


## Psychological well-being of Australian hospital clinical staff during the COVID-19 pandemic

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**Abstract.**

**Objective.** This study assessed the psychological well-being of Australian hospital clinical staff during the COVID-19 pandemic.

**Methods.** An anonymous online cross-sectional survey was conducted in a large metropolitan tertiary health service located in Melbourne, Australia. The survey was completed by nurses, midwives, doctors and allied health (AH) staff between 15 May and 10 June 2020. The Depression, Anxiety and Stress Scale – 21 items (DASS-21) assessed the psychological well-being of respondents in the previous week.

**Results.** In all, 668 people responded to the survey (nurses/midwives,  $n = 391$ ; doctors,  $n = 138$ ; AH staff,  $n = 139$ ). Of these, 108 (16.2%) had direct contact with people with a COVID-19 diagnosis. Approximately one-quarter of respondents reported symptoms of psychological distress. Between 11% (AH staff) and 29% (nurses/midwives) had anxiety scores in the mild to extremely severe ranges. Nurses and midwives had significantly higher anxiety scores than doctors ( $P < 0.001$ ) and AH staff ( $P < 0.001$ ). Direct contact with people with a COVID-19 diagnosis ( $P < 0.001$ ) and being a nurse or midwife ( $P < 0.001$ ) were associated with higher anxiety scores. Higher ratings of the health service's pandemic response and staff support strategies were protective against depression ( $P < 0.001$ ), anxiety ( $P < 0.05$ ) and stress ( $P < 0.001$ ).

**Conclusions.** The COVID-19 pandemic had a significant effect on the psychological well-being of hospital clinical staff, particularly nurses and midwives. Staff would benefit from (additional) targeted supportive interventions during the current and future outbreaks of infectious diseases.

**What is known about the topic?** The outbreak of COVID-19 is having, and will have, a considerable effect on health services. No Australian data about the effect of COVID-19 on the psychological well-being of hospital clinical staff are available.

**What does this paper add?** Australia healthcare providers have experienced considerable emotional distress during the COVID-19 pandemic, particularly nurses and midwives and clinical staff who have had direct contact with people with a COVID-19 diagnosis. In this study, nurses and midwives had significantly higher levels of anxiety, depression and stress during the pandemic than general Australian adult population norms, and significantly more severe anxiety symptoms than medical and AH staff. Despite a lower number of COVID-19 cases and a lower death rate than in other countries, the proportion of Australian hospital clinical staff experiencing distress is similar to that found in other countries.

**What are the implications for practitioners?** Targeted well-being interventions are required to support hospital clinical staff during the current and future outbreaks of infectious diseases and other 'crises' or adverse events.

**Keywords:** anxiety, Australia, COVID-19, depression, hospitals, mental health, occupational groups, stress.

Received 2 August 2020, accepted 5 September 2020, published online 9 October 2020

**Introduction**

Coronavirus (COVID-19) was first identified in China in December 2019. By March 2020, the World Health Organization<sup>1</sup> had declared the COVID-19 outbreak a pandemic. In order to slow the spread of the virus and 'flatten the curve', several measures were implemented in Australia, including social and physical distancing and the closure of non-essential services and schools.<sup>2</sup> Health services implemented several measures aimed at protecting employees while providing best care for patients, including infection control measures, such as the use of personal protective equipment (PPE).<sup>3</sup>

The work of health service staff can be emotionally demanding and they often experience high levels of occupational stress as a result of long work hours, heavy workload, irregular schedules, managing the emotional needs of patients and their families and patient death.<sup>4–6</sup> Compared with the general population, the prevalence of psychological distress tends to be higher among health service staff. For example, the recent National Health Survey found that approximately 13% of adult Australians experienced high or very high levels of psychological distress,<sup>7</sup> whereas a large cross-sectional survey of Australian midwives found that around 20% reported symptoms of depression, anxiety and stress.<sup>8</sup>

To date there have been few studies about the psychosocial effect of COVID-19 on health service staff, particularly in Australia. Previous research about the experiences of health service staff during the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 indicated staff were fearful for their own health and that of their families,<sup>9–12</sup> and that they experienced increased job stress,<sup>10</sup> feelings of vulnerability,<sup>9</sup> helplessness, stigmatisation, loss of control, uncertainty<sup>9,11</sup> and emotional distress,<sup>9,12–14</sup> especially those who had had contact with patients who had SARS.<sup>10</sup> Emotional distress was experienced by approximately 25–35% of hospital staff during the SARS outbreak,<sup>12,13</sup> and nurses tended to experience more distress than other staff.<sup>10,12</sup>

