The 'haves' and 'have-nots' of personal protective equipment during the COVID-19 pandemic: the ethics of emerging inequalities amongst healthcare workers

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ABSTRACT

The COVID-19 pandemic has exacerbated inequalities, including among the healthcare workforce. Based on recent literature and drawing on our experiences of working in operating theatres and critical care in the UK's National Health Service during the pandemic, we review the role of personal protective equipment and consider the ethical implications of its design, availability and provision at a time of unprecedented demand. Several important inequalities have emerged, driven by factors such as individuals purchasing their own personal protective equipment (either out of choice or to address a lack of provision), inconsistencies between guidelines issued by different agencies and organisations, and the standardised design and procurement of equipment required to protect a diverse healthcare workforce. These, we suggest, have resulted largely because of a lack of appropriate pandemic planning and coordination, as well as insufficient appreciation of the significance of equipment design for the healthcare setting. As with many aspects of the pandemic, personal protective equipment has created and revealed inequalities driven by economics, gender, ethnicity and professional influence, creating a division between the 'haves' and 'have-nots' of personal protective equipment. As the healthcare workforce continues to cope with ongoing waves of COVID-19, and with the prospect of more pandemics in the future, it is vital that these inequalities are urgently addressed, both through academic analysis and practical action.

INTRODUCTION

The COVID-19 pandemic has thrown health inequalities into sharp relief; the correlations between poor outcomes, socioeconomic deprivation and race are now well documented.[1 2] The mechanisms underlying these correlations remain incompletely understood, but poor housing, comorbidity, lifestyle risks, employment type and the financial necessity to continue working despite advice to isolate have all been implicated.[1] Attempting to understand the reasons behind higher risk among patients of black, Asian and minority ethnic groups, a report by Public Health England concluded that, among other factors, historic racism may have hampered equal access to healthcare during the pandemic among these communities.[3] It is clear from these sources and others that where inequalities exist, the COVID-19 pandemic has exacerbated them, contributing to poorer outcomes among marginalised groups.[4]

In addition to magnifying existing health inequalities, COVID-19 has created or revealed new ones, including within the healthcare community. In this analysis, we reflect on our experiences of working in operating theatres and critical care in the UK's National Health Service to highlight the ethical challenges associated with personal protective equipment (PPE). We draw attention to how differences in PPE have become emblematic of inequalities among healthcare workers, creating divisions between the 'haves' and the 'have-nots'.

Both operating theatres and critical care have been intensely involved in the provision of invasive respiratory support to patients with SARS-CoV-2 infection during the pandemic. In addition to providing the usual perioperative care, staff usually based in the operating theatre (eg, anaesthetists, operating department practitioners and anaesthetic and recovery nurses) have been called on to join critical care nurses, physicians, therapy staff and allied health professionals in caring for critically ill patients with COVID-19. Likewise, auxiliary and technical staff (eg, circulating practitioners, medical engineers) have supported the expansion of critical care services into new areas, including operating theatres.

Though supplies of PPE are now more reliable than during the first surge of the pandemic (April to July 2020 in the UK), inequalities have nevertheless persisted.[5 6] Based on two of the coauthors' (CS and KE-B, both anaesthetists) lived experiences working in operating theatre and critical care during the pandemic, and their contemporaneous discussions with the third coauthor (JBA, a moral philosopher with expertise in bioethics), we identify three domains in which inequalities relating to PPE have recurrently emerged. We present representative reflections on situations commonly encountered in practice, highlight the key ethical issues that arise as a result, make recommendations when possible and call for further action to be taken in research, policy and practice to address them.

PERSONAL PROTECTIVE EQUIPMENT

Epidemiological evidence suggests that the primary route for SARS-CoV-2 transmission is airborne,[7] via droplets which fall to the ground under the influence of gravity, or aerosols which remain suspended in the air.[8] Inhalation or mucous membrane contact with a sufficient dose of airborne virus is thought lead to infection.[9] With this mechanism in mind, Public Health England has issued several iterations of guidelines for PPE use, all of which draw a distinction between circumstances in which aerosols may be generated, and those where this is deemed

Box 1 Aerosol-generating procedures thought to increase the risk of SARS-CoV-2 transmission, according to public health England guidance.[10]

