

Work-based concerns of Australian frontline healthcare workers during the first wave of the COVID-19 pandemic

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Australia adopted an early public health response limiting community transmission of the SARS-CoV-2 virus that worked to comparatively limit the levels of acute hospitalisation and mortalities seen in many other countries. However, Australia has not been immune to spikes in community transmission. As of 4 August 2021, Australia has recorded just under 35,000 SARS-CoV-2 positive cases and 925 deaths.¹ The majority of cases were recorded during two distinct periods in 2020: the first in March/April and the second in July through September. The second spike of SARS-CoV-2 positive cases were primarily isolated to Victoria.¹

As of 12 May 2021, over 3,500 healthcare workers in Victoria had tested positive to SARS-CoV-2, representing around 17% of the state's cases.¹ Some 70% of these infections in healthcare workers were acquired through work.²

Internationally, healthcare workers are three to four times more likely to contract SARS-CoV-2 than members of the public.³ Those on the frontline also have an increased risk of anxiety,³⁻⁸ depression,^{3,5} insomnia,^{3,5,7-9} severe stress reactions and secondary trauma.^{10,11} Some studies are reporting declines in job satisfaction⁶ demoralisation and staff burnout.^{12,13} Limited access to personal protective equipment (PPE) has been suggested as a primary driver of increased stress and anxiety, with increased risk of exposure in the workplace being associated with concern about taking the infection home to family members.^{4,14-16} These factors have been corroborated by larger survey-

Abstract

Objective: This research sought to gauge the extent to which doctors, nurses and paramedics in Australia were concerned about contracting SARS-CoV-2 during the country's first wave of the virus in April 2020.

Methods: Australian registered doctors, nurses and paramedics (n=580) completed an online questionnaire during April 16–30, 2020 (period immediately following the highest four-week period (first wave) of SARS-CoV-2 confirmed cases in Australia).

Results: During April 2020, two-thirds of participants felt it was likely they would contract SARS-CoV-2 at work. Half the participants suggested Personal Protective Equipment (PPE) supplies were inadequate for them to safely perform their job, with two-thirds suggesting management advised them to alter normal PPE use. One-third of participants suggested they were dissatisfied with their employer's communication of COVID-19 related information.

Conclusions and implications for public health: After reports of PPE shortages during Australia's first SARS-CoV-2 wave, and suggestions access to PPE was still limited during Australia's second wave five months later, we must forecast for this and future pandemics ensuring adequate access to PPE for frontline healthcare workers. Further, ensuring consistent and standardised pathways for communication to staff (acknowledging the reality that information may rapidly change) will help alleviate frustration and anxiety.

Key words: COVID-19, frontline healthcare, infectious disease, workplace communication, Personal Protective Equipment

based studies in China,¹⁷⁻¹⁹ Pakistan,²⁰ Turkey²¹ and Saudi Arabia.²²

One study surveyed 637 primary healthcare nurses gauging areas of support that were perceived to be lacking during April 2020 (i.e. during Australia's first SARS-CoV-2 spike), which included access to PPE, effective communication from management and access to psychological support systems.²³ While typically reflective of data generated from frontline healthcare responders in other countries, few studies have sought to delineate between COVID-19 pandemic response challenges and experience of

different frontline healthcare response personnel. Understanding differences in perspectives across healthcare roles could provide a more specific understanding of challenges more or less prevalent across different clinical working roles.

The study sought to address three research questions. During the initial outbreak of SARS-CoV-2 in Australia:

1. To what extent were doctors, nurses and paramedics concerned about contracting SARS-CoV-2?
2. What factors exacerbated concerns?

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3. Did the extent of concern differ between doctors, nurses and paramedics?