The few studies to date that have examined the impact of a coronavirus outbreak on the psychological well-being of nurses, midwives, doctors and allied health (AH) staff have investigated the effects in the countries most affected by SARS, namely Canada,<sup>10,12</sup> China,<sup>14</sup> Hong Kong,<sup>9</sup> Singapore<sup>13</sup> and Taiwan.<sup>11</sup> Little is known about the well-being of health service staff working in Australia during the current COVID-19 pandemic.

The aim of this study was to assess the psychological well-being of hospital clinical staff during the COVID-19 pandemic. The specific objectives of the study were to assess: (1) levels of depression, anxiety and stress; (2) the proportion of clinical

staff in the mild, moderate, severe and extremely severe diagnostic categories for depression, anxiety and stress; (3) factors significantly associated with higher levels of depression, anxiety and stress; and (4) differences in psychological well-being between discipline groups (nursing and midwifery, AH and medical staff).

## Methods

### *Design, setting and participants*

A brief self-administered anonymous online cross-sectional survey was administered to hospital clinical staff (nurses, midwives, doctors and AH staff) employed at the study health service during the recruitment period (May–June 2020).

At this stage the state of Victoria (Australia) was in Stage 3 restrictions;<sup>15</sup> up to 15 May 2020 there had been 1543 cases of COVID-19 in Victoria (most in metropolitan Melbourne) and 18 deaths; nine people were in hospital, including seven patients in intensive care.<sup>16</sup>

The health service, Western Health, is located in metropolitan Melbourne, Australia. It includes three acute hospitals, a day hospital, a transition care program and a drug and alcohol service and provides acute tertiary services, subacute care, specialist ambulatory clinics and community health services. During data collection, the health service cared for COVID-19 patients and was affected by two COVID-19 clusters in the region, one from a fast food restaurant and one from a meat processing facility.

There are approximately 4530 clinical staff in total at the health service. To compare continuous outcomes such as subscale scores on the Depression, Anxiety and Stress Scale – 21 items (DASS-21;<sup>17</sup> used to measure psychological distress) between subgroups (e.g. nurses/midwives vs doctors), a sample size of 105 was required in each group ( $d = 0.5$ ,  $\alpha = 0.05$ , 95% power).

### *Procedure*

The survey was available in Qualtrics (Provo, UT, USA), an online survey platform, from 15 May to 10 June 2020. An invitation was sent to the group email address for each discipline (nursing/midwifery, medical and AH staff), followed by a reminder email 2–3 weeks later. The email invitation included the link to the survey and a plain language statement; completion of the survey was taken as informed consent.

The self-report questionnaire was informed by published studies on the effect of similar infectious diseases (e.g. SARS, Middle East Respiratory Syndrome Coronavirus (MERS-CoV)) on the psychosocial well-being of health service staff<sup>9–13,18</sup> and the clinical experience of the research team. The DASS-21, a widely used validated psychometric instrument,<sup>17</sup> was used to measure respondents' psychological well-being.

The survey included mostly fixed-response questions and assessed four domains, as described below.

1. Sociodemographic and employment characteristics: sex, age, country of birth, occupation, living with school-aged children (yes/no), employment status (full time/part time/casual), years of clinical experience and employed at health service
2. Health status
  - General health status: 'In general, would you say your health is: excellent, very good, good, fair, or poor?'

- Psychological well-being: Depression, anxiety and stress symptoms during the past week were assessed using the DASS-21.<sup>17</sup> Scores on each subscale range from 0 (no distress) to 21 (most distressed). Clinical cut-off points have been established for depression (mild, 5–6; moderate, 7–10; severe, 11–13; extremely severe,  $\geq 14$ ), anxiety (mild, 4–5; moderate, 6–7; severe, 8–9; extremely severe,  $\geq 10$ ) and stress (mild, 8–9; moderate, 10–12; severe, 13–16; extremely severe,  $\geq 17$ ).<sup>17</sup> In this study, Cronbach's  $\alpha$  was 0.901, 0.754 and 0.886 for the Depression, Anxiety and Stress subscales

