

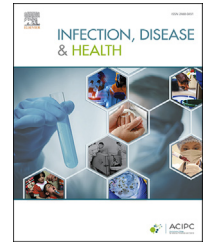


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Research paper

“One minute it’s an airborne virus, then it’s a droplet virus, and then it’s like nobody really knows...”: Experiences of pandemic PPE amongst Australian healthcare workers

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Abstract *Background:* The SARS–CoV-2 pandemic has challenged health systems globally. A key controversy has been how to protect healthcare workers (HCWs) using personal protective equipment (PPE).

Methods: Interviews were performed with 63 HCWs across two states in Australia to explore their experiences of PPE during the SARS–CoV-2 pandemic. Thematic analysis was performed.

Results: Four themes were identified with respect to HCWs’ experience of pandemic PPE: 1. Risk, fear and uncertainty: HCWs experienced considerable fear and heightened personal and professional risk, reporting anxiety about the adequacy of PPE and the resultant risk to themselves and their families. 2. Evidence and the ambiguities of evolving guidelines: forms of evidence, its interpretation, and the perception of rapidly changing guidelines heightened distress amongst HCWs. 3. Trust and care: Access to PPE signified organisational support and care, and restrictions on PPE use were considered a breach of trust. 4. Non-compliant practice

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in the context of social upheaval: despite communication of evidence-based guidelines, an environment of mistrust, personal risk, and organisational uncertainty resulted in variable compliance.

Conclusion: PPE preferences and usage offer a material signifier of the broader, evolving pandemic context, reflecting HCWs' fear, mistrust, sense of inequity and social solidarity (or breakdown). PPE therefore represents the affective (emotional) demands of professional care, as well as a technical challenge of infection prevention and control. If rationing of PPE is necessary, policymakers need to take account of how HCWs will perceive restrictions or conflicting recommendations and build trust through effective communication (including of uncertainty).

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Highlights

- First in-depth data on Australian HCWs' experiences of PPE in the SARS–CoV-2 pandemic.
 - Qualitative data from HCWs shows PPE represents more than protection from infection.
 - Responses to PPE reflect social/institutional relations of risk, trust and uncertainty.
 - PPE guidelines should consider subjective experience to support best practice.
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Introduction

The SARS–CoV-2 pandemic has seriously challenged healthcare systems across the globe. Central to managing patient volumes while ensuring ongoing functioning of health systems has been the issue of protecting healthcare workers from infection by a virus for which the routes of transmission were (and to some extent remain) uncertain. Discussions and policies around HCW protection have to a large extent focussed on the issue of personal protective equipment (PPE).

What is adequate PPE for SARS–CoV-2?

Risk of SARS–CoV-2 transmission is mitigated within hospitals and community settings by multiple measures of which PPE represents a small but significant part. These measures include a hierarchy of controls such as risk assessments, contact tracing, social distancing, administrative and engineering controls [1].

Although PPE is only one of the protective strategies undertaken within health services to limit the risk of SARS–CoV-2 transmission, it has retained an emotive focus throughout the pandemic. Beliefs and evidence around types of PPE required to prevent transmission of SARS–CoV-2 have evolved throughout the pandemic [2–9].

The type of PPE required has been discussed extensively [9, 10] as have the different attributes of various masks and other devices [11]. Even where there is agreement on what constitutes optimal PPE, supply chain disruption, economic resources, and global shortages have sometimes hindered its provision [12]. In addition, emerging studies suggest that HCW compliance is variable for complex reasons [13]. An expanding literature emerging from the pandemic shows that PPE can impair communication, cause physical discomfort, and impact interpersonal interactions and

interpretation of emotions (including making patients feel isolated or stigmatised), in addition to complicating patient assessment and management [14–18].

As the SARS–CoV-2 pandemic unfolded in 2020, it became clear that HCWs were experiencing significant stress/distress globally. This qualitative study was designed to document, through in-depth interviews, the experiences of HCWs in relation to infection prevention and control during the pandemic. A broader aim was to contribute to enabling health services to take into account (where possible) the subjective experiences of healthcare workers in the design of future pandemic responses. This paper reports HCWs' experiences of PPE in this context. While early studies of HCWs' experiences of PPE during the SARS–CoV-2 pandemic have been predominantly survey-based [12, 19], in-depth interviews provide an opportunity for exploring experiences in greater depth.

