

It is relatively simple to monitor various activities and procedures that are included in the *facility infection prevention and control plan* and confirm that the responsible persons implement the planned activities.

- Monitoring should take place daily.
- Monitoring should be carried out by the infection prevention and control focal point and / or a member of the infection prevention and control team.

- Monitoring is done through *direct observation*. A *checklist* may be used to guide and document the observations and measures that have been taken to strengthen activities that are not done satisfactorily.
  - For example, the supervisor may detect that cleaning chemicals are not available. S/he will then need to discuss the reason for the stock out with the responsible person and place an order. They will also need to make alternative arrangements while awaiting the arrival of new stocks.
- Each infection prevention and control activity should be assigned to a staff member and summarised in a duty roster. A facility may have, for example, following duty rosters (Table 9.1):
  - Duty roster for staff members responsible for patient triage by week day and work-station/department.
  - Duty roster for staff responsible for opening windows and doors.
  - Duty roster for staff responsible for surface and other cleaning.
- The method of how an activity, for example, surface and other cleaning, should be done is described in the *standard operating procedures* for infection prevention and control.
- Training and mentorship are important in maintaining good infection prevention and control.
- Records maintained of staff who have attended on-the-job or other training sessions and their dates to ensure that all health personnel get a regular training opportunity.

Table 9.1: Example of a health facility infection prevention and control duty roster from 1-31 July 2020

Infection prevention and control activity	*Name of responsible person*	*Frequency of activity*
Health education on cough etiquette for people attending out-patient department		Daily
Triage of people with cough in out-patient department		As people present themselves
Opening windows:		
Out-patient department	_____	Daily
In all wards	_____	Daily
Consultation rooms	_____	Daily
Antenatal ward	_____	Daily
Administration wing	_____	Daily
Checking condition of IPC posters in facility corridors		Monthly
Using standard operating procedures for processing sputum and other respiratory samples in laboratory		Daily

9.3 Monitoring impact of a comprehensive approach to respiratory health

In addition to monitoring implementation of infection prevention and control activities, it is important to monitor their *impact*.

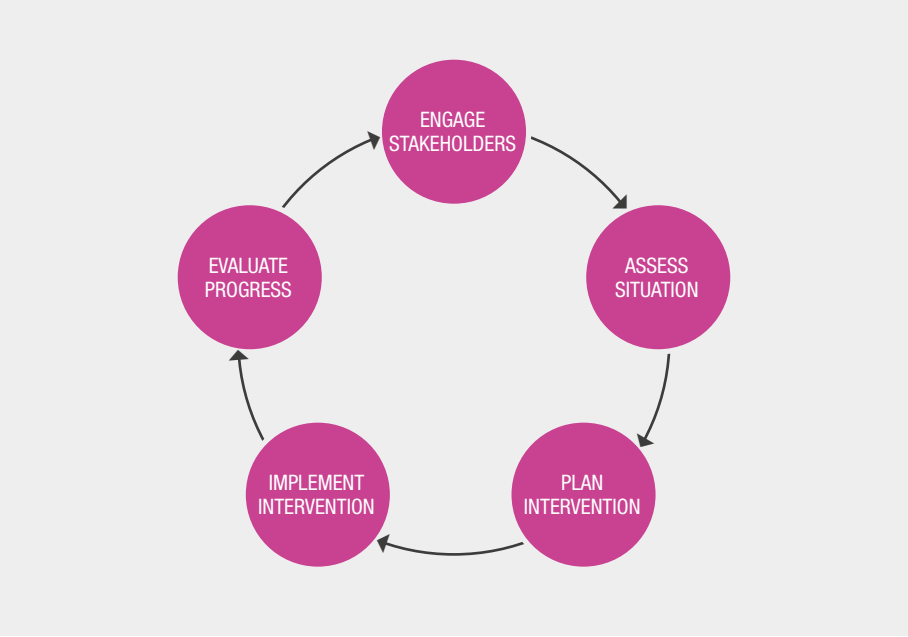
The ultimate impact of infection prevention and control measures is to make all health facilities *as safe as possible* for all people working in these facilities and visiting them.