3. Contact with, and concerns about, COVID-19, including one fixed-response question about exposure to or contact with COVID-19 and a matrix with a total of six items about concerns related to the effects of COVID-19 on personal and family health, rated using a five-point Likert scale (not concerned, slightly concerned, somewhat concerned, very concerned, extremely concerned). Respondents were asked, 'Given the current situation, how concerned are you about ...'
  - falling ill as a result of COVID-19
  - passing COVID-19 on to family members
  - your family's health (i.e. that members of your family may become infected)
  - your colleagues having COVID-19
  - hospital patients having COVID-19
  - caring for a patient who has or has suspected COVID-19?
4. The health service's response to COVID-19, assessed using a matrix with a total of seven items rated using a five-point Likert agreement scale. Respondents were asked to rate the following seven aspects of the health service's response to COVID-19, including perceived concern and support for staff's psychological well-being:
  - current level of preparedness
  - availability and use of precautionary measures (e.g. PPE such as masks)
  - communication with nurses and midwives, AH staff, doctors
  - training provided to nurses and midwives, AH staff, doctors (e.g. in use of masks)
  - concern for the physical well-being of nurses and midwives, AH staff, doctors;
  - concern for the emotional well-being of nurses and midwives, AH staff, doctors
  - availability of emotional support for those who need it.

The survey was the same for each clinical group except for the sociodemographic questions, which were discipline specific (e.g. the occupational role question included response options such as 'registered nurse', 'midwife' and 'nurse unit manager' for the nursing/midwifery survey; 'intern', 'hospital medical officer', 'registrar' and 'consultant' for the doctor survey; and 'social worker', 'physiotherapist', and 'occupational therapist' for the AH survey).

### *Data management and analysis*

Data were analysed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Data were summarised using descriptive statistics.

Scale scores were calculated for Concerns (six items,  $\alpha = 0.904$ ) and Health Services Response (seven items,  $\alpha = 0.892$ ). Scores consisted of the mean value of item responses; for these scales, one missing item was permitted per scale and the mean of the remaining items was calculated for the scale in question.

DASS-21 subscale scores and the proportion of respondents scoring in clinical ranges were calculated as outlined by the instrument's authors<sup>17</sup> in order to determine the clinical staff who have experienced 'normal', 'mild', 'moderate', 'severe' or 'extremely severe' depression, anxiety or stress. These labels assist in characterising the degree of distress severity relative to the general population. Using one-sample *t*-tests, the findings were compared with DASS-21 scores reported for healthy adults in Australia.<sup>19</sup> Cohen's *d* is reported, along with qualitative descriptors: small (0.20), medium (0.5), large (0.8) and very large (1.3).<sup>20</sup>

Associations were investigated between DASS-21 subscale scores and demographic variables, namely employment characteristics, COVID-19 contact status, health professional group, self-rated general health and the Concerns and Health Service Response scores. The distribution of all DASS-21 subscale scores was significantly non-normal, so Mann–Whitney *U*-tests, Kruskal–Wallis tests or Spearman's  $\rho$  coefficients were used as appropriate. For post hoc pairwise comparisons, significance values were adjusted by the Bonferroni correction for multiple tests.

Variables significantly associated with scores on any of the subscales ( $P < 0.05$ ) were included in hierarchical regression models with DASS-21 Depression, Anxiety and Stress subscale scores as outcome variables. Preliminary analyses were conducted to ensure that assumptions of multicollinearity were not violated. Hierarchical regression models were planned to include (if significantly associated) demographic and employment characteristics (Step 1), indicators of health and concerns about COVID-19 (Step 2), contact with COVID-19 and disciplinary group (Step 3) and health service response ratings (Step 4).

### Ethics approval

This study was approved by the Western Health Low Risk Ethics Panel (HREC Reference no. HREC/20/WH/62913, 5 May 2020).

## Results

### Sample and response

Approximately 4530 clinical staff are employed by the health service, and 668 (15%) completed the survey.

More than half the respondents ( $n = 391$ ; 58.5%) were nurses or midwives; the remainder were doctors ( $n = 138$ ; 20.7%) and AH staff ( $n = 139$ ; 20.8%). The proportion of respondents from each discipline is broadly representative of the proportion in the health service; approximately two-thirds (66%) of the clinical staff at the health service are nurses and midwives and one-quarter (26%) are doctors. AH staff were slightly overrepresented in the study sample because the proportion in the health service is approximately 7%. Most respondents were female and born in Australia; approximately one-third lived with school-aged children (Table 1).