Methods

Participant recruitment and data collection

Individual, semi-structured interviews were conducted via Zoom with 63 healthcare workers working in two large tertiary hospitals in two states in Australia (September 2020–March 2021). Interviews were conducted by two university-based social scientists with extensive experience in qualitative research (Authors 2 and 3). Purposive sampling was undertaken to ensure participation from a broad range of specialties, professional and operational streams, and levels of experience (see Table 1). Participants were invited to participate by investigators at the research sites who were clinicians working in COVID-19 response (infectious diseases physicians and infection control professionals). HCWs with experience of preparing for, overseeing, or delivering care for COVID-19 patients were

Table 1 Participants by site, role, and experience.

	Total	NSW	Queensland	>10 years' experience	Managerial role
Doctors	20	7	13	19	9
Nurses	23	6	17	17	5
Allied health	9	4	5	5	2
Non-clinical ^a	8	4	4	3	1
Other ^b	3	2	1	3	1
Total	63	23	40	47	18

^a Includes administrative officers, cleaners etc.

^b Includes ambulance staff, educators.

included. Emails were sent by the site investigators to directors of relevant units involved in the COVID-19 response, inviting their department to participate in the interviews. The interview guide covered the following domains: perceptions of risk and how these manifest in clinical practice including experiences of PPE; reflections on organisational and governmental COVID-19 responses; perceptions of responsibility (individual vs collective) across person, hospital, state and society. Interviews ranged between 20 and 91 min and were audio-recorded and transcribed in full. Interviewing continued until the researchers agreed that data saturation was reached.

Data analysis

NVivo10 software was used to conduct a thematic analysis of the full interview transcripts. The thematic analysis was driven by a framework approach, which included the following steps: [1] familiarisation; [2] identification of framework; [3] indexing; [4] charting; [5] mapping and interpretation [20]. Independent coding of the data was provided initially by members of the research team (authors 1 and 3), which was then cross-checked to facilitate the development of themes (authors 1, 2 and 3), moving towards an overall interpretation of the data. Analytic rigour was enhanced by searching for negative, atypical and conflicting or contradictory items in coding and theme development. Inter-rater reliability was ensured by integrating other research team members in the final analysis, including infection control practitioners and infectious diseases physicians.

Ethics

Human research ethics approval for this study was granted at both hospital sites. All participants provided informed, written consent.

Results

Analysis of participants' accounts of their experiences of PPE in the COVID-19 pandemic identified four main themes. Table 2 shows the themes and sub-themes.

Risk, fear and uncertainty (for additional quotes see Table 3)

Participants discussed the fear and anxiety they experienced working in a pandemic environment. This emerged from the HCWs' perceived risk, both personally and professionally. Significant anxiety existed around the forms of PPE provided, its adequacy to protect them from infection, when they were (or were not) permitted to use it, ongoing supply issues, and the risk to their families if they were to become infected. Observations of other types of PPE (perceived as more protective) provided in other countries, such as hair coverings and full protective suits, were reported to increase uncertainty and anxiety. Participants described vulnerability in terms of age (with increased risk to older colleagues or relatives), and factors such as family members' medical conditions.

I was looking at videos of my friends who were in other countries, because I have a lot of classmates from uni and we're spread all over the world, and we were comparing PPEs and I was shocked with what we have. We were just having goggles, N95 mask, and also gown. Whereas with them, they are all covered with all those hazmat suits and with different layers as well and they've got all their hats and everything. Whereas I don't even have any hat at all. So, for me, I feel really, really insecure about the PPE that we had (ICU nurse Queensland P26).

Evidence and the ambiguities of evolving guidelines (for additional quotes see Table 4)

Disputed or absent evidence around PPE was reported by multiple participants as causing significant anxiety. These included questions such as: what is adequate PPE; is there airborne transmission of COVID-19; and should PPE be extended to cover airborne transmission in all cases? Interpretation of evidence was perceived as variable across different professional groups, and where evidence was dismissed by decision-makers as limited in quality (e.g. anecdotal or small studies), individual participants reported distress that potentially severe consequences were being ignored. However, participants also noted that, when

Table 2 Thematic analysis.