Methods

Study design

This study utilised a mixed-methods embedded design. Participants completed an anonymous online questionnaire disseminated via a multi-modal recruitment strategy utilising both convenience and subsequent snowball sampling through social media. Initial convenience sampling was conducted using targeted social media sites, including a range of Facebook groups for Australian paramedics, doctors and nurses (e.g. Australasian College of Paramedicine, World Association of Disaster and Emergency Medicine, The Royal Australian College of General Practitioners, College of Emergency Nursing Australasia). Approval was sought from these sites to post an invitation to participate which included a link to the online survey. Once participants clicked on this link, they were directed to the survey delivered through Qualtrics software (Provo, UT). At the close of the survey, participants were encouraged to share or forward the social media advertisement, including the online link to the survey, to others they felt may be interested in participating. The survey was active for two weeks between 16–30 April, 2020 (i.e. period immediately following the highest four-week period (first wave) of SARS-CoV-2 confirmed cases in Australia).¹ A sample size calculation undertaken in Qualtrics (Provo, UT) suggested $n=384$ responses would be representative of the study population (95% confidence level; 5% margin of error). This study received ethics approval from the Edith Cowan University Human Research Ethics Committee (#2020-01397).

Participants

Prospective participants included any licensed medical doctor, nurse (or midwife) or paramedic currently working within the Australian healthcare system during the survey period.

The survey

The survey tool was created by members of the research team for the purposes of the research. Prior to dissemination the tool was assessed by a panel of nine clinicians (equal spread of doctors, nurses and paramedics)

to provide feedback with respect to face and content validity. Following entry into Qualtrics, it was then further piloted amongst the same sample for useability and a final round of feedback prior to finalisation. The final survey was separated into four key sections: (1) demographic factors; (2) concerns regarding contracting and spreading of SARS-CoV-2; (3) concerns regarding PPE access; and (4) satisfaction with work-place based communication. Response to survey questions occurred via mandatory questions with dichotomous or seven-point Likert scale responses, as well as optional open-ended questions. Prior to beginning the survey participants viewed an information letter and were informed that by proceeding they were providing informed consent for the data to be used for the purposes of the research. Survey questions are provided in Supplementary File 1.

Data analysis

Survey data was exported into IBM SPSS Statistics version 24.0 (SPSS Inc., Chicago, Ill., USA). Chi square and Fisher's Exact tests were utilised to compare differences in proportions between categorical variables. Independent samples t-tests and One-Way ANOVA analyses were utilised to compare differences in means of continuous variables between groups.

A coding protocol was developed to identify key themes within the descriptive, qualitative data provided through the survey's open-ended questions. A grounded theory approach was deemed appropriate given its ability to help researchers understand, develop and utilise real-world knowledge and experiences to develop new theory and understanding.²⁴ The coding protocol included manual coding by two independent researchers to identify relevant themes. Inter-coder agreement was assessed using the kappa coefficient, and agreement was high for all coding (0.95). Discrepancies were resolved through discussions until 100% agreement was achieved.

Results

A total of 735 participants began the questionnaire. There were 150 participants who did not complete the survey in full, but 95 (of these 150) did provide demographic data. There were no differences for age of respondents ($p=0.594$), gender ($p=0.277$) and clinical role (i.e. paramedic vs. nurse

vs. doctor) ($p=0.155$) between the 95 participants who did not complete the survey in full (but did provide demographic data), and the 585 participants who did complete the survey in full. Thus, we deemed this data missing completely at random and therefore appropriate to not include in resultant analyses. Of the 585 participants who answered the questionnaire in full, five were removed as they were not paramedics, nurses or medical doctors, leaving a total of 580 participants to be included.