### COVID-19 contact status

Three respondents had been diagnosed with COVID-19 and 108 (16.2%) had been in direct contact with people with a COVID-9 diagnosis and had experienced associated self-isolation and testing (with negative results). Significantly more nurses and midwives ( $n = 69$ ; 20%) and doctors ( $n = 27$ ; 22%) had been in direct contact with a person with the diagnosis than AH staff ( $n = 12$  (9%);  $\chi^2 = 10.945$ ,  $P < 0.05$ ).

### Psychological well-being

Mean scores for nurses and midwives on all DASS-21 subscales were statistically significantly higher than normative data; effect size was small for the Depression subscale, and medium for the Anxiety and Stress subscales. For AH staff and doctors, there were no significant differences compared with normative data for the Depression and Anxiety subscales, but the Stress scores were significantly higher than the normative data, with medium effect sizes (Table 2).

Almost one-quarter of nurses and midwives (23%), AH staff (23%) and doctors (23%) reported mild to extremely severe symptoms of depression; similarly, 25% of nurses and midwives, 22% of AH staff and 23% of doctors reported at least mild symptoms of stress. However, mild to extremely severe levels of anxiety were reported by 29% of nurses and midwives, but only 12% of AH staff and 16% of doctors (Table 2;  $\chi^2 = 20.776$ ,  $P < 0.05$ ). Continuous scores on the Anxiety subscale were also significantly higher for nurses and midwives than doctors ( $P < 0.001$ ) and AH staff ( $P < 0.001$ ).

Age, sex, having school-aged children living at home, years of experience, self-rated general health, Concerns and Health Service Response scores were all significantly ( $P < 0.05$ ) associated with at least one subscale score and were therefore included in the regression models. As reported above, Anxiety subscale scores also differed significantly between health professional groups; dummy variables were created for the inclusion of these groups in the models. Age and years of experience were highly correlated ( $\rho = 0.898$ ,  $P < 0.001$ ); thus, only years of experience was included.

More years of experience was significantly associated with lower DASS-21 Anxiety ( $P < 0.001$ ) and Stress ( $P < 0.01$ ) scores; this association was not significant for Depression scores once all other variables were controlled. Better self-rated general health scores were significantly associated with lower DASS-21 Depression, Anxiety and Stress scores ( $P < 0.001$  for all). Higher Concerns scores were significantly associated with higher DASS-21 Depression ( $P < 0.05$ ), Anxiety ( $P < 0.001$ ) and Stress ( $P < 0.001$ ) scores (Table 3).

Direct contact with confirmed COVID-19 cases was significantly associated with DASS-21 Anxiety scores ( $P < 0.01$ ), but not Depression or Stress scores, when all other variables were controlled for. Similarly, being a nurse or a midwife was significantly associated with higher Anxiety scores ( $P < 0.001$ ; Table 3).

Higher (more positive) Health Service Response scores were significantly associated with lower DASS-21 Depression ( $P < 0.001$ ), Anxiety ( $P < 0.05$ ) and Stress ( $P < 0.001$ ) scores (Table 3).



**Table 1. Respondents' sociodemographic characteristics**Unless indicated otherwise, data are given as *n* (%). Note, *n* values are specified where there were missing data