- Regarding respiratory health, this means that no health staff should become sick with a respiratory infection due to exposure at work (such as, common cold, seasonal flu, COVID-19 or tuberculosis).
- In real life, some health staff develop respiratory infections and we need to document everyone who becomes sick (for example, with COVID-19 or tuberculosis) or who may have been exposed to certain micro-organisms.

  - The IPC focal person needs to do a risk assessment and the staff member managed accordingly.
  - Some staff may develop a health care-associated infection and it is particularly important to document the occurrence of these infections. This documentation facilitates monitoring their frequency and who are at most risk and taking measures to prevent future occurrences.
  - In high tuberculosis burden settings, keeping records of health staff who develop tuberculosis is essential. If occupational health services provide tuberculosis diagnosis and treatment to staff, the occupational health clinic should use the national recording and reporting tools.

- A *register* is used for documentation of respiratory infections in health care workers that the national policies require to be monitored.
- A register summarises the details of every health staff who has been exposed, who becomes infected or who falls sick with a respiratory disease.
- Records should be kept of risk factors for respiratory diseases among health staff, for example, body mass index, blood pressure and pulse rate, random blood glucose, HIV status, smoking status, use of alcohol etc. See Appendix 2.
- To maintain complete *confidentiality* of the information in the register, only people responsible for occupational health services should have access to the register. When the register is not in use, it must be kept safely under lock and key.
- Periodic (monthly, quarterly or annually) *reports* can be prepared using the information in the register. These reports should not include names or any other data that can be used to identify a person.
- The data in the registers and reports can be summarised in a *table* or *figure* to better understand the trends in the numbers (and proportions) of health staff who were exposed, developed an infection or a disease, and to facilitate decision making to strengthen infection prevention and control measures in a facility.
- Measures, as outlined in this guide, to provide a comprehensive approach to respiratory diseases in health care workers need to be recorded, monitored and reviewed to ensure *continuous quality improvement* (Figure 9.1).

Figure 9.1: Continuous quality improvement cycle



For example:

- **Engage stakeholders and assess situation**: the IPC focal point engages the facility staff to collect and report data, for example, for the most recent quarter, tabulate, analyse and then use these data for decision making to strengthen services.
- **Plan intervention**: based on the data, the team decides what needs to be strengthened and how it can be done within their resources.
- **Implement intervention**: the team members follow a revised approach.
- **Evaluate progress**: the team analyses the facility data for the subsequent time period to see if the steps that were implemented made a difference
    - If yes, the team may decide to continue implementing the revised approach. They have developed a beneficial work practice that should be shared with other facility and district teams.
    - If no, the team re-assesses, for example, what gaps may remain in the activity that is undertaken.

9.4 Operational research in occupational respiratory health

Operational research can be defined as research on strategies and interventions to strengthen quality and performance of health services. Maintaining good records and registers in occupational health services and ensuring that good quality data are available facilitate carrying out operational research using routinely available data and finding local answers to local challenges. Through operational research we can strengthen occupational respiratory health and make health facilities 'safer'.

Glossary

Aerosol: small particle(s) with a size of 5-10 micrometres that may remain suspended in air for long periods of time and may carry micro-organisms. They can be released into the air by people with an infectious disease when they cough, sneeze, shout, sing etc.

Aerosol generating procedure: clinical activity that may create and spread aerosols, for example, airway suctioning and intubation.

Airborne (in the context of occupational safety and health): micro-organisms or other hazards spread by air.

Body mass index: defined as body mass (in kg) divided by the squared height (m^2). See BMI chart in Appendix 4.

Communicable disease: disease that spreads from one person (with the disease) to another person through transmission of micro-organisms, such as bacteria, viruses, parasites and fungi. Also called infectious or contagious disease.