Participants consisted of 82 medical doctors, 237 nurses, midwives or nurse practitioners (hereafter referred to as nurses), and 261 paramedics. The entire sample was 72% female, most heavily influenced by the nursing sub-sample which was 95% female. The paramedic sub-sample was 56% female, and medical doctor sub-sample 61% female. All paramedics worked for Australian ambulance services, while medical doctors worked either in a hospital (73%) or General Practice (GP) clinic (27%), and nurses worked either in hospital (68%), GP clinics (17%), aged care facilities (7%) or in community care roles (8%). The mean age of the entire sample was 41.2 years (± 10.8 years). Paramedics ($\mu=37.2$ years) were significantly younger than nurses ($\mu=44.6$ years; $p<0.001$) and medical doctors ($\mu=44.1$ years; $p<0.001$). Similarly, while the mean years of experience working in their primary profession for the entire sample was 12.7 years (± 9.2 years), paramedics ($\mu=9.8$ years) had less years of work experience than nurses ($\mu=15.3$ years; $p<0.001$) and medical doctors ($\mu=14.7$ years; $p<0.001$).

Concerns over contracting and exposing others to SARS-CoV-2

Of the entire sample, 98% suggested they were continuing to work during the COVID-19 pandemic. At the time of completing the survey, 21% reported they had been tested for SARS-CoV-2. Medical doctors were more likely to report being tested compared to both nurses (40% vs. 22% respectively; $p=0.001$) and paramedics (40% vs. 15% respectively; $p<0.001$). Nurses were also more likely to report that they had been tested compared to paramedics (22% vs. 15% respectively, $p=0.022$). Of those that were tested, no participant reported a positive test result.

Participants were more likely to suggest they had been exposed to risk of SARS-CoV-2 at work compared to outside of work (53% vs.

14% respectively; $p < 0.001$). No professional group was more likely to report probable exposure to the SARS-CoV-2 virus at work than any other professional group. Almost two-thirds of participants felt it was likely they may contract the virus at work compared to one-sixth suggesting they feared contracting the virus outside of work (63% vs. 16%; $p < 0.001$).

More than half (53%) of all participants were personally concerned about becoming infected with SARS-CoV-2, with the level of concern not differing across the professional groups. Of greater concern for participants than personal infection were colleagues being exposed to patients with the virus (71% of participants), fear of exposing their own patients to the virus through transmission (63% of participants) and fear of exposing members of their household (80%) ($p < 0.001$ for all analyses).

While 40% of participants felt it was likely other members of their household would contract the virus, only 26% ($n = 151$) had undertaken measures to self-isolate from their family. Medical doctors were more likely to report they had self-isolated from family compared to paramedics (35% vs. 20%; $p = 0.018$). Of these 151 participants, 146 responded to the open-ended textbox question asking in what way they were self-isolating. Self-isolating within separate bedrooms and using different bathrooms within the same household was commonly reported ($n = 68$). A further 64 participants reported that they had moved to a location away from their primary household or had members of their household move out:

I moved away from my husband and son. I'm now living alone and not visiting them. (Nurse)

I haven't hugged my family in months. (Paramedic)

My children are currently in isolation with their grandparents. (Nurse)

Access to Personal Protective Equipment

Participant perceptions of access to PPE can be found in Table 1. Paramedics were less likely to suggest access to PPE was causing safety concerns compared to nurses ($p < 0.001$) or doctors ($p < 0.001$). Nurses were less likely to suggest PPE was causing safety concerns than medical doctors ($p < 0.001$). Paramedics were less likely to suggest access to PPE was creating undue stress and/or anxiety than

Table 1: Australian frontline healthcare workers perceptions of access to PPE and associated impacts by professional group.

		% Disagreed with statement			
		Doctors (n=82)	Nurses (n=237)	Paramedics (n=261)	Total sample
1	Current access to PPE is adequate for me to safely perform my job	72% ^{b,c}	49% ^{a,c}	39% ^{a,b}	48%
2	I feel just as safe performing my job now as I did prior to COVID-19	90% ^{b,c}	75% ^a	79% ^a	79%
3	I am confident my workplace has sufficient PPE stock on hand to protect staff if there is a rapid surge in patients with possible COVID-19	87% ^{b,c}	71% ^a	72% ^a	74%
4	Access to PPE is not creating undue anxiety or stress for me personally	77% ^{b,c}	59% ^a	52% ^a	58%
5	Access to PPE is not creating undue anxiety or stress for colleagues in my workplace	87% ^{b,c}	71% ^a	68% ^a	72%
6	I am confident my workplace is doing everything possible to protect my well-being at the present time	68% ^{b,c}	44% ^a	43% ^a	47%