	Nurses and midwives ( <i>n</i> = 391)	Allied health ( <i>n</i> = 139)	Doctors ( <i>n</i> = 138)	Total ( <i>n</i> = 668)
Sex				
No. responses	375	135	128	638
Female	345 (92)	121 (90)	76 (59)	542 (85)
Male	27 (7)	12 (9)	50 (39)	89 (14)
Other or prefer not to say	3 (1)	2 (1)	2 (2)	7 (1)
Age				
No. responses	370	134	128	632
Range (years)	21–70	22–64	25–70	21–70
Mean $\pm$ s.d.	41.2 $\pm$ 12.5	35.9 $\pm$ 10	41.0 $\pm$ 11.0	40.0 $\pm$ 11.8
Country of birth				
No. responses	371	135	127	633
Australia	248 (67)	113 (84)	69 (54)	430 (68)
Overseas	123 (33)	22 (16)	58 (46)	203 (32)
Live with school-aged children				
No. responses	372	135	127	634
Yes	119 (32)	33 (24)	41 (32)	193 (30)
No	253 (68)	102 (76)	86 (68)	441 (70)
Employment status				
No. responses	371	134	127	632
Full-time	108 (29)	85 (63)	77 (61)	270 (43)
Part-time	232 (63)	49 (37)	50 (40)	331 (52)
Other (casual, bank, pool)	31 (8)			31 (5)
Years practised				
No. responses	367	133	125	625
Range (years)	0–50	0.5 – 40	0–47	0–50
Mean $\pm$ s.d.	16.4 $\pm$ 12.9	10.7 $\pm$ 8.9	16.1 $\pm$ 11.2	15.1 $\pm$ 12.0
Years employed at health service				
No. responses	370	134	128	632
Range (years)	0–45	0–25	0–28	0–45
Mean $\pm$ s.d.	8.4 $\pm$ 8.0	5.6 $\pm$ 4.8	7.1 $\pm$ 7.2	7.5 $\pm$ 7.4
General health status				
No. responses	358	134	125	617
Good, very good or excellent	310 (87)	120 (90)	110 (88)	540 (88)
Fair or poor	48 (13)	14 (10)	15 (12)	77 (12)

## Discussion

This study is one of the first Australian studies to investigate the effects of the COVID-19 pandemic on the psychological well-being of hospital clinical staff. The findings indicate that a considerable proportion of nurses, midwives, doctors and AH staff experienced psychological distress during the pandemic. Nurses and midwives reported more severe symptoms of anxiety than doctors and AH staff. Respondents who had less clinical experience, poorer general health and more COVID-19-related concerns reported higher levels of depression, anxiety and stress than those who had more clinical experience, were in better health and had fewer concerns. Those who had had contact with confirmed COVID-19 cases were significantly more anxious than those who had no COVID-19 contact. Perceptions that the health service had responded appropriately to the pandemic and provided sufficient staff support were associated with better mental health.

Approximately one-quarter of respondents reported symptoms of psychological distress, as indicated by their score on the DASS-21. The proportion of respondents with clinical levels of anxiety was higher than this for nurses and midwives, but much lower for AH staff and doctors. Despite a lower number of cases

of COVID-19 and a lower death rate in Australia, the findings of this study are consistent with emerging evidence from China, India, Singapore and the UK, which also indicates that during the COVID-19 pandemic health service staff have experienced symptoms of anxiety,<sup>21–25</sup> depression<sup>21–25</sup> and pandemic-related stress or distress.<sup>21–23,25</sup>

Nurses and midwives were more likely than doctors and AH staff to experience symptoms of anxiety, and their mean score on each subscale of the DASS-21 was significantly higher than general Australian adult population norms.<sup>19</sup> The prevalence of anxiety symptoms among nurses and midwives in the present study (29%) was also higher than that found among a cross-sectional study of adults in the general population during the first month of COVID-19 restrictions in Australia (21%).<sup>26</sup> These findings are consistent with other studies, which have found that nurses and midwives are more likely to report severe or extremely severe depression, anxiety or stress than other health service staff during the COVID-19 pandemic.<sup>23,25</sup> Nurses are the largest occupational group in a health service and have direct, intense and sustained patient contact and are therefore particularly vulnerable to infection. Nurses and those who cared for infected patients were also found to experience greater

**Table 2. Respondents' scores on the Depression, Anxiety and Stress Scale – 21 items (DASS-21) subscales**  
Possible scores for the Depression, Anxiety and Stress subscales on the DASS-21 range from 0 to 21. AH, allied health