Contact (in the context of respiratory health): anyone with a possible exposure to a certain micro-organism due to being or living for a certain time period in some proximity with a person with a communicable disease (also called an 'index patient'). Contact can be close (living permanently with this person) or casual (short meeting with this person).

Contamination (in the context of health facilities): occurs when micro-organisms are spread due to weak implementation of the standard infection prevention and control precautions and when, for example, hand hygiene, is not observed. Various elements, such as surfaces, air, water and food, may become contaminated.

Cough etiquette/cough hygiene: covering one's nose and mouth when coughing and sneezing with a tissue paper (or one's bent arm/elbow) and when possible, providing tissue papers or face masks to people attending health facilities.

Doffing (PPE): taking off personal protective equipment.

Donning (PPE): putting on personal protective equipment.

Droplet: small particle(s) with a size of 10-100 micrometres that fall onto surfaces (and do not remain suspended in air) and may carry micro-organisms. They can be released into the air by people with an infectious disease when they cough, sneeze, shout, sing etc.

Exposure: being in contact with or caring for a person who has a communicable disease and being subjected to the micro-organisms that they may have released into the 'shared' air through coughing etc, through contact with their blood and other body fluids.

Extubation: removal of a tube from a person's trachea (in a person who was intubated).

Fomite(s): objects or surfaces that may to carry micro-organisms.

Front line health personnel: health care workers who work in outpatient, emergency and acute medical care and are usually the first point of contact with the health system and who are at an increased risk of exposure to various micro-organisms and other hazards.

Hazard (in occupational safety and health context): any source of potential damage, harm or adverse health effect on something or someone

Health care-associated infection(s): communicable/infectious diseases that are spread in health facilities from health care workers to patients and vice versa.

Health care worker (in this Guide): all personnel (clinical and non-clinical, trained and in training) working in health facilities.

High-efficiency particulate air (HEPA) filter units: gadgets that satisfy certain levels of efficiency, for example, they must remove from the air that passes through at least 99.95-99.97% of particles whose diameter is equal to 0.3 micrometres.

Incubation period: time between exposure to a micro-organism and when signs of disease/illness first become apparent.

Infection prevention and control: certain measures and work practices that reduce the likelihood of spreading micro-organisms. Airborne infection prevention and control measures are arranged into a hierarchy that includes i) administrative, ii) environmental and iii) personal respiratory protective measures.

Influenza-like illness: sicknesses caused by over 200 micro-organisms and whose symptoms resemble those of influenza, that is, a sudden onset of fever, shivering, chills, malaise, dry cough, loss of appetite, body aches and nausea.

Intubation (in the context of respiratory health): introduction of a tube into trachea to facilitate breathing in a person with respiratory difficulties.

Isolation: separation of a person with a communicable disease. Isolation can take place in a health facility or an isolation centre or at person's home (self-isolation).

Micrometre: a unit of length equal to one millionth of a metre, also called micron.

Micro-organism: organism, for example, a bacterium or a virus, of microscopic size that can be measured in micrometres. Some micro-organisms can cause infection and disease in people. Also called pathogens.

Occupational safety and health: multidisciplinary field concerned with the safety, health, and welfare of people at their workplaces. It includes the laws, standards and programmes that aim at making the workplaces better for workers, customers/clients and other stakeholders.

Occupational health (and safety) services: services that keep people healthy and safe while at work, both physically and mentally, and manage any risks in workplace that are likely to give rise to work-related ill health. In certain resource-limited settings, these may be called staff clinics and services may be provided by persons who are not trained in occupational health.

Personal protective equipment: equipment worn to minimise exposure to hazards that cause serious workplace injuries and illnesses.

Quarantine: restriction of movement, or the separation from the rest of the population, of healthy persons who may have been exposed to a person with a certain communicable disease, such as COVID-19. The objective of the separation is to monitor their symptoms and ensure the early detection of disease to prevent additional exposures and to interrupt spreading of the disease.