Notes:

Pearson Chi-Square test suggested remained statistically significantly different ($\alpha = 0.05$) even after administration of Benjamini-Hochberg procedure for multiple comparisons²⁵ compared to doctors^a, compared to nurses/midwives^b, compared to paramedics^c

nurses ($p = 0.034$) and doctors ($p < 0.001$). Nurses were also less likely to suggest PPE was creating undue anxiety and/or stress than medical doctors ($p = 0.001$). Doctors felt less safe to perform in their job given current perceived PPE access compared to paramedics ($p < 0.001$) and nurses ($p = 0.001$).

Only 15% ($n = 87$) of all participants were confident their workplace had adequate PPE stock should a surge in SARS-CoV-2 positive patients occur. Doctors were less confident than nurses ($p = 0.05$) and paramedics ($p < 0.001$). Nearly half (47%) of all participants did not feel their workplace was doing everything possible to protect their wellbeing, with doctors less confident than nurses ($p < 0.001$) and paramedics ($p < 0.001$).

Participants were also asked which of six forms of PPE they believed were in short supply at their workplace (Table 2). Face masks and face shields were the top two items participants stated were in short supply. On the other hand, only 16% of total participants indicated that gloves were not readily available.

When asked what other forms of PPE were not in adequate supply in their workplace not depicted in Table 2, 133 participants provided

a response, identifying tyvek suits ($n = 57$), sanitary wipes ($n = 28$), shoe covers ($n = 7$) and disinfectant to clean equipment ($n = 15$).

Participants reporting that face masks were in short supply elaborated further:

We were being provided with traditional surgical masks when N95 respirators and would have been more appropriate. (Nurse)

I'm being offered surgical masks only. As I am working closely with COVID positive patients N95 is far more appropriate. (Nurse)

Workplace management had asked 65% of participants to alter their typical usage of PPE due to shortages and/or rationing. No one professional group was more likely to be asked this compared to another. Of these participants, 353 (94%) provided a response to an open-ended question enquiring in what way they had been asked by management to alter their usage of PPE; 155 participants reported that they had been asked to extend use of PPE passed standard guidelines; most commonly face masks ($n = 123$), followed by goggles ($n = 19$), tyvek suits ($n = 18$), and gloves ($n = 2$).

A total of 213 (56%) participants had been told by their workplace management to use alternate forms of PPE. Face Masks

Table 2: Number of participants by professional group indicating their workplace was in short supply of differing PPE aspects.

	Doctors (n=82)	Nurses (n=237)	Paramedics (n=261)	Total (580)
Gloves	24 (29%)	53 (22%)	14 (5%)	91 (16%)
Gowns	54 (66%)	121 (51%)	117 (45%)	292 (50%)
Goggles	41 (50%)	95 (40%)	55 (21%)	191 (33%)
Face masks	70 (85%)	160 (68%)	153 (59%)	383 (66%)
Face shields	61 (74%)	135 (57%)	148 (57%)	344 (59%)
Hand sanitiser	44 (54%)	115 (49%)	131 (50%)	290 (50%)

(e.g. surgical masks instead of N95 or P2, or no surgical masks at all) were the most commonly cited item (n=126), followed by use of aprons instead of tyvek suits (n=58), rationing hand sanitiser (n=23) and gloves (n=7).

One nurse who was testing potential SARS-CoV-2 patients in a car-park based testing center reported that “when Tyvek suits ran out we changed to plastic aprons that blow in the breeze and don’t even cover your legs.” A doctor participant was “told to not wear surgical masks because I was ‘inciting fear.’ When I refused to take it off, management got involved and rang me at home and I was told off by our surgical manager.”

