



HPA INTERIM ADVICE ON EXTENDING THE LIFESPAN OF FACEMASKS AND RESPIRATORS – 06 May 2009, 1500h.

In 2005 and 2007, HPA worked closely with DH and HSE to produce pandemic infection control guidance for hospitals and primary care settings (http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_080771). The HPA's standard advice on the use of facemasks and respirators in healthcare settings during a pandemic is reflected within that document. Nevertheless in the light of the current A/H1N1 crisis and the current shortfall in existing stocks of facemasks and respirators versus possible near-term demand, this additional paper discusses extraordinary measures that could be considered in the short-term.

Several strategies might be deployed to extend the useful lifespan of face mask and respirators – reuse, prolonged wearing, conserving stocks or the use of alternatives to masks. Each of these options is considered and a recommendation listed.

RE-USE OF FACEMASKS AND RESPIRATORS

Any method for decontaminating a face mask or respirator should eliminate the viral threat, be harmless to the user, and not compromise the integrity of the various elements of the mask or respirator such as the nose clip, the filtering efficiency of the material etc. Currently available facemasks and respirators are designed for disposal after single use and, since there has been no reason or incentive to develop methods for decontamination and reuse, they are made of materials that are likely to deteriorate with currently available chemical and thermal means of disinfection. In addition, the Health and Safety Executive advises against the reuse of disposable masks on the grounds that this may increase the risk of transmission of influenza virus.

Facemasks

We are not aware of any validated method of decontamination that eliminates the viral threat, is harmless to the user or maintains the integrity of the essential elements of the facemask¹.

FFP3 respirators

We are not aware of any validated method of decontamination that eliminates the viral threat, is harmless to the user or maintains the integrity of the essential elements of the FFP3 respirator¹. However, preliminary data from a paper by Viscusi² suggests that certain decontamination methods available in a hospital setting which are consistent with significant reductions in viral contamination and able to be performed within 12 hours may be useful. In the research, tests were performed on two types of N95 (similar to FFP2) respirators. Liquid and vapourised hydrogen peroxide and ultraviolet radiation

eliminated the virus and were assessed to have relatively little impact on filtration performance of the respirators. Bleach (10% diluted household bleach), ethylene oxide and the use of a microwave oven also eliminated the virus but were associated with some degradation in performance that still allowed the device to exceed NIOSH minimum criteria. Autoclaving, 160 degrees C dry heat, 70% isopropyl alcohol and a 20 min soak in soap and water were not considered suitable.

Although this is encouraging and offers the possibility of emergency decontamination, some caution needs to be exercised in trying to extrapolate these findings to the higher specification FFP3 respirator used in the UK. There are also issues around the effect that some of the measures, such as soaking in 10% bleach, may have on the user.

PROLONGED USE OF FACEMASKS AND RESPIRATORS

Once they are in use, all forms of facemasks and respirators have life-spans which are specified by the manufacturer.

Facemask

There is a clear consensus that masks that have become damp through use are no longer effective and those contaminated by patient material or are visibly soiled should be changed at once. There is therefore little that can be done to extend the time for which a face mask can be used in these circumstances.

FFP3 Respirator

It has been suggested that a respirator might be used for an extended period or covered by a facemask (which could be changed) however there is no evidence base in support of the above measure. Information from HPA led simulations of pandemic respiratory protection suggest that staff find respirators uncomfortable³. The use of any personal protective equipment (PPE) places a strain on the user and the use of a facemask over a respirator will magnify this, increasing the potential for fatigue and exhaustion if worn for long periods of time⁴.

USE OF FACE MASK AND RESPIRATORS PAST THEIR USE BY DATE.

Recent work by Viscusi⁵ suggests that most N95 (FFP2) respirators stored in warehouse and laboratory conditions are likely to maintain their filtration capacity for up to 10 years. While we are not aware of any specific work of this kind in relation to FFP3 respirators, it would seem reasonable to assume that respirators past their use by date would offer some degree of protection. HSE comments that the filtering efficacy of respirators is unlikely to degrade much even if materials are two years out of date, but a visual check should be made for structural integrity. The HSE have also noted that many hospitals may have acquired local stockpiles of masks and some of these may now be out-of date. They should not be destroyed, and could be pressed into service once in-date stocks have been exhausted, provided they have been stored appropriately. The HPA supports this view.

CAN ANYTHING BE DONE TO ALTER THE RULES/THRESHOLD FOR MASK WEARING TO 'EKE OUT' EXISTING SUPPLIES?