- Tracheal intubation and extubation.
- Manual ventilation.
- Tracheotomy or tracheostomy procedures (insertion or removal).
- Bronchoscopy.
- Dental procedures (using high speed devices, for example ultrasonic scalers/high speed drills).
- Non-invasive ventilation; bi-level positive airway pressure ventilation and continuous positive airway pressure ventilation.
- High-flow nasal oxygen.
- High-frequency oscillatory ventilation.
- Induction of sputum using nebulised saline.
- Respiratory tract suctioning.
- Upper ear, nose and throat airway procedures that involve respiratory suctioning.
- Upper gastrointestinal endoscopy where open suction of the upper respiratory tract occurs.
- High-speed cutting in surgery/postmortem procedures if respiratory tract/paranasal sinuses involved.

unlikely.[10] 'Aerosol-generating procedures' (AGPs) are commonplace in operating theatre and critical care practice (box 1), and Public Health England advises that the most comprehensive PPE be worn when they are undertaken on patients at risk of SARS-CoV-2 infection, to protect against exposure to airborne particles.[10] We situate our analysis in these circumstances because the highest theoretical risk of COVID-19 transmission exists alongside unequal provision of PPE to healthcare staff.

The level of PPE advised during or shortly following AGPs in all but the lowest-risk patients (ie, asymptomatic for COVID-19, recent negative SARS-CoV-2 test, isolated since testing) is described as 'airborne precautions'.[11] It comprises, as a minimum, a respirator, eye protection, a fluid-resistant long sleeved gown, and gloves. The supply of all of these items have been disrupted at times during the pandemic, leading to widespread reports of inadequate PPE in both the general and academic press.[12–14] Respirators in particular have become one of the most controversial items of PPE, owing both to their scarcity of supply and perceived importance.[15 16] This category of equipment includes disposable and reusable respirator face masks (eg, filtering facepiece; FFP), full face masks which incorporate both eye protection and respirator features, and powered air-purifying respirators (PAPRs).[17]

According to the Health and Safety Executive (HSE), high-efficiency FFP class 3 (FFP3) respirator face masks reduce the quantity of inhaled particles by a factor of at least 20 (known as the 'protection factor'). These tight-fitting masks can be worn continuously for periods of up to an hour.[17] The most efficient PAPRs, loose-fitting hoods which are supplied with filtered air via a powered pump, have a protection factor of at least 40 and can be worn for prolonged periods of time.[17] As the degree of filtration and duration of continuous use increases, so does complexity and cost,[18] while as a result availability diminishes.

Scarcity of PPE on a global, national, institutional and individual level, which was particularly prevalent during the first waves of the pandemic, generates ethically problematic inequalities among the clinical workforce that have the capacity to persist despite supplies becoming more plentiful.[19] We describe three situations, each of which highlights a different way in which inequalities manifest, and identify the ethical issues that urgently require further attention from clinicians, ethicists, organisations and regulators .

INDIVIDUAL PURCHASING AND FAIR ACCESS

To begin, let us consider the following fictional situation, based on a common clinical dilemma, to provide context for the discussion that follows:

> In the early stages of the pandemic, an anaesthetist, concerned about the dwindling supplies of PPE in her own organisation, orders a re-usable respirator mask from an online hardware store. She notices that it is much more expensive than when she checked the price only a few days previously, and stocks are running low—only five masks left—she messages a few colleagues on their work WhatsApp group to let them know that the store has masks in stock, and sends them a link to the page. If they want to buy one before they run out, they will need to be quick…

According to a British Medical Association survey, 34% of hospital doctors purchased their own PPE during the early stages of the COVID-19 pandemic, driven by a lack of adequate provision by healthcare organisations.[20] However, Individual purchasing creates socio-economically driven inequality. Those with the means and the contacts can acquire PPE (or 'better' PPE) while others are unable to access these scarce and expensive goods. As a result of this inequality, clinical teams working in high-risk environments such as critical care and operating theatres may include some individuals who possess high-grade PPE while others may only have minimal or insufficient equipment. This disparity raises a number of important ethical issues.

To begin with, an inherent sense of moral injustice and resentment can manifest in an environment where some members have superior PPE while others may have equipment that is inadequate, used outwith its intended purpose, or beyond its expiry date.[21] In a basic sense, there is nothing ethically wrong with some staff procuring their own equipment using personal funds. However, it nevertheless seems that this inequality of PPE provision is underpinned by pre-existing inequities (eg, socio-economic disparities and professional hierarchies) that create situations wherein those who cannot afford to buy their own PPE still have to carry out their work with a lower degree of protection.

