Infection control 5: equipment for facial and respiratory protection

Fluid-resistant surgical face masks, eye protection and respiratory protective equipment (RPE) are important items of personal protective equipment (PPE). They are used to protect the mucous membranes of the wearer from exposure to blood and/or body fluids when splashing may occur, as well as from exposure to infectious large droplets and droplet nuclei. Surgical face masks are also used to prevent respiratory droplets from the health professional’s mouth and nose being expelled into the environment (Loveday et al, 2014). This article focuses on selecting these products for use as PPE, and explains the procedures for applying and removing them.

When to use facial and respiratory protection

The decision to use or wear PPE should be based on the results of an assessment of the level of risk associated with a specific activity, and should take account of:

- The task being undertaken;
- The characteristics of the biological agent to which there is a risk of exposure;
- The duration of the task;
- The local environment;
- Current health and safety legislation.

Users should be trained in how to select the most-appropriate items, as well as how to apply, adjust, remove and dispose of them. There is evidence that both a lack of knowledge of guidelines and non- adherence to recommendations are common; regular in-service education and training is therefore required (Loveday et al, 2014). All PPE should be:

- Located close to the point of use;
- Stored in a clean/dry area until required for use (expiry dates must be adhered to) to prevent contamination;
- Single-use only items unless specified by the manufacturer;
- Disposed of after use into the correct waste stream: healthcare (including clinical) waste or domestic waste (Health Protection Scotland, 2015).

Facial protection, including fluid-repellent surgical face masks, is not commonly worn when caring for patients with cold or flu-like illnesses, but should be considered when:

- Caring for those with undiagnosed respiratory illness for whom coughing and sneezing are significant features;
- There is known widespread respiratory virus activity in the community;
- There is a suspected or confirmed outbreak of a respiratory illness in a closed or semi-closed setting.

Respiratory protection, for example an FFP3 filtering facepiece respirator, as well as eye protection, must be worn when performing aerosol-generating procedures (AGPs) on patients with known or suspected influenza and some other respiratory viral illnesses. AGPs include positive-pressure ventilation, endotracheal intubation, airway suction, high-frequency oscillatory ventilation, tracheostomy, nebuliser treatment, sputum induction and bronchoscopy (Khai et al, 2012). The user should, however, follow local policy for a full list of AGPs in their area of work.

Facial and eye protection (including visors) should not be impeded by accessories such as false eyelashes and should not be touched when worn.

Facial protection: face masks and eye protection

Standard, single-use, fluid-resistant type IIR surgical facemasks that fully cover the nose and mouth (Fig 1) can be used:

- To prevent respiratory droplets from being expelled into the environment;
- In conjunction with eye protection, to protect the wearer’s mucous membranes from exposure to blood and/or body fluids in situations where splashing may occur;
- To protect the wearer’s mucous membranes from infectious large droplets, such as those generated by a patient with seasonal influenza.

Protective eyewear (visors or goggles) can protect health professionals against potential splashing into the eyes of blood or body fluids that may be infectious. If such an occurrence is likely, these should be worn as part of appropriate facial protection. Regular spectacles are not classed as PPE and are not an appropriate alternative.
The choice of visors or goggles will depend on:
- The procedure that is to be undertaken;
- A risk assessment of likely exposure;
- Local policy;
- Availability.

A face shield that fully covers the front and sides of the face or goggles (in addition to a respirator) may be worn during AGPs on patients who are suspected of being infected with a respiratory pathogen.

Respiratory protection
RPE is used to protect the wearer from inhaling aerosolised droplet nuclei expelled from the respiratory tract. As surgical face masks are not effective at filtering out such particles, respirators are required:
- When caring for patients with certain respiratory diseases, such as active pulmonary tuberculosis;
- As part of a PPE ensemble for suspected high-consequence infectious diseases spread by the airborne route, such as avian influenza or Middle East respiratory syndrome coronavirus (MERS Co-V).

Patients in whom diagnoses of these diseases have been confirmed will be transferred to a specialist centre for ongoing management.

Respirators will protect the wearer from inhaling small respiratory particles but they must fit closely to the face to minimise leakage around the mask. Wearing must be ‘fit tested’ by trained personnel to the specific respirator they are using and must ‘fit check’ it every time it is donned (Coia et al, 2013). It is good practice to conduct fit tests annually unless the person has dramatic changes to the face as a result of, for example:
- Weight gain/loss;
- Substantial dental work;
- Facial changes (such as scars, moles and effects of ageing) around the face seal area (Health and Safety Executive, 2019).

Respirators, also known as filtering face pieces (FFPs) are classified into three categories in Europe: FFP1, FFP2 and FFP3. FFP3 (Fig 2) provides the highest level of protection and is the only one approved for use in UK healthcare settings. Other parts of the world, for example the US, use N95, which is equivalent to FFP2.

Putting on facial PPE
Hand hygiene must be performed before putting on any PPE. The items worn should be put on in the following order:
1. Apron/gown;
2. Face protection/respirator if worn;
3. Eye protection;

Face protection
When putting on a surgical face mask, secure the ties at the middle of the head and neck according to the manufacturer’s instructions (Fig 3a), then fit the flexible band to your nose ridge by pressing gently (Fig 3b).

Put on and fit FFP3 respirators following the steps in Fig 4; perform a fit-check as you will have been trained to do. It may be helpful to look in the mirror when applying the FFP3 respirator.

Masks and most FFP3 respirators are single-use only, they should not be worn around the neck or put to one side for later use. Reusable FFP3 respirators are available as an option for staff who cannot be successfully fit tested on single-use types.

Eye protection: goggles or visors
- Place over the eyes (goggles) or face (visor) (Fig 5).
- Adjust to fit.

Removing PPE
PPE should be removed in the following order:
1. Gloves;
2. Apron/gown;
3. Eye protection;
4. Surgical face mask or FFP3 if worn.

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manufacturers’ instructions at the following times, or in the following circumstances:
- If contaminated with blood or body fluids;
- If their integrity is compromised, for example by moisture build-up in masks;
- At the end of the procedure;
- Before leaving the dedicated clinical area – or, in the case of airborne infection, just outside in a designated doffing area for respirators.

Hand hygiene must be performed immediately after removing all items of PPE.

Eye protection
Avoid touching the outside surface of the goggles or visor as it is contaminated – handle only by the headband or earpieces. Discard into a lined waste bin for disposal as healthcare (including clinical) waste or, if a reusable piece of equipment – for example, reusable goggles – a receptacle for reprocessing or decontamination.

Face protection
Avoid touching the front of the mask or respirator. If wearing a facemask, unfasten the bottom ties, then those at the top. Pull the mask or respirator away from the face without touching the front. Discard into a lined waste bin for disposal as healthcare (including clinical) waste or, if suitable for a reusable piece of equipment – for example, reusable respirator – a receptacle for reprocessing or decontamination.

Conclusion
Respiratory and facial protective equipment is designed to protect both patients and health professionals from infection. To maximise their effectiveness, they should be selected and used after an assessment of the risks associated with a planned procedure, and used as described in this article in accordance with local policy.

References