PPE training

Participants were also asked if they had undertaken training to safely don and doff PPE in the previous year (i.e. from April 2019); 36% reported they had not. Paramedics had the largest proportion of participants who had not undertaken training in the past year (44%), followed by medical doctors (37%) and nurses (27%). The proportion of paramedics who had not undertaken training was significantly larger than nurses ($\chi^2=15.511$, $p<0.001$).

Use of unregulated (homemade) forms of PPE

Just under one-fifth (18%) of participants reported utilising unregulated forms of PPE, with 32% suggesting they had observed colleagues doing the same. Of the 103 participants who had utilised unregulated or non-traditional forms of PPE, the most commonly cited form was makeshift face masks followed by makeshift surgical caps, suits/gowns/aprons, and face shields. Participants had also sourced their own hand sanitiser and shoe covers. The problem was highlighted in one open-ended response: “Once we ran out of our (small) pandemic kit stock, everything except masks, gloves and hand sanitiser have been improvised.”

Satisfaction with workplace practices regarding handling of COVID-19

More than one-third (34%) of participants were dissatisfied with their employer’s communication to staff throughout the COVID-19 pandemic. Doctors were more dissatisfied on average than both paramedics ($p=0.006$) and nurses ($p=0.019$). Participants were asked if they would like to make a

comment on their employer’s communication to staff pertaining to the COVID-19 pandemic; 250 participants elected to provide a response. The most prominent theme was a lack of information coming through from employers (n=72) surrounding COVID-19 policies or procedures. This frustration was reflected in a comment from a nurse participant who highlighted that “Media [are] informed of changes before staff - repeatedly!”

In contrast however, there were a number of participants (n=62) who reported they had received too much information and were experiencing information overload. This sentiment was reflected by the comment of a doctor participant who reported concern regarding “... confusing and contradictory information with changes to criteria on a daily basis causing confusion if you haven’t had time to catch up with changes.” Another doctor commented that “Communication is disjointed and uncoordinated, there are multiple messages being sent from different departments multiple times a week, and via different channels. It is difficult to know what is official and what is not.”

The importance of empathy and communication style was also acknowledged. While there were participants who commended their employer for their approach to communication during the pandemic (n=47), a number of participants also reflected on the uncaring and unempathetic style of communications coming from their manager or employer, some even highlighting that they believed some communications were dishonest (n=50).

Communication has been aimed at pacification rather than transparency. It is both humiliating and shows how out of touch admin are compared to frontline. Please don't bother with the pick me up message of hope - I would rather you send my staff appropriately fitted PPE! Even thinking about it makes me angry. (Doctor)

Our employer is trying to appear caring, however, it feels very false when other information pertaining directly to our department is withheld and staff are now in fear of their jobs and their health. (Nurse)

Discussion

This research has identified that during the first wave of the COVID-19 pandemic in Australia, doctors, nurses and paramedics had

three key work-based concerns: contracting and spreading SARS-CoV-2 to patients, colleagues and household contacts; access to PPE; and communication from their employer.

Of note is that participants were more concerned about colleagues contracting the virus than themselves personally. It is unclear whether this response is altruistic in nature and healthcare workers’ concern for colleagues outweighed their own, or whether participants were more confident in their own navigation and adherence to safety standards than their colleagues, thus inflating concern for colleagues being at higher risk of infection. Regardless, fear of infectious disease transmission among healthcare workers during pandemic response (and COVID-19 response specifically) is well documented.^{6,10,14,20} Fear of spreading the virus to family members remains one of the primary concerns expressed by frontline healthcare workers when working during pandemics.²⁶⁻²⁸ While potentially problematic for some, self-isolation from family during pandemics could be a method to alleviate concern among frontline healthcare workers of transferring infectious disease to family members during pandemics. Such decisions will likely need to be made in consideration of multiple factors, but given the clear and documented burden and risk of decline in psychological wellbeing for frontline healthcare workers during pandemics,^{29,30} isolating from family members could help alleviate this particular facet contributing to anxiety and/or stress.