Face masks

In order to conserve the supply of facemasks it may be possible to stop or reduce other use around the hospital. Facemasks are commonly worn in operating theatres or for other sterile procedures, such as the insertion of central venous catheters, in order to reduce the incidence of hospital infection. Facemasks have not been proven to be effective for this purpose. However, they do protect the face and mouth area from body fluid splashes that may occur with some types of surgery.

To eke out supplies, it would be defensible to reduce the use of facemasks in routine NHS surgical practice to only those circumstances in which the surgeon is at high likelihood of blood and body fluid splashes, and only for those in close proximity to the patient. A separate risk assessment would be required by infection control practitioners were this to be pursued as a policy option. Other use of facemasks around the hospital could also be stopped or reduced.

A consideration of the transmission of influenza (albeit on a limited evidence base) would suggest that most transmission occurs at short range and via large droplets or contact transmission. Large droplets are considered to fall out at distances up to 1 metre (some other countries argue 2 metres but this is precautionary rather than driven by strong evidence). It is therefore possible to strictly limit the wearing of facemasks to close contact with infected patients. At present, the UK pandemic infection control guidance states that facemasks should be worn within 1 metre of infected patients but that in practice these could be donned when entering a cohorted area, for convenience. The guidance could be strictly applied so that facemasks are only worn when directly at the bedside.

Facemasks are considered useful to be worn by patients ill with pandemic influenza on the grounds that this reduces the chance of an infected patient transmitting infection to HCWs in close attendance and lessens the chance of environmental contamination; this should be continued. However, masking patients with a facemask as an alternative to masking HCWs might be a more efficient use of limited quantities of facemasks in circumstances where the patient can comfortably tolerate wearing a facemask and is likely to comply with masking instructions.

FFP3 respirators

Currently because the swine influenza is considered to be a novel influenza subtype, high level PPE is being used for contact with probable or confirmed cases of swine influenza. Once it is considered that there is sustained transmission within the UK then we would move to the situation where FFP3 respirators would only be used for aerosol generating procedures.

The existing stockpile of respirators might be extended by using any existing supplies of lower grade respirators (in circumstances where respirators are

indicated in pandemic infection control guidance) in a strict order of hierarchy FFP3 – 2 – 1. However, the emphasis has been on acquiring supplies of facemask and FFP3 respirators and it is not clear what stocks of FFP2/1 respirators are available. But note: an out-of-date FFP3 respirator is still regarded as superior to an in-date respirator of lower filtration capacity.

Can any other commonly available materials be used as a mask alternative if/when supplies are exhausted?

During Winter Willow a view was expressed a number of layered surgical masks worn simultaneously might be a last resort alternative to an FFP3 respirator. This is supported by limited data from Derrick⁶. However this will impact on the available supply of facemasks as multiple facemasks would be needed.

The HSE has expressed a view that if facemasks are not available, any alternative that offers a physical barrier to prevent direct exposure of the nose/mouth could be considered. There are almost no data on what could constitute a suitable alternative. However Dato⁷ proposed the use of a prototype DIY mask made from layered re-usable cotton. As would be expected this mask performed poorly against an N95 respirator but its protection was somewhat variable, but nevertheless not zero.

RECOMMENDATIONS FOR EXTENDING THE LIFESPAN OF MASKS:

- Use out-of-date facemasks and respirators to the extent available
- Use lower grade respirators to the extent available (where a respirator is indicated)
- Out-of-date but in-grade respirators are preferred to incorrect grade but in-date stock
- Layered facemasks might be considered as a last resort when no respirators (of any grade) are available for the performance of aerosol generating procedures however this will impact on the supply of facemasks for other uses.
- Re-use of any device is not recommended except as absolute last resort
- Decontamination of facemasks is not recommended
- Experimental work suggests that high efficacy respirators can be decontaminated without degradation using certain regimens, but these are unlikely to prove practical and there are insufficient data to be certain of a reliable effect. This should only be considered if practical and then as a measure of last resort.
- Hospitals can perform individual risk assessments to minimise all but essential non-pandemic use of facemasks and determine whether alternatives measures could be adopted.
- Masking patients with a facemask as an alternative to masking HCWs might be a more efficient use of limited quantities of masks in certain circumstances.
- Any other nose/mouth covering could be considered once facemask are exhausted, but there are no data in support of specific items other than the DIY cotton mask described by Dato et al.

REFERENCES

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