Theme	Sub-themes
Risk, fear and uncertainty	Personal risk - To themselves - To family and friends Professional risk - Difficult to provide usual standards of clinical care with PPE pressures - Concern about missing diagnoses
Evidence and the ambiguities of evolving guidelines.	Guideline uncertainty - Lack of evidence for a new disease - Changing evidence -rapidly evolving - Uncertainty around modes of transmission - Mistrust in guidelines Increased security where high level guidance provided
Trust and care	PPE provision as a representation of care - Organisational care (or lack of) - Organisational justice (or injustice) PPE use as a barrier to care - Delayed or suboptimal patient care because of requirements for PPE
Non-compliant practice in the context of social upheaval.	Non-compliance with PPE - Reported at individual and organisational levels - Arose from mistrust of guidelines/evidence - Balanced against the need to conserve PPE

staff were required to wear PPE for extended periods, some found it uncomfortable and expressed reluctance to use it. Several experienced staff reflected on the potential for increased risk conferred by introducing new and complex processes – such as use of a powered air purifying respirator (PAPR) – and suggested that safety was more likely to be achieved by using known PPE well.

If you go from the standard P2/N95 masks and the face shields up to the eye protection, up to the PAPRs, the tight-fitting face PAPRs or the hooded PAPRs, I mean, then people don't want to use them. Or people think they want to use them, and then when they find out how hard it is, then they decide they don't want to use them (Infectious Diseases Physician NSW P69).

Increased frequency of PPE requirements (such as SARS–CoV-2 PPE for any patient with a fever or non-specific respiratory symptoms) also raised ethical challenges for staff, as the increased frequency of PPE use was perceived to reduce their ability to respond quickly to sick patients, resulting in diagnostic (such as radiology investigations) and resuscitation delays. The apparently rapid pace of change in both evidence and the volume of different sources of guidance and evidence interpretation was reported to increase uncertainty, anxiety, and workload. Participants reported that guidelines from reputable sources provided an increased sense of security.

Trust and care (for additional quotes see [Table 5](#))

Provision of PPE was experienced by participants as a physical manifestation of organisational support and care (or lack thereof). When PPE was perceived as inadequate or unavailable, this was interpreted as representing a lack of preparedness within the healthcare system. Limits to what PPE participants were allowed to use (driven by a desire to protect supply for high-risk situations) diminished their trust in the organisation's support and willingness to protect them. Comparisons with protection provided at other sites (both within Australia and overseas) were repeatedly raised by participants and, where deficits were perceived, there was a sense of inequity or lack of care. Staff also noted perceived variations in organisational concern for their protection, depending on their role within the organisation. For example, lower levels of PPE were made available for cleaners, and doctors and allied health professionals were enabled to avoid direct patient contact to a greater extent than nurses. This led to a sense of inequity within the hospital.

So the radiologists and the cleaners and that and people like the admin officers, why they've got the union involved, because they felt that they weren't cared for, that they were being put at risk by using less quality products (Infection control nurse Queensland P3).

Table 3 Risk, fear and uncertainty.