Respirator: particulate filtering facemask to protect the wearer from breathing in droplets and aerosols. Should be N95/FFP95 or greater and must be complemented with administrative and environmental control measures.

Respiratory: refers to anything related to breathing (that is, the movement of air or dissolved gases into and out of the lungs) or organs of a body required for breathing. For example, upper and lower respiratory tract, respiratory illness, respiratory infection.

Risk: chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard.

Risk assessment: activity to determine the risk categorisation and management of health personnel, especially frontline health care workers, after exposure to people with certain serious conditions, such as a COVID-19 and tuberculosis. It is should be done by a trained health professional with experience in infection prevention and control.

Transmission: passing of a micro-organism causing communicable disease from an infected person (frequently called host or index case) to another (susceptible) person.

Triage: identifying persons with symptoms of respiratory illness, separating them from others (to control possible spread of micro-organisms) and fast tracking their management.

Ultraviolet germicidal irradiation (UVGI): environmental infection prevention and control measure to kill or inactivate micro-organisms, such as *Mycobacterium tuberculosis* through exposure to UVGI.

Ventilation: system of providing 'fresh' air into a room or building and creating a flow of air to keep air 'fresh'. Natural ventilation is natural air movement to achieve air exchange in an area, for example, through open windows. Mechanical ventilation includes different engineering methods that can be used to dilute and remove air in an area. Examples of mechanical ventilation include window fans, exhaust ventilation systems and negative pressure isolation rooms.

XpertMTB/RIF®: cartridge-based nucleic acid amplification test that can identify DNA of *Mycobacterium tuberculosis* and resistance to rifampicin.

Further reading

1. **World Health Organization**. Improving infection prevention and control at the health facility. Interim practical manual supporting implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva, Switzerland, 2018. *https://www.who.int/infection-prevention/tools/core-components/facility-manual.pdf?ua=1*

2. **U.S Centers for Disease Control and Prevention**. Infection control in healthcare personnel - infrastructure and routine practices for occupational infection prevention and control services. Atlanta, USA, 2019. *https://www.cdc.gov/infectioncontrol/guidelines/healthcare-personnel/index.html*

3. **World Health Organization**. Minimum requirements for infection prevention and control programmes. Geneva, Switzerland, 2019. *https://www.who.int/infection-prevention/publications/min-req-IPC-manual/en/*

4. **World Health Organization**. Infection prevention and control assessment framework at the facility level. Geneva, Switzerland, 2018. *https://www.who.int/infection-prevention/tools/core-components/IPCAF-facility.pdf*

5. **International Union Against Tuberculosis and Lung Disease**. The Union's Tobacco-free healthcare: a tobacco-free futures action guide. Paris, France, 2020. *https://theunion.org/sites/default/files/2020-12/pubtc_tobaccofreehealthcare-en.pdf*

6. **Alli BO**. Fundamental principles of occupational health and safety. International Labour Organization. Geneva, Switzerland, 2008. *http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_093550.pdf*

7. **U.S. Centers for Disease Control and Prevention**. Infection Control Assessment tools. Atlanta, USA, 2016. *https://www.cdc.gov/hai/prevent/infection-control-assessment-tools.html*

8. **Houghton C, Meskell P, Delaney H, et al**. Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis. Cochrane Database of Systematic Reviews 2020, Issue 4. Art. No.: CD013582. DOI: 10.1002/14651858.CD013582. Accessed 11 January 2021

9. **Ehrlich R, Spiegel J, Yassi A**. Diverse approaches to preventing occupational tuberculosis in health workers: cross-disciplinary or cross purposes? Public Health Action 2019; 9(1):11-14. doi:10.5588/pha.18.0086

10. **Ehrlich R, Spiegel J, Adu P, et al**. Current guidelines for protecting health workers from occupational tuberculosis are necessary, but not sufficient: towards a comprehensive occupational health approach. Int. J. Environ. Res. Public Health 2020, 17(11): 3957; *https://doi.org/10.3390/ijerph17113957*