Further, ensuring adequate access to PPE would undoubtedly serve to alleviate concerns among frontline healthcare workers. This is not the first study to suggest access to PPE was of substantial concern to frontline healthcare workers during the COVID-19 pandemic,³¹⁻³⁶ and also corroborates previous research that these concerns were felt during Australia’s first wave of community transmission.²³ Among our sample, of interest was that doctors were more concerned about shortages of PPE compared to paramedics. Half of all participants suggested PPE access was inadequate to safely perform their job, with the biggest shortages being face mask and face shield protection. Lack of PPE access led some to appropriate unregulated and/or improvised forms of PPE, such as makeshift face masks and surgical caps. Torso and leg protection (i.e. gowns, suits, aprons), hand sanitiser and goggles were also suggested to be in short supply. However, gloves were

only identified as being in short supply by 16% of the sample. While gloves are typically included in reports of limited access to PPE among frontline healthcare workers combatting SARS-CoV-2,^{32,37} gloves were also identified as being more accessible than other forms of PPE during the first month (i.e. March 2020) of the COVID-19 pandemic in the United States of America (USA).³⁸ Across the entire sample, there was little confidence workplaces would have access to adequate PPE should a further surge in positive cases occur. Interestingly, months after data was collected for this study, reports emerged again suggesting inadequate access to PPE stocks during the country's second wave (primarily isolated to Victoria).³⁹ This included an open letter signed by 3,587 Australian healthcare workers in August–October 2020 (five months after the present study's data collection) calling for better respiratory protection.⁴⁰

Following the H1N1 influenza pandemic in Australia in 2009, whereby more than 37,000 confirmed cases were identified,⁴¹ research suggested PPE access was inadequate to effectively keep frontline healthcare workers and their patients safe.^{42,43} It has also been suggested that the Australian National Medical Stockpile may not have been adequately restocked following H1N1.⁴⁴ The 2019–2020 Black Summer bushfires further reduced Australia's stocks of PPE in attempts to reduce the impacts of bushfire smoke.⁴⁵ Ensuring adequate PPE stockpiles and improving global supply chains will be imperative to ensure adequate PPE access in the future.

While it is clear PPE acts as a barrier to infection, of note is that while interaction with SARS-CoV-2 positive patients is suggested to be the primary factor contributing to frontline healthcare workers being at increased risk of exposure,⁴⁶ interaction with patients is not the only form of potential exposure. Exposure to infected co-workers is also a risk. Noncompliance with PPE and social distancing guidelines in nonclinical work areas (e.g. break rooms) has led to infections among healthcare workers.⁴⁷

Almost two-fifths (36%) of participants suggested they had not received PPE training in the previous year (i.e. since April 2019). This is not the first study to suggest that in the early months of the COVID-19 pandemic frontline healthcare workers felt inadequately prepared and undertrained when it came to donning and doffing PPE.^{40,48–49} The World

Health Organization advises PPE training should blend both theory and practice (including practical demonstration and application).⁵⁰ However, given the large resource allocations required to administer this form of training, other research suggests video-based tutorials⁵¹ or virtual simulations⁵² can also be efficacious. One small study directly compared video-based to instructor-led PPE training and found no differences in competency of donning and doffing PPE among medical students one month after training.⁵³