Infection control nurse unit manager, Queensland (P03)	I came in on the Saturday, for example, to that ward that had just opened on the Friday and they moved all staff from other areas into it. [...] And when I got there, the nurses were crying, they didn't know what PPE there was, they didn't know what to do, and they were looking after the positive COVID patients. That made me just feel really like let's just go back to basics and do what we can. But then the problem was, we'd put something in place and then I'd have to go back the next day and say, "Well that was actually incorrect. There's further research..."
Paramedic, NSW (P68)	Yeah. I guess, some of the difficulty in the beginning was that it was, look, the experts are saying that it was droplet precautions, then there was some confusion and certainly conflicting information in the media about is it droplet, is it aerosol. And so it's like, "Well, if it's droplet, I think we're pretty good. But then, if it's airborne, that's a bit more concerning." I guess I took a lot more precautions than I would normally. I would leave my boots at work.
Clinical manager/doctor, Queensland (P24)	In some areas, people were being told to stay onsite if they were doing testing and not to go home to their families. People were being told, "You shouldn't go home in the clothes you've been wearing. You should wear something different under your PP&E." There was lots of discussion around the different types of masks. There were high levels of anxiety about the availability of PP&E.
ICU nurse, NSW (P53)	I think there was a heightened level of anxiety, in a way, because they're obviously highly infectious. Especially being on the ventilator, you're really vigilant about PPE. And I think as well, wearing the N95 mask that there's an element of re-breathing, so it was quite tiring as well. So, a 12-hour shift of caring for a patient with those precautions was quite tiring as well.
Emergency manager/doctor, NSW (P36)	See, a lot of people were anxious. Some were anxious about getting sick themselves, some were anxious about bringing the illness home, be it to children or parents or somebody sick in their house, which we could have done on any other given day, but for some reason this is different. Some were anxious that the PPE supply would run out and we would be forced to wear the wrong masks [...]. Some were anxious because, yeah, just because of all that uncertainty, and others were anxious because they felt they shouldn't be anxious, that they were in leadership roles, the fact that they were anxious was making them anxious.
Respiratory/ID nurse, Queensland (P21)	And the only time it became fearful for me is when I didn't understand the decisions that were being made, that seemed to be quite counterintuitive. Where one minute airborne generating procedures were, "Oh my god, don't do them," to all of a sudden, "Oh no, it's okay, we can do them now." And I never understood how they got from that decision to the other decision where I walked in one day and it was a killer procedure to the next day it's, "Oh no, we'll say it's okay because this person more than likely hasn't got it."

Participants reported that their ability to provide care for patients was limited by PPE requirements, as described above, resulting in emotional distress.

So it's really difficult to watch somebody. You can see the look on their face, thinking, "But this patient's just arrested. I now have to leave," which can take them 45 seconds, a minute to doff and then don and come back in and then recommence CPR again. So again, it's completely against our human nature as medical professionals to do that (Physiotherapist Queensland P34).

Clinical decision-making was altered to protect staff and communities, e.g. delaying scans or treatment until receiving a negative COVID-19 swab to alleviate stringent PPE requirements. While staff reported significant ethical

conflicts as a result, some also perceived this shift as signalling that the institution cared about staff safety.

They were really strict and all those things. But yeah, I think you felt comforted that they were so strict. That the health board were looking after their workers as much, as well as they were looking after anyone else. Yes, definitely, I felt, as much as it was annoying sometimes, you know what I mean, they really did look after their workers (Social worker Queensland P10).

Non-compliant practice in the context of social upheaval (for additional quotes see [Table 6](#))

Multiple participants reflected on practice variation both within their organisation and across organisations. They

Table 4 Evidence and the ambiguities of evolving guidelines.