11. **Trajman A, Menzies D**. Occupational respiratory infections. Current Opinion in Pulmonary Medicine 2010, 16:226–234. *http://www.redetb.hucff.ufrj.br/attachments/article/202/1315_Current%20Opinion%202010.pdf*

12. **KNCV Tuberculosis Foundation**. Tuberculosis stigma reduction for health care institutions, intervention package. Allies Approach, the KNCV stigma reduction toolbox, The Hague, the Netherlands, 2018. *https://www.kncvtbc.org/uploaded/2018/10/Allies_Approach_V4.pdf*

13. **End Tuberculosis Transmission Initiative and Stop TB Partnership**. Technical information sheet on respirator fit testing, Geneva, Switzerland, 2018. *http://stoptb.org/wg/ett/assets/documents/ETTI_InfoSheet_FitTesting_Final.pdf*

Videos

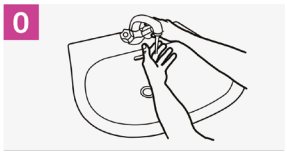
1. **U.S. Centers for Disease Control and Prevention**. TB IC implementation in outpatient settings. *https://www.youtube.com/watch?v=tsnGi-eLIQc*

2. **U.S. Centers for Disease Control and Prevention**. TB IC implementation in hospitals and inpatient settings. *https://www.youtube.com/watch?v=Em24CYvek-c*

Appendix 1

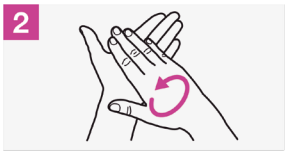
How to ensure good hand hygiene by either washing hands with water and soap or using alcohol-based hand rub

When your hands are visibly soiled, wash them for 40-60 seconds as follows:

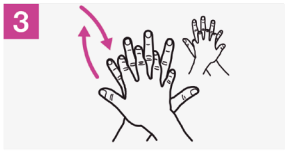


Wet hands with water;

Apply enough soap to cover all hand surfaces;

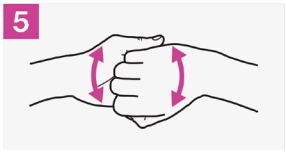


Rub hands palm to palm;



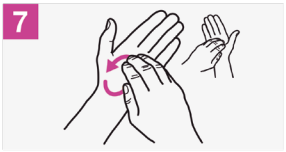
Right palm over left dorsum with interlaced fingers and vice versa;

Palm to palm with fingers interlaced;

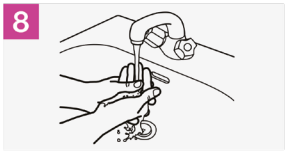


Backs of fingers to opposing palms with fingers interlocked;

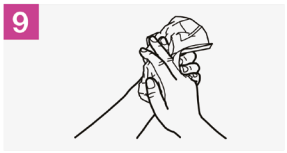
Rotational rubbing of left thumb clasped in right palm and vice versa;



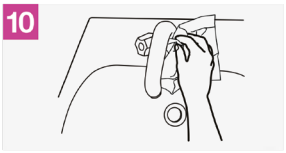
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



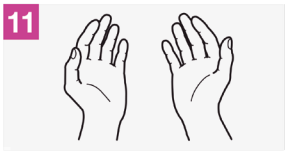
Rinse hands with water;



Dry hands thoroughly with a single use towel;

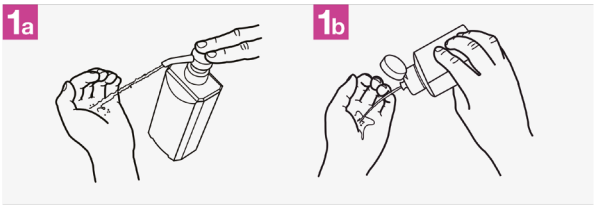


Use towel to turn off faucet;

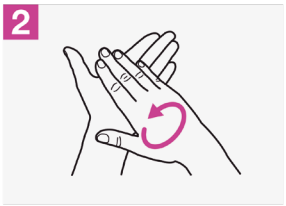


Your hands are now safe.