Matters become yet more complicated when we consider how anyone in a clinical team could be required to work without appropriate PPE in a high-risk environment. Some might argue that because patients' lives are at risk, healthcare professionals should be compelled to work in unfavourable conditions if necessary. However, this argument is mistaken because it overlooks at least two important elements. First, despite ongoing debate, there is no compelling special duty defined in ethics or law for staff to carry out high-risk tasks without minimally adequate PPE if doing is so is deemed to disproportionately put them at risk.[22–24] Sadly, this is true even if it means patients might come to harm, for example due to delays in treatment while appropriate PPE is obtained and donned. Just as a patient should expect a duty of care from their clinicians, so too should clinicians expect a duty of care from their institution,[25 26] an obligation that is upheld in UK law. Second, the moral responsibility for any clinical failings caused by staff shortages or delayed care due to unavailable or inadequate PPE lies squarely with those who have failed in their responsibilities for emergency preparation, planning, and

distribution. If a member of a clinical team was to choose to engage in high-risk work without adequate PPE, then this should be considered a supererogatory act that may be virtuous, but not morally required.

Another complicated ethical challenge exists for clinical teams when there is some institutionally provided high-grade PPE available that any team member may benefit from using (eg, a PAPR), but there is only enough equipment available for some members of staff. Assuming everyone could make equal use of the equipment if they were given it and no additional resources are available, who, if anyone, should be the recipient? Questions like these remain commonplace during the current phase of the pandemic and we recommend that further ethical analysis is undertaken by the research community to address them. In the meantime, healthcare organisations must carefully consider the guidelines and systems for allocating devices that cannot be made universally available.

INCONSISTENT GUIDELINES AND OVERUSE

Consider another fictionalised situation to provide context for the next stage of our discussion:

> A patient, receiving ventilation on the intensive care unit for COVID-19 pneumonitis, requires a tracheostomy. At the pre-procedure briefing the operating theatre team discuss PPE. The surgeon states that he will require a PAPR during the procedure. The operating theatre only has one PAPR, and the supplies of disposable hoods for use with these devices have been running low. The scrub nurse points out that the operating theatre guidelines state that staff should wear FFP3 masks for tracheostomies, but the surgeon explains that he would feel safer with a PAPR because he will be working close to the airway throughout the procedure, and he has four more tracheostomies to do this week…

The inconsistencies between PPE guidelines issued by WHO,[27] Centers For Disease Control and Prevention,[28] Public Health England,[10] as well as local organisations have caused controversy throughout the pandemic.[29] Likewise, as guidelines have changed over time, suspicions have been articulated that this may be motivated by 'supply rather than science'.[30] Perhaps the most high-profile such inconsistency in UK practice is the ongoing discordance between guidance issued by PHE and the Resuscitation Council UK regarding whether chest compressions during cardiopulmonary resuscitation should be considered an AGP (box 1), leaving individual healthcare organisations to decide which guidelines to follow.[10 31] Furthermore, several profession-specific guidelines are inconsistent with one another, or appear to prioritise one profession over others.[32] For example, the ENT-UK tracheostomy guideline contains advice to 'consider additional protection for surgeons (eg, … powered (air) purifying respirator)', without mentioning other staff,[33] and the Royal College of Paediatrics and Child Heath advises the use of airborne precautions for AGPs in low-risk patients at times when community SARS-CoV-2 prevalence is greater than 2%, while Public Health England does not.[10 34] These inconsistencies create differing expectations among different staff groups, which are particularly evident in the operating theatre where multiple professions and specialties may work closely together on a single case.

Inconsistencies in guidelines, combined with the anxiety provoked by working in a high-risk environment creates the conditions for PPE to be used when not indicated. While to err on the side of caution is a well-established principle in healthcare, that the overuse of PPE may deplete already-scarce resources at a time of ongoing shortage has led to the assertion that 'overuse of PPE is a form of misuse' from some commentators.[11] Meanwhile, others argue that well-informed staff should be empowered to choose their own PPE, much as patients should be empowered to be active participants in decisions about their clinical management.[33 35]

In the absence of an interprofessional consensus on the minimum standards of PPE for all staff working in a given environment, it remains difficult to develop an ethical system of resource allocation. Instead, we are left with a system that is skewed by professional hierarchy, and the politics of some professions insisting on the provision of higher-grade protection, while those with less leverage (eg, without PPE guidance from their professional associations) cannot.[36]

The UK's Nuffield Council on Bioethics has recently issued a statement calling for 'national guidance on resource allocation decisions in the COVID-19 pandemic' and we support this call not only in terms of treatment resources, but PPE resources also.[37] In particular, it is vital that national guidance is harmonised in such a way that one healthcare profession is not unfairly given preferential treatment above another. Instead, all healthcare workers who are exposed to a high-risk environment must receive access to an appropriate quality and quantity of PPE.[38]