Almost two-thirds (65%) of the sample suggested they had been advised to modify typical use patterns of PPE while on shift in the forms of extended use (i.e. for longer periods across multiple patient interactions) or altered forms of PPE potentially providing less protection (e.g. surgical masks instead of N95 masks). While it is unclear the extent to which appropriate PPE usage among participants differed to PPE COVID-19 usage guidelines, altered forms of PPE can place clinicians at higher risks of infection. One study found that while surgical face masks and other forms of face protection do provide some defense against SARS-CoV-2 transmission, N95 respirators provide far superior filtration efficiency (following fit testing to ensure a tight seal).⁵⁴ Given this, it is not surprising data from this study (and others) suggest communications from management informing clinicians of altered PPE usage in response to shortages can be met with anxiety and frustration,^{55–57} particularly if organisation guidelines differ from advice provided from federal or state health departments.⁵⁸

More than one-third (34%) of participants suggested they were dissatisfied with the communication from management surrounding processes and protocols in response to COVID-19, with doctors being more dissatisfied than both nurses and paramedics. The reasons for this frustration seemed to come from polar opposites, with some suggesting not enough information was being filtered through in a timely manner, while an almost equal proportion suggested too much information was coming through too frequently, making it near impossible for clinicians to determine the most pertinent pieces of information. Other research conducted in June–September 2020 (two to five months following data collection for the present study) similarly suggested many emergency frontline healthcare

workers felt workplace/organisation communication lacked clarity and oftentimes was not timely.³⁶ Interestingly, *reliable* and *fast sharing* of information have been outlined as two crucial components of crisis management for healthcare teams during the COVID-19 pandemic.⁵⁹ While reliability of information may be more difficult to address, given that (particularly during the early stages of a pandemic) information is likely to rapidly evolve as public health authorities learn more about the virus (certainly the case of the early months of COVID-19), pathways through which information is shared could potentially be streamlined. Many participants suggested they received pertinent information and updates via multiple avenues including emails, text messages, memos and the media.

Limitations

One of the inherent strengths of this research was the timing in which data collection was undertaken, being within the two weeks immediately following the highest four-week period of Australia's first wave of SARS-CoV-2 confirmed cases. This facilitated the capturing of participant perspectives at a crucial period free of memory recall bias.⁶⁰ However, this study is not without limitations. The sample consisted of more females than males (72% female), most heavily influenced by the sample of nurses (95% female). However, according to the Nursing and Midwifery Board of Australia, the proportion of female nurses within our sample is somewhat reflective with females comprising 89% of enrolled and/or registered nurses in Australia.⁶¹ Convenience and snowball sampling was utilised for participant recruitment and it is possible voluntary self-selection bias may have led to some recruitment bias. While this may potentially limit the generalisability of study findings, the issues derived from this research study are clearly prevalent among a not insubstantial proportion of frontline healthcare workers, particularly given our data is reflective of other study findings both within²³ and outside of Australia.^{4,14,16,18–21} Further, we acknowledge this research did not measure actual workplace conditions, but instead measured perception of workplace conditions. The extent to which participant perceptions of workplace conditions are truly reflective of reality is unclear. Future research could compare healthcare worker perceptions to objective measurement of factors such as PPE stocks, as well as to actual

exposure to SARS-CoV-2 infected patients. Lastly, while this research focused on the frontline healthcare worker professions of doctors, nurses and paramedics, other frontline healthcare professions and non-clinical workers (e.g. clerical staff, cleaners, security guards) are also potentially exposed to SARS-CoV-2 operating within their roles in the healthcare system. Future research would benefit from exploring the concerns of these additional cohorts.

These limitations notwithstanding, it is clear a not insubstantial proportion of our frontline healthcare worker doctors, nurses and paramedics feared exposure to the virus during the first wave of the COVID-19 pandemic in Australia. Lack of access to PPE, to the extent that some clinicians chose to don homemade PPE alternatives, seemed the prominent contributing factor. These concerns were at times further exacerbated by poor communication from management surrounding updated information and protocols. Medical doctors seemed to be consistently more concerned about exposure to SARS-CoV-2 infection, access to PPE and communication practices from management than nurses, and particularly paramedics.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary File 1: Online survey questions.