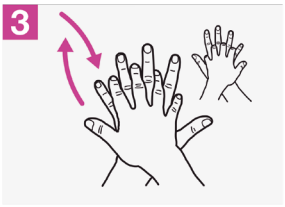
Rub your hands with an alcohol-based hand rub as follows for hand hygiene:



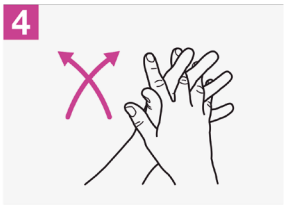
Apply a palmful of the product in a cupped hand, covering all surfaces;



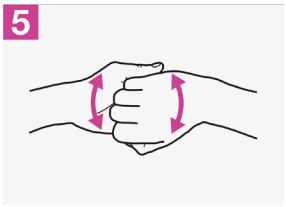
Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



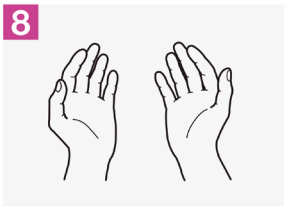
Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;

Rotational rubbing of left thumb clasped in right palm and vice versa;

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.

Appendix 2

How to put on and remove a face (surgical) mask

1 **Perform hand hygiene** with soap and water or hand sanitizer before touching the mask.

2 **Check the mask** to make sure there are no obvious tears or holes in either side of the mask, and that it is not wet or dirty.

3 Determine which side of the mask is **the top**. The side of the mask with a stiff bendable edge is the top. The bendable edge is meant to mould to the shape of your nose.

4 Determine which side of the mask is **the front**. The coloured side of the mask is usually the front (i.e. should face away from you). The white side of the mask should touch your face.

5 Follow the instructions below for the type of mask you are using.

- *Face Mask with Ear loops*: Hold the mask by the ear loops. Place a loop around each ear.
- *Face Mask with Ties*: Bring the mask to your nose level and place the ties over the crown of your head and secure with a bow. Then take the bottom ties, one in each hand, and secure with a bow at the nape of your neck.
- *Face Mask with Bands*: Hold the mask in your hand with the nosepiece or top of the mask at fingertips, allowing the headbands to hang freely below hands. Bring the mask to your nose level and pull the top strap over your head so that it rests over the crown of your head. Pull the bottom strap over your head so that it rests at the nape of your neck.

6 Once the mask is secured to your face, mould or pinch the stiff edge to the shape of your nose.

7 Pull the bottom of the mask over your mouth and chin.

How to remove a face (surgical) mask

1 **Perform hand hygiene** with soap and water or hand sanitizer before touching the mask. **Avoid touching the front of the mask**. The front of the mask is contaminated. **Touch only the ear loops/ties/bands**.

2 Follow the instructions below for the type of mask you are using.

- *Face Mask with Ear loops*: Hold both of the ear loops and gently lift and remove the mask.
- *Face Mask with Ties*: Untie the bottom bow first then untie the top bow and pull the mask away from you as the ties are loosened.
- *Face Mask with Band*s: Lift the bottom strap over your head first then pull the top strap over your head.

3 Discard the mask in a closed waste container.

4 Perform hand hygiene with soap and water or hand sanitizer.

Appendix 3

How to properly put on and take off a filtering facepiece (N95 or FFP2 respirator)

To begin:

- Perform hand hygiene for at least 20 seconds with soap and water or hand sanitizer
- Use a model and size of the respirator that you have been fit tested for
- Check the respirator to make sure there is no obvious damage. Discard the respirator in an appropriate waste container if it appears damaged or wet.
- Make sure there is no hair (e.g., moustaches, beards), jewellery, glasses, clothing or anything else between your face and the respirator.