DASS-21 subscale	Nurses and mid-wives (n = 391)	AH staff (n = 139)	Doctors (n = 138)	Score ranges for clinical cut-off points <sup>B</sup>	No. (%) scoring in each range		
					Nurses and mid-wives (n = 391) <sup>C</sup>	AH staff (n = 139) <sup>C</sup>	Doctors (n = 138) <sup>C</sup>
<b>Depression</b>							
Mean (s.d.) score	3.25 ± 4.13	3.06 ± 3.32	2.59 ± 3.68	Normal (0–4)	268 (77.5)	103 (76.9)	96 (76.8)
P-value (vs 2.57 <sup>A</sup> )	<0.01	NS	NS	Mild (5–6)	24 (6.9)	17 (12.7)	10 (8.0)
Cohen's d	0.17 (small)			Moderate (7–10)	25 (7.2)	8 (6.0)	13 (10.4)
				Severe (11–13)	12 (3.5)	3 (2.2)	3 (2.4)
				Extremely severe (≥14)	17 (4.9)	3 (2.2)	3 (2.4)
<b>Anxiety</b>							
Mean (s.d.) score	2.74 ± 3.02	1.57 ± 2.05	1.43 ± 2.08	Normal (0–3)	250 (70.8)	116 (88.5)	103 (83.7)
P-value (vs 1.74 <sup>A</sup> )	<0.001	NS	NS	Mild (4–5)	49 (13.9)	8 (6.1)	10 (8.1)
Cohen's d	0.33 (medium)			Moderate (6–7)	23 (6.5)	4 (3.1)	7 (5.7)
				Severe (8–9)	17 (4.8)	2 (1.5)	3 (2.4)
				Extremely severe (≥10)	14 (4.0)	1 (0.8)	0 (0.0)
<b>Stress</b>							
Mean (s.d.) score	5.23 ± 4.45	4.94 ± 3.65	4.81 ± 3.94	Normal (0–3)	262 (75.5)	104 (78.2)	92 (76.7)
P-value (vs 3.99 <sup>A</sup> )	<0.001	<0.01	<0.05	Mild (4–5)	34 (9.8)	12 (9.0)	13 (10.8)
Cohen's d	0.28 (medium)	0.26 (medium)	0.21 (medium)	Moderate (6–7)	26 (7.5)	11 (8.3)	10 (8.3)
				Severe (8–9)	15 (4.3)	6 (4.5)	4 (3.3)
				Extremely severe (≥10)	10 (2.9)	0 (0.0)	1 (0.8)

<sup>A</sup>Comparative DASS-21 scores reported for healthy adults in Australia.<sup>19</sup>

<sup>B</sup>From Lovibond and Lovibond.<sup>17</sup>

<sup>C</sup>Some data were missing, therefore not all numbers sum to the total.

distress during the SARS outbreak.<sup>10</sup> It is likely that nurses' and midwives' distress levels were exacerbated by: caring for and prolonged contact with infected patients; fears about becoming infected themselves or transmitting the virus to others, including colleagues and family members; concerns about the availability of PPE; and media reports of potential exposure to and high transmission rates of COVID-19 among health service staff.<sup>27,28</sup> These concerns are likely to have been reflected in their scores on the Anxiety scale of the DASS-21, which emphasises enduring anxiety, autonomic arousal and fearfulness, as opposed to the Stress scale, which measures symptoms corresponding to those associated with generalised anxiety disorder, such as irritability and muscle tension, or the Depression scale, which assesses low positive affect, loss of self-esteem and hopelessness.<sup>29</sup>

### Strengths and limitations

We surveyed a large and diverse sample of hospital clinical staff, including nurses, midwives, doctors and AH staff. We used a validated instrument to assess depression, anxiety and stress; normative data are available for this scale. Data were collected for this study during the first wave of the COVID-19 outbreak in Victoria. Our analyses adjusted for several other relevant variables.

The survey is limited by the use of cross-sectional data, which cannot reveal causal relationships. The comparison of responders with non-responders was not possible because the survey was anonymous.

We collected data at only one time point in order to minimise the burden on staff and the effect on essential clinical care. Perceptions, experiences and well-being of health service staff are likely to vary at different time points during the pandemic. Follow-up surveys are required to understand the long-term psychosocial effect of the pandemic on Australian hospital clinical staff.

Although the response rate was relatively low, it is similar to that of other studies that used unsolicited surveys during an infectious disease outbreak.<sup>10</sup> Due to infection control protocols at the health service, staff could only be invited to participate via email and the survey had to be completed online. It was not possible to accurately determine the number of staff who received the link to the survey; thus, our conservative estimate of the response rate was based on the total number of clinical staff in the health service.

The study was conducted at a large metropolitan health service; therefore, the results may not be generalisable to other health services or settings.

In accordance with the wording on the validated DASS-21, participants were asked to rate their psychological well-being in the 'past week'. It is not possible to speculate whether the depression, anxiety or stress symptoms reported were associated with the work setting or other aspects of participants' lives.