STANDARDISED DESIGN AND PROCUREMENT

Finally, consider one last fictional situation to contextualise this last stage of our discussion:

> An operating department practitioner, working in intensive care during the first wave of the pandemic, is finding her shifts difficult. She is working long hours with SARS-CoV-2 positive patients and has to wear 'airborne precautions' PPE throughout. She can't seem to get comfortable in her respirator mask, and over the last few days has noticed a persistent, painful red mark on the bridge of her nose. A colleague suggested that she should place a strip of silicone tape over her nose to relieve the pressure. The mask is more comfortable with the tape in place, but she thinks she can feel air leaking in around the mask seal whenever she takes a deep breath…

Perhaps one of the least discussed aspects of the PPE crisis during the COVID-19 pandemic is the tendency for equipment to be designed based on a prototypical (Caucasian, male) face and body shape. This derives in part from the rules of regulatory approvals, such as the requirement to test the filtration efficiency of respirator masks using a standardised head-form known as a 'Sheffield Head'.[39] While this provides a consistent basis for the quantitative evaluation of masks, it may also mean that women and staff members of non-Caucasian ethnicities experience poorly-fitting PPE, and evidence is emerging to suggest that this is the case.[40–42]

Most PPE was developed for industrial, rather than healthcare use, and although the impacts of standardised PPE design on a diverse workforce are recognised by the Trades Union Congress to affect numerous industries,[40] this issue is likely to disproportionately impact healthcare workers. In the National Health Service, women account for over three quarters of the workforce, and over 18% identify as being of black, Asian, Chinese or mixed ethnicity; a much greater proportion than in the general working age population.[43 44]

Poorly fitting PPE either renders staff unable to work in areas where AGPs are undertaken, or imposes greater risks on those who choose to do so.[34] Furthermore, the ongoing expectation to wear tight-fitting face masks for periods of more than

an hour despite HSE advice to the contrary may render those with poorer-fitting PPE more vulnerable to pressure-related skin damage.[17 45] Likewise, healthcare organisations ordering gowns in large sizes on the basis that both physically larger and smaller staff members will fit into them creates problems with both manual dexterity and large gaps, for example around the neckline, which would not be present with appropriately fitted equipment.

The absence of appropriately fitted PPE for some staff groups staff amounts to more than a shortage of supplies, it also reflects a general lack of awareness and respect for the diverse workforce of the health service. This translates into harm to the dignity of many healthcare workers and a sense of unfair treatment towards those whose safety is being inadequately accounted for. In response to the glaring practical shortcoming and moral harm of inappropriate 'standardised' PPE supplies, we call for a national effort to review and commission new and better designed PPE that more accurately suits and reflects the physical characteristics and cultural norms of the diverse workforce of the National Health Service.

CONCLUSION

In this clinical ethics paper, we have provided an overview of the recurring dilemmas related to PPE in critical care and operating theatres, in the context of the COVID-19 pandemic, and the associated crisis of inequality within the clinical workplace. While we believe that the recommendations that we have made (summarised in box 2) deserve careful consideration, it is also true that the issues we have identified require further analysis and ongoing discourse. Inequalities relating to PPE are impacting the clinical staff that society is counting on to keep us healthy; in order to avoid perpetuating these problems in this and future pandemics, it is paramount that the ethical issues created by PPE provision are given the urgent attention they deserve.

Box 2 Recommendations for research, policy and practice.

- Engaging in patient facing work without adequate personal protective equipment (PPE) is not morally required. Individuals may choose to undertake such work if they are aware of the associated risk, but they should not be pressured to do so.
- Personal purchasing of PPE can create problematic inequities. Healthcare organisations should provide sufficient PPE to render personal purchasing unnecessary, and individuals should consider the impacts of personal purchasing on others.
- Researchers should develop an ethical framework for the allocation of limited supplies of PPE to healthcare workers.
- Where appropriate PPE is not universally available, healthcare organisations must carefully consider and agree the guidelines and systems for allocating equipment.
- National bodies and professional organisations should reach consensus on PPE allocation and use so that some healthcare professionals are not unfairly given preferential treatment above others.
- Healthcare organisations should procure a diverse range of PPE to provide equitable protection to the diverse demographics of the health service workforce.
- Healthcare workers should not be expected to work outwith the intended use of the PPE that they are provided.
- New PPE should be developed that better suits and reflects the physical characteristics and cultural norms of the diverse workforce.

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