Clinical manager/doctor, Queensland (P24)	And there was a lot of conflicting evidence. So we would get given instruction from our state Chief Health Officer, we'd be referencing the CDNA [Communicable Diseases Network Australia] guides as well, and then there'd also be information coming out, so through the various other clinician colleges, and sometimes they weren't all singing from the same hymn sheet, and so that created a level of uncertainty in people. And in our nursing staff in particular, there were high levels of anxiety about whether they would be carrying this disease home.
ID doctor, Queensland (P7)	We're relying on trusted guidelines, so that's the guidelines from the Communicable Diseases Network, the WHO [World Health Organisation], and those guidelines are then sort of endorsed by the hospital executive and by Queensland Health. One of the good things, I guess, has been that the response has been very driven from higher up on this occasion, so by executive and by the Health Department. And it's good and bad, because some of the things that they do are a little bit over the top. But on the other hand, it's good to have their endorsement of the guidelines.
ICU nurse, Queensland (P32)	But now when they're navigating a position where PPE is scarce, the stocks are short, so therefore what we really should be doing [is] being a little bit more judicious with our PPE and not using airborne PPMs [personal protective measures] [unless doing an] aerosol generating [procedure]. But hang on, the chest compressions and bag valve masks are aerosol generating. And because we run the risk of finding a patient arrested whilst wearing our PPE, if we're in the wrong PPE, we can't do anything. And often we were challenged by, "What would the Resuscitation Council say?" "Well, they say nothing."
Respiratory/ID nurse, Queensland (P20)	It's like the masks as well, that all changed. One minute it's an airborne virus, then it's a droplet virus, and then it's like nobody really knows how it's transmitted.
ID doctor, Queensland (P5)	And that feeling that it [PAPR – Powered Air-Purifying Respirators] is going to save them from something, even though it probably won't. And the trouble is, and in defence of what's happening, [...] we're finding that new information's coming out all the time. And the problem with this being drawn out for so long is that every time you turn around there's a new bit of information coming out about one thing or another. And some of it actually falls in favour of some things that were stated as incorrect early on.
Radiographer, NSW (P50)	Look, I guess hindsight would help us really well. But I think at the time there was a lot of frustration about dissemination of changing information. And so it would be this for one week. Emergency would be the example, because our radiographers have a department down in emergency. And for them, it was very much like, "Oh, as of today, no one should be wearing their uniform. Everyone should be wearing scrubs." "Okay, but that's fine. All right." "Today, all of the patients who are going to be COVID, suspected COVID, are going to be on this side of the department." And then two days later they're now on this side of the department. And all of a sudden, we don't need to use N95 masks, we only need to use surgical masks.
COVID nurse, Queensland (P21)	I'm sure people were making decisions in really good, scientific ways that did have nurses' welfare at heart, but, on the other hand, I don't think they were particularly well explained because there were times when I just went, "Hang on, how can that be one rule one day and a different rule the next and no one's actually told me this?" And I've got a daughter at home, I've got a son at home, because I need to know why I'm doing things.
Anaesthetist, Queensland (P38)	So then someone said to me, "You really don't like these things?" And I said, "No, no, actually, that's not true." I said, "PAPR suits are fine. They're fine if you've trained with them, if you've got a procedure for how to clean them, if you understand how to communicate in them, because it can be very difficult, and you appreciate what the risks are with that. But don't just, in the middle of a pandemic, start sending out equipment everywhere and think that that's going to solve the problem. The best way to do it is to do this stuff really well."

Table 5 Trust and care.

Nurse Unit Manager, Queensland (P12)	They [staff in the unit] trust me to look after them and to make sure that they've got enough PPE, to make sure that we've got enough experienced staff, that I'm not going to allocate them to work in an area with COVID positive patients if they don't feel safe or if they had an immunocompromised elderly parent at home or they're a brand new mother or a brand new father. I'll take into consideration all of those things.
Cleaning team leader (P71)	Some of the staff felt better going in with the shield on than just goggles and nursing staff would not release what they had to us cleaners. And that's the only thing that I really found. But there was other wards and other areas that you'd go to, they'd have everything there for you.
ICU nurse, Queensland (P54)	I never once was concerned that we weren't [sic] going to be left unprotected or vulnerable or to sort of fend for ourselves, like what you've seen in other parts of the world where they're making their own PPE. That was something that I never once thought that would happen to us. That was a nice feeling, to kind of know that, yeah, we're coming to work in this very unexpected and difficult time, but I don't feel like my organisation is just leaving me out on a limb to fend for myself.
ICU nurse, Queensland (P32)	So the elephant of the room was actually, if we don't get this right then we have this massive impact on our workforce, potentially. But then there was this issue with the changing resuscitation procedures, and this was before the likes of the International Liaison Committee on resuscitation, or even any of the resus councils were coming out with any sort of clear guideline, was that if first responders weren't appropriately dressed in airborne contact precautions, then chest compressions, even on their own, were dangerous, that we shouldn't be doing bag valve masking, and that, actually, we needed to go against every other instinct that's been instilled in us and walk away until we were appropriately dressed to be able to come back in, and it was about protecting yourself first.
Radiographer, NSW (P59)	It wasn't the appearance they wanted to have from the outside. They wanted it, "Everything's fine. Nobody needs a mask," appearance. And then, within a week, we got an email saying that masks were compulsory throughout the hospital every day, eight hours a day. And it just really annoyed me at the time that I had been told, "No, you can't do that for your own, I suppose, mental state. We're not wasting any extra hospital PPE." And then three days later that was flipped on its head. But there was just so many instances of things like that where something wasn't allowed and then all of a sudden you couldn't possibly not do it.

described non-compliance, by themselves and others, with recommendations, predominantly involving over-use of PPE.

And then I find out several weeks later that, "Oh yes. Actually we've been using level three masks all the time because we didn't believe what you said about the level two masks being effective" (Clinical Manager Queensland P24).