Putting on the respirator

1. Position the respirator in your hand with the nose piece at your fingertips. Avoid touching the inside of the respirator.

2. Cup the respirator in your hand allowing the headbands to hang below your hand. Hold the respirator under your chin with the nosepiece up.

3. The top strap (on single or double strap respirators) goes over and rests at the top back of your head. The bottom strap is positioned around the neck and below the ears. Do not crisscross straps.

4. Place your fingertips from both hands at the top of the metal nose clip (if present). Slide fingertips down both sides of the metal strip to mold the nose area to the shape of your nose.

Checking your seal

1. Place both hands over the respirator, take a quick breath in to check whether the respirator seals tightly to face.

2. Place both hands completely over the respirator and exhale. If you feel leakage, there is not a proper seal.

3. If air leaks around the nose, adjust the nosepiece slightly and repeat the seal check step. If air leaks at the mask edges, adjust the straps along the sides of your head and repeat the seal check step until a proper seal is achieved.

4. If you cannot achieve a proper seal, ask for help or try a different size or model that you have been fit-tested for.

Removing your respirator

1. DO NOT TOUCH the front of the respirator as it may be contaminated.

2. Remove by pulling the bottom strap over back of head, followed by the top strap, without touching the respirator.

3. Discard in a waste container.

4. Perform hand hygiene with soap and water or hand sanitizer.

Source: *https://www.cdc.gov/niosh/docs/2010-133/default.html*

Appendix 4

SAMPLE RESPIRATORY HEALTH SCREEN QUESTIONNAIRE

This questionnaire has sample questions that focus on respiratory health.

These questions can be added to existing staff health questionnaires or adapted accordingly.

The points in brackets are for screening for diabetes mellitus (DM): persons with more than 4 points should be referred for fasting blood glucose.

Name: _____

Date of birth: _____

Date: _____

Job Title: _____

Department: _____

How old are you? (for DM)

☐ Less than 40 yrs (0 points) ☐ 40-49 years (1 point)

☐ 50-59 years (2 points) ☐ 60 years or older (3 points)

Are you physically active? (for DM)

☐ I do less than 2hrs physical activity a week (0 point)

☐ I do more than 2 hrs physical activity a week (1 point)

Do you smoke? (for tobacco cessation)

☐ Yes ☐ No If yes, how many cigarettes do you smoke per day? _____

Do you use alcohol?

☐ Yes ☐ No If yes, how many units a week do you drink? _____

What is your BMI? (for DM, TB)

☐ 25 or less (0 points) ☐ 25 – 29.9 (1 point) ☐ 30 or more (2 points)

See BMI chart overleaf.

If you are a woman, have you ever been diagnosed with gestational diabetes? (for DM)

☐ Yes (1 point) ☐ No (0 points)

Do you have a mother, father, sister or brother with diabetes? (for DM)

☐ Yes (1 point) ☐ No (0 points)

Have you ever been diagnosed with high blood pressure? (for DM)

☐ Yes (1 point) ☐ No (0 points)

Do you have any allergies? (for occupational asthma) ☐ Yes ☐ No

If yes please specify: _____

_____

Do you have asthma? (for occupational asthma) ☐ Yes ☐ No

Do you have any other medical conditions? ☐ Yes ☐ No

If yes please specify: _____

_____

Are you taking any regular medication? ☐ Yes ☐ No

If yes please specify type and dosage: _____

_____

Do you know your HIV status? (for TBI and TB) ☐ Yes ☐ No

If yes, are you receiving antiretroviral therapy? ☐ Yes ☐ No

Have you received TB treatment in the last 3 years?

