Why is respiratory protective equipment still an issue in the NHS?

Revised NHS guidance has relaxed infection prevention and control (IPC) requirements for hospitals and GP practices. These authors question why airborne transmission is not more clearly acknowledged and why healthcare workers still do not have access to appropriate personal protective equipment.

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The World Health Organisation (WHO) and the US Centers for Disease Control and Prevention (CDC) both recognise the airborne transmission of SARS-CoV-2, at both short and long range, yet there continue to be delays in implementing respiratory protective equipment across the NHS for staff caring for infectious covid-19 patients. Why?

The evidence on airborne transmission of SARS-CoV-2 is overwhelming, readily available, and expertly communicated. SARS-CoV-2 is an aerosol borne virus which infects hosts by being inhaled and this has long been acknowledged in UK government messaging on ventilation.¹

In the first wave of covid-19 in 2020, the lack of appropriate personal protective equipment (PPE) for healthcare staff was blamed on supply and production issues. This excuse could have had some credibility if one was to ignore decades of pandemic planning that ought to have pre-empted such an occurrence. However, two years later and the official line is that there are no supply issues. So why are staff still not being provided with adequate PPE? It has never been clear if the stated insufficiency of supply is because this has been calculated based on guidance for non airborne precautions (except for aerosol generating procedures [AGPs]) which, if altered to more sensibly cover physiologically produced aerosols such as when breathing and talking, would significantly alter the levels of supplies required. Given the formal reassurances, this is not a viable reason particularly in a resource rich country.

Another reason suggested for the lack of appropriate PPE has been about the discomfort and safety of wearing it for long periods of time. Studies have shown that the space behind both a surgical and protective mask contains exhaled CO2, leading to some concerns that this may lead to CO2 retention (hypercapnia) in the wearer.² However, some “dead space” (usually quoted at 150ml) is part of normal respiratory physiology, and it is difficult to calculate whether wearing a mask contributes to increasing this due to issues measuring both physical volume and admixture.³ However, studies investigating physiological effects of N95 masks have shown no adverse effects on the wearer’s CO2 levels, or indeed heart rate, oxygenation, and other variables when worn for periods up to eight hours.⁴ As might be expected from a tight-fitting mask, there can be some discomfort initially, but in a study of 68 healthcare workers all symptoms spontaneously resolved and all staff were able to wear their mask for an 8-hour shift.⁴

While this is an oft repeated claim, it is not borne out in the literature and needs to be weighed in the context of occupational and nosocomial risk of covid-19.²⁶

Another concern is about fit testing all staff for PPE. While it would have been difficult in the initial stages to fit-test all staff, that can no longer be the case given that we are two years into the pandemic. Trusts that have switched to using FFP3 masks have, in some instances, done so mid-way through a pandemic wave (for example, Cambridge University Hospitals NHS Foundation Trust [CUH] 22 December 2020) demonstrating feasibility even when the healthcare system was under pressure. Entire staff groups were able to be fit-tested over the Christmas holiday period with staff at higher risk of being exposed to covid-19 prioritised and tested within a week. Testing clinics can be opened up before shifts start to enable late comers or those returning from isolation to be tested and return to work.

Practical considerations include the methodology used for fit testing, either traditional smell testing or the use of aerosol measuring devices (e.g. Portacount). The former can be challenging as some staff retain the smell of the chemical after a single fail and require a repeat appointment on an alternative day which makes rapid deployment challenging. Portacounts or similar devices enable both the tester and worker to cycle through multiple disposable options quickly and give real time feedback on security of fit.

Trusts that have switched often ensure that staff have two masks approved for their personal use in case of temporary stock shortages. Staff that fail repeated mask models can use elastomerics or powered hoods. Monthly cleaning and filter replacement schedules need to be in place if these options are used.

Many trusts have demonstrated that where there’s a will, there’s a way, and that it is feasible to implement these processes.

Since January 2021, FreshAir NHS (a group of frontline NHS workers and supporters calling for recognition of airborne transmission and the urgent need for ventilation and RPE) have been requesting that the UK infection, prevention and control (IPC) guidance is updated to accept that airborne transmission of SARS-CoV-2 occurs in all settings and conditions, necessitating airborne mitigations. Initially supported by a petition of 1500 signatories, the request was shared with the UK prime minister, and the first ministers, health ministers and chief medical officers of all four nations.⁷ To date we have not received a
response even to acknowledge the letter and accompanying rationale for ventilation and FFP3 (or equivalent) provision in healthcare settings. These components are critical, but are not sufficient by themselves as a prevention strategy (vaccination and administrative means are also important); however any approach to prevention that omits airborne mitigation is woefully inadequate.

Two years in, there has been very little acknowledgment from the government that there remains an issue with PPE, likely due to the negative press surrounding shortages at the beginning of the first wave; remember nurses in bin liners? On 4 January 2022 there was however some recognition from the chief medical officer for England, Chris Witty when he stated that wider adoption of FFP3 respirators within healthcare “was a technical discussion with several different views on it.” However, with multiple NHS healthcare workers who have died from covid-19 and longstanding ill-health resulting from work acquired covid-19, denouncing the importance of this problem as a mere technical debate fails to do it justice; particularly to the bereaved who are yet to have answers on why and how this was allowed to happen.

We anticipate that unless airborne transmission is acknowledged, clearly explained, and acted upon in infection and prevention control guidance, the discipline of infection control is in danger of relegating itself to obscurity as a credible specialty. High-reliability theory, in particular “crew resource management,” dictates when in a crisis, defer to experts and expertise as opposed to simply those in management positions or other positions of power. The NHS needs to embrace the breadth of scientific disciplines and evidence base needed to save lives and minimise suffering caused by infectious pathogens to the benefit of staff and patients.

Competing interests: The authors are all part of FreshAir NHS


2 Roberge RJ, Coca A, Williams WE, Powell JB, Palmiero AJ. Physiological impact of the N95 filtering facepiece respirator on healthcare workers. Respir Care 2010;55:569-77. pmid: 20420727


7 BBC News. Shukman “Call for better coronavirus masks for all medical staff” https://www.bbc.co.uk/news/health-55537624

8 10 Downing Street Press Conference, 4th January 2022, Sir Chris Witty timestamp 41m:38s, (https://youtu.be/y78rCwwwE7w?t=2498)