At an organisational level, participants observed non-compliance with state policy and some key clinicians observed that it was "kept under the radar" in state level meetings. At an individual level, participants described colleagues' intentional or accidental breaches of PPE guidelines – e.g. using an N95 mask when a surgical mask was considered adequate according to guidelines. PPE non-adherence emerged from an environment of mistrust, personal perceptions of risk, and organisational uncertainty, despite communication of evidence-based guidelines. Issues of collective vs individual (staff member/patient) good were considered by multiple participants. For example, there was recognition of the need to conserve PPE on a wider level, but individual practice of higher use, often supported by local Infectious Diseases specialists, to protect staff.

Across these themes, PPE appeared as focal point for the emotional demands of providing healthcare during a pandemic: anxiety, fear and uncertainty about risk, evidence, changing roles and organisational care and structures. In many participants' minds the PPE provided seemed to symbolise the levels of care, support, protection from risk and uncertainty, and organisational justice (or injustice).

Discussion

This study extends previous qualitative work on HCW experiences in the COVID-19 pandemic, including (but not limited to) issues around lack of supply, beliefs about efficacy, workplace culture and training issues, variable compliance, rapidly changing guidelines, anxiety about personal risk, and the impact of PPE on their relationships with and ability to care for patients [18,21]. Novel data are emerging such as strategies to "humanise" PPE [22]. The COVID-19 pandemic is providing a unique opportunity to examine our relationship with infection control strategies and how to use them in both an effective and humane manner.

Table 6 Non-compliant practice in the context of social upheaval.

Infection control nurse, Queensland (P2)	I think the biggest sticking point is definitely personal protective equipment. So, some people just want to wear all PPE all the time or they want to wear a mask for airborne precautions, when only a mask for droplet precautions is required, they want to go over and above just in case.
Clinical manager/doctor, Queensland (P24)	Although, having said that, it doesn't matter how many guidelines you publish, you will always find that sometimes, different practices, so work as imagined, by me as a clinical supervisor and the work that actually happens, there's often a bit of a disconnect. And then I find out several weeks later that, "Oh yes. Actually we've been using level three masks all the time because we didn't believe what you said about the level two masks being effective."
ID doctor, NSW (P35)	We kind of kept quiet at [hospital], in some of those forums, about the fact that we've been using N95 masks anyway, because our colleagues elsewhere haven't.
ID doctor, NSW (P69)	It was obviously very difficult because there was a lot of disagreement in general, and this was a big feature at the beginning, about what levels of PPE were supposed to be worn. And it was difficult in many ways because at [hospital] we just decided on our own and we didn't listen to the state. And, in fact, we used airborne transmission precautions rather than just droplet for all certainly proven patients. I can't remember if we ever used them for suspected patients now, but definitely proven we did. Whereas in the absence of aerosol generating procedures, there was a push away from that across the state, but we didn't do that.
ICU nurse, NSW (P53)	And so, for instance, I noticed a nurse that went in a room with a surgical mask and an N95 on top of it, for some reason just to grab one thing, no other PPE on, and, for me, I was so mortified because I was like, "Well, you're not only just putting yourself at risk, you're putting all of your colleagues at risk and your family and everyone."
Emergency nurse, Queensland (P55)	We were able to, yes. And in most circumstances I did wear a N95 mask. It was generally the more senior doctors who would say, "No, you don't need that. Why are you putting that on? You're just wasting our PPE." And often my response is, "Well, I'll be in the room for a good hour and this lady's coughing and spluttering everywhere, so, doing my own risk assessment, that's probably fair we wear the N95." It's not like I'm going to go in and out and change it three times, so we're just using one mask as opposed to three.
Emergency doctor/manager, Queensland (P44)	Now, a particular brand, you can't go and buy one million Smith and Nephew N95 masks. That would be easy. You could if you did fit tests. But out of that fit test you've got to hold about five or six different brands because the shape of your face is different. So what that's going to do is, as we make each individual feel safer, the logistic and health cost just blows out in the back end. But the risk is, if you don't do that they don't come to work.
ID doctor/manager, Queensland (P01)	Whereas I think the state, on a national and state level, they're also considering the ability to have PPE stocks on the long term, ability to manage people in ICU or the ward who needed an N95 masks.
ICU doctor, Queensland (P57)	I know that some of the management people were suggesting using some of the N95 because they ran out of surgical masks. And so they wanted to keep doing elective surgery, but they proposed using the highest standard mask, the N95 masks to do elective surgery. And when people are making those sorts of decisions, you're like, "Well, if someone dies in two months' time because we've run out of those high-quality masks, because you wanted to use them for elective surgery, well, that's not very good then."