☐ Yes, for TB disease

☐ Yes, TB preventive treatment

☐ No

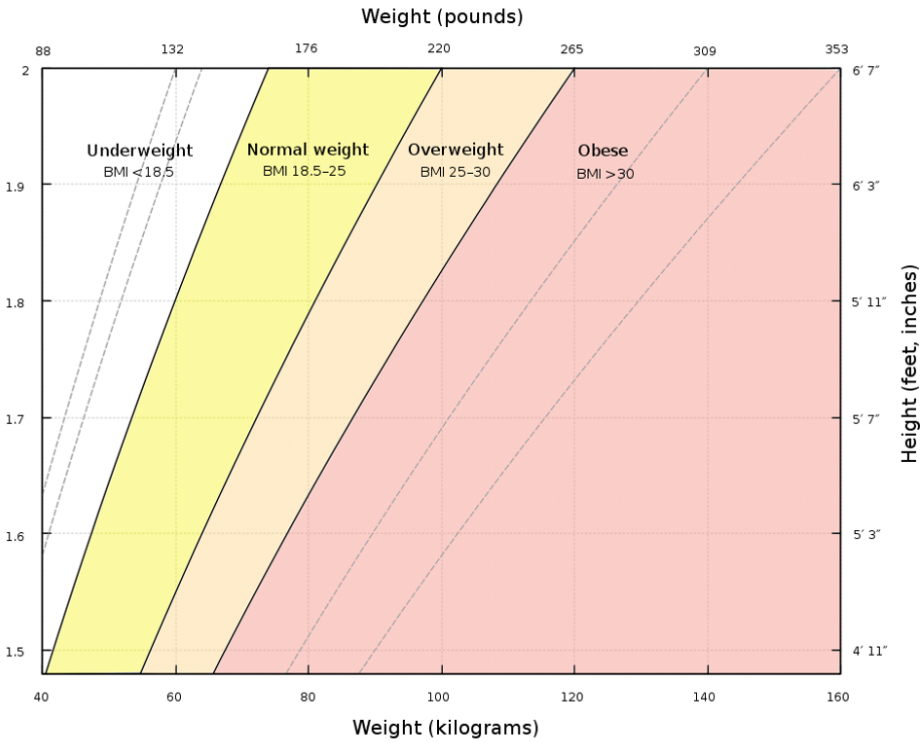
Please complete your vaccination record

For occupational health nurse / doctor TO COMPLETE on recruitment and regular intervals:

Weight:	**Blood pressure reading:**
Height:	
Random blood glucose if available:	**TB symptom screen (as per national guidelines):**_____

TB infection test: TST/IGRA (delete as appropriate)
TB infection test result: Positive/Negative (delete as appropriate)

BMI Chart


Weight (pounds)
88
132
176
220
265
309
353
2
1.9
1.8
1.7
1.6
1.5
6′ 7″
6′ 3″
5′ 11″
5′ 7″
5′ 3″
4′ 11″
Height (feet, inches)
Underweight
BMI <18.5
Normal weight
BMI 18.5–25
Overweight
BMI 25–30
Obese
BMI >30
40
60
80
100
120
140
160
Weight (kilograms)

Appendix 5

What is a 100% tobacco-free healthcare facility?

1 No smoking is allowed in healthcare facilities.

2 All staff and patients who use tobacco, and family members who expose patients to smoke in the home, are offered support to quit.

3 Tobacco-free incorporates all tobacco products, such as cigarettes and smokeless tobacco.

4 No tobacco products can be sold in healthcare facilities.

5 No tobacco advertising or sponsorship is allowed in healthcare facilities.

ABOUT THE INTERNATIONAL UNION AGAINST TUBERCULOSIS AND LUNG DISEASE (THE UNION)

The Union is a global scientific organisation with the mission to improve health among people living in poverty. We do that by conducting scientific research, working with governments and other agencies to translate research into better health for people around the world, and delivering projects directly in the field. The Union is made up of a global membership body of people who help advance our mission, and a scientific institute that implements public health projects within countries. For more than 100 years, we have been leaders in the fight against some of the world's biggest killers, including tuberculosis, lung diseases and tobacco use.

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