Although statistically significant, the contribution of demographic characteristics (Step 1) and the perception of the health service's response to the pandemic (Step 4) was minimal. The contribution of exposure to COVID-19 (Step 3; operationalised through a question about direct contact with cases and membership of specific disciplinary groups) was statistically significant but minimal for the Anxiety scale, and not significant for the other two subscales. These analyses should be repeated following the second wave of the pandemic to assess the effect of direct contact with positive cases and individual positive test results, which are likely to be reported by a much larger proportion of the health workforce than was the case in the first wave.

Overall, the proportion of variance explained in the DASS-21 subscale scores is low, particularly for the Depression and Stress subscales, indicating that several other factors that are

**Table 3. Hierarchical regression models showing factors associated with the Depression, Anxiety and Stress Scale – 21 items (DASS-21) Depression, Anxiety and Stress subscale scores**  
The regression models were planned to include (if significantly associated) demographic and employment characteristics (Step 1), indicators of health and concerns about COVID-19 (Step 2), contact with COVID-19 and disciplinary group (Step 3) and health service response ratings (Step 4). AH, allied health; B, unstandardised coefficient;  $\beta$ , standardised coefficient; CI, confidence interval

Step	Independent variables	Depression			Anxiety			Stress		
		$R^2$	Change in $R^2$	$\beta$	$R^2$	Change in $R^2$	$\beta$	$R^2$	Change in $R^2$	$P$ -value
1	Sex, years of experience and living with school-aged children	0.030	0.030		0.036	0.036		0.036	0.036	<0.001
2	Added self-rated general health, Concerns scale score	0.105	0.075		0.149	0.113		0.124	0.088	<0.001
3	Added direct contact with confirmed cases of COVID-19 and disciplinary group	0.113	0.008		0.200	0.051		0.127	0.004	>0.05
4	Added Health Service Response score	0.143	0.030		0.208	0.008		0.134	0.021	<0.001
Final model	Sex (1 female, 2 male)	B (s.e.) -0.31 (0.41)	$\beta$ -0.03	95% CI -1.12, 0.49	B (s.e.) 0.2 (0.28)	$\beta$ 0.03	95% CI -0.36, 0.76	B (s.e.) -0.32 (0.45)	$\beta$ -0.03	95% CI -1.20, 0.55
	Years of experience	-0.02 (0.01)	-0.08	-0.05, 0.00	-0.04 (0.01)	-0.16	-0.05, -0.02	-0.04 (0.01)	-0.11	-0.07, -0.01
	Live with school-aged children (1 Yes, 2 No)	0.59 (0.33)	0.07	-0.06, 1.24	0.27 (0.23)	0.05	-0.18, 0.72	0.66 (0.36)	0.07	-0.05, 1.37
	Self-rated general health (1 very poor, 2 poor, 3 fair, 4 good, 5 excellent)	-1.19 (0.23)	-0.21	-1.63, -0.75	-0.69 (0.16)	-0.17	-1.00, -0.39	-0.94 (0.25)	-0.15	-1.43, -0.46
	Concerns score	0.35 (0.16)	0.09	0.03, 0.67	0.58 (0.11)	0.20	0.36, 0.81	0.93 (0.18)	0.21	0.58, 1.29
	Direct contact with confirmed cases of COVID-19 (1 No, 2 Yes)	0.69 (0.39)	0.07	-0.08, 1.46	0.84 (0.27)	0.12	0.31, 1.38	0.41 (0.43)	0.04	-0.44, 1.26
	Nurses and midwives (Reference: medical staff)	0.04 (0.41)	0.01	-0.76, 0.85	1.03 (0.29)	0.19	0.46, 1.59	-0.33 (0.46)	-0.04	-1.23, 0.57
	AH staff (Reference: medical staff)	0.19 (0.48)	0.02	-0.74, 1.13	0.03 (0.33)	0.00	-0.62, 0.69	-0.29 (0.53)	-0.03	-1.32, 0.75
	Health Service Response score	-1.03 (0.23)	-0.19	-1.49, -0.58	-0.37 (0.16)	-0.09	-0.69, -0.05	-0.94 (0.26)	-0.15	-1.44, -0.43

associated with psychological distress were not accounted for in the model. This is not surprising, given that the survey did not include questions about personal circumstances, living arrangements, relationships with significant others or the financial effect of COVID-19 on participants' families. Nevertheless, we identified several variables significantly associated with psychological distress during the COVID-19 pandemic.

### Implications for health policy and practice