From our data, what might seem at first to be issues of evidence or supply emerge as much more complex problems. Pandemic PPE is not merely a technical or rational challenge. Decisions made about PPE by organisations can (intentionally or inadvertently) convey messages about organisational values and priorities, impacting on staff emotions and trust in the organisation. In a pandemic context, building trust is essential to counterbalance shifting evidence and inconsistent communication. It is important to recognise that PPE arguments are not just about PPE, but represent a material indication of a wide variety of issues, including, *rationing* (of limited supplies),

power relations (i.e. providing a sense of less or more 'important' workers), and *mistrust* (i.e. not believing the evidence). In this sense, PPE is situated within a social field which becomes critical to its acceptance and effective use. This is not simply a matter of context, but rather, how demands for technologies become 'irrational' and/or 'competitive' during a pandemic involving a novel and changing virus.

This study provides an important evidentiary basis for considering how to approach PPE discussions and decision-making in future pandemics. It points to the importance of recognising that fear and anxiety drive anger and

resentment about PPE, and of considering the need for organisational justice in PPE decision-making, and organisational support for HCWs experiencing distress. This study also raises considerations for ongoing and future management of pandemics, in terms of the ways health services might approach staff communication and support as PPE recommendations change in response to new viral variants, and as vaccination alters the balance of risk to HCWs. The study demonstrates how changes to policies and practices can engender anxiety and confusion. Acknowledging and responding to these anticipated reactions will enhance future health service strategies to support HCW wellbeing.

Participants in this study who described strong leadership in their units, and previous training and knowledge in Infection control practices, appeared resilient in the face of changing risks. Important outcomes from this pandemic experience have been the building of health service knowledge, and policies, around the escalation of PPE requirements in response to pandemic outbreaks, and strategies to optimise patient assessment and management while using appropriate PPE. However, it may be that training and building trust will be more effective when separated, in time, from the highly charged pandemic environment.

Conclusions

In the context of the SARS-CoV-2 pandemic, PPE has come to represent more than personal protection, including also personal control, organisational protection, justice and care. Debate that focuses solely on rapidly moving and often nebulous evidence is likely to persist endlessly without improving HCW safety. In an uncertain global environment, it may be that no level of PPE will feel 'safe enough' to all HCWs. It is important to acknowledge risk, fear, uncertainty, and the need for increased organisational support and effective communication in the form of both PPE guidelines and supplies and other forms of interventions to support staff and organisational resilience.

Ethics

Human research ethics approval for this study was granted by The Prince Charles Hospital Human Research Ethics Committee (66340) and Western Sydney Local Health District Human Research Ethics Committee (2020/ETH01803).

Authorship statement

Jennifer Broom: Conceptualization; Formal analysis; Writing – original draft; Writing – contributed to revising drafts of the article; approved the final article. **Alex Broom:** Conceptualization; Formal analysis; Supervision; Investigation; Methodology; Writing – original draft; Writing – contributed to revising drafts of the article; approved the final article. **Leah Williams Veazey:** Data curation; Formal analysis; Investigation; Project administration; Writing – original draft; Writing – contributed to revising drafts of the article; approved the final article.

Penelope Burns: Conceptualization; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article. **Chris Degeling:** Conceptualization; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article. **Suyin Hor:** Conceptualization; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article. **Ruth Barratt:** Conceptualization; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article. **Mary Wyer:** Conceptualization; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article. **Gwendolyn L. Gilbert:** Conceptualization; Supervision; Funding acquisition; Writing – review & editing; Writing – contributed to revising drafts of the article; approved the final article.

Conflict of interest

Lyn Gilbert is Section Editor of Infection, Disease and Health but played no role in the peer review or editorial decision-making of the manuscript. The authors declare no other conflict of interest.

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