Use of respiratory and facial protection

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Infectious microorganisms can be transmitted by various routes. Respiratory and facial protection is needed to prevent infection with organisms that are usually transmitted through the droplet/airborne route, or when airborne particles have been artificially created, for example during aerosol-generating procedures.

Recent experiences with severe acute respiratory syndrome and pandemic (H1N1) influenza in 2009 highlighted that health professionals may have difficulty in choosing the correct type of facial and respiratory protection (MacIntyre et al, 2011; Loeb et al, 2009). To address this issue, in 2011 the scientific development committee of the Healthcare Infection Society established a working group to develop guidance (Coia et al, 2013) based on a review of the literature and expert consensus (Bunyan et al, 2013).

Risks associated with infectious particles

Health professionals who are exposed to infectious particles in the air need respiratory and facial protection. The size of the infectious particle determines how many potentially harmful microbes it carries, the distance it can travel, how deeply it can penetrate the respiratory tract and what form of protection will be necessary.

Particles can be grouped into:
- Splashes: large particles (>100µm in diameter) that fall out of airborne suspension within a few seconds;
- Aerosols: small, lightweight particles that can remain in suspension in the air for long periods and travel long distances. These particles can penetrate the respiratory system to the alveolar level and are generally <5µm in diameter.
- Droplets: small particles larger than aerosols (approximately 5-100µm in diameter).

Types of respiratory and facial protection

Surgical facemask

Surgical facemasks provide a barrier to splashes and droplets that could reach the health professionals have access to a range of facial and respiratory equipment that offers protection when they are exposed to infectious particles. This includes surgical facemasks, respiratory protective equipment, protective spectacles, goggles and visors.

However, recent experiences of severe acute respiratory syndrome and the 2009 (H1N1) influenza pandemic suggest that they may not always choose the correct type of facial and respiratory protection (MacIntyre et al, 2011; Loeb et al, 2009). To address this issue, in 2011 the scientific development committee of the Healthcare Infection Society established a working group to develop guidance (Coia et al, 2013) based on a review of the literature and expert consensus (Bunyan et al, 2013).

5 key points

1. Respiratory and facial protection is needed to prevent against airborne infection.
2. Respiratory protection equipment is usually comprised of a surgical mask or respirator, with or without eye protection.
3. The need for personal protective equipment is determined by a risk assessment that considers a range of factors.
4. In most cases where respiratory and facial protection is required, a surgical mask is adequate.
5. A respirator is needed for a few airborne pathogens or during aerosol-generating procedures involving infectious body fluids.

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wearer’s nose, mouth and respiratory tract. However, since they do not provide protection against airborne (aerosol) particles, they are not classed as respiratory protection equipment.

While some surgical masks are claimed to be effective, they do not always filter adequately for respiratory protection. Most are not designed to fit closely to the face, so aerosols can pass through the gap between the mask and the wearer’s face.

Facemasks should be worn for the duration of the exposure, task or procedure. They should be changed if they become damaged or contaminated with respiratory secretions and discarded as healthcare waste after use. We recommend that surgical facemasks used for protection against infection must be fluid repellent, compliant with the medical devices directive (MDD 93/42/EEC) (Medicines and Healthcare products Regulatory Agency, 2010) and “CE” marked (UK Government, 2002).

**Respirators**

Respirators provide respiratory protection, and health professionals usually use a filtering half-facemask to provide this. The European standard for filtering facemasks, EN 149 (currently 2009), lists three classes of filtering face equipment: FFP1, FFP2 and FFP3 (Health and Safety Executive, 2005a); FFP3 offers the highest level of protection.

Although most evidence supporting the use of FFP respirators to prevent airborne transmission of infection is based on N95/FFP2 devices, FFP3 is the only class acceptable to the Health and Safety Executive for use against infectious aerosols in healthcare in the UK.

FFP respirators are available with or without an exhalation valve. Although slightly more expensive, valved respirators are more comfortable than non-valved as the valve reduces overall breathing resistance, and heat and humidity build-up.

FFP3 respirators should be changed after each use, if breathing becomes difficult, if the respirator is damaged or if it becomes contaminated with respiratory secretions or other body fluids. Health professionals should wear single-use respirators once and dispose of them as healthcare waste.

**Eye protection**

An often-forgotten aspect of facial protection, eye protection shields the conjunctivae against droplets and splashes. The most common items are safety spectacles, full-face visors or integral transparent panels on the top of surgical facemasks.

Eye protection should always be worn by everyone in the room during potentially infectious aerosol-generating procedures. We recommend using disposable, single-use eye protection; reusable eye protection must be decontaminated between uses.

**Selecting and wearing respiratory and facial protection**

Health professionals should use a risk assessment-based approach to choose the most appropriate respiratory and facial protection based on:

- The task or procedure being carried out;
- The patient’s suspected or known infectious status;
- The patient’s presenting symptoms.

In most situations, a surgical mask will be adequate. A respirator will be required for a small number of pathogens that are transmitted via the airborne route, or where aerosol-generating procedures involving infectious body fluids are being carried out. The need for eye protection is largely determined by the risk of splashing body fluids to the eyes or face.

Staff training is crucial to help health professionals choose and use appropriate respiratory and facial protection.

**Fit-testing and checking**

FFP respirators must be suitable for the user’s face shape, leaving no gaps between the mask and face where air can pass though unfiltered. This can be checked by the user putting on a respirator and being challenged with a particulate spray of a sweet or bitter substance that could be tasted if it passed through the respirator.

Fit is a legal requirement that, when people are required to use respirators, these are fit-tested by a competent person.
the results are satisfactory, and those results are recorded and available for inspection. The Control of Substances Hazardous to Health (COSHH) regulations recommend fit testing is repeated:
» If it is necessary to change to another type of face piece (for example, if a new types of respirator is introduced);
» If the wearer has lost or gained weight;
» If the wearer has undergone substantial dental work;
» If the wearer has developed facial imperfections, such as moles, around the face seal area (HSE, 2005b).

However, health professionals should perform a “fit check” each time they wear a respirator. A good fit can only be achieved if the area where the respirator seals against the skin is clean shaven, as facial hair may cause leaks around the respirator. Box 1 explains how to perform a fit check.

Removal of respiratory and facial protection
PPE must be put on and removed in an order that minimises the potential for cross contamination. Before leaving the work area:
» Gloves, gown/apron and eye protection should be removed (in that order, where worn) and disposed of as healthcare waste;
» Eye protection should be handled by the headband or earpieces only;
» Non-disposable eye protection should be decontaminated between uses;
» Hand hygiene must be performed after removal and disposal.

After leaving the work area:
» The respirator or surgical mask can be removed and disposed of as healthcare waste – untie or break the bottom ties first, followed by top ties or elastic, and remove by handling ties only;
» Hand hygiene must be performed after disposal.

Conclusion
Facial and respiratory protection are crucial to reduce the risk of airborne infections spreading. This equipment is only effective if used correctly and if proper consideration is given to the type used.

Health professionals must take into consideration the risk posed when choosing facial and respiratory protection to ensure they are properly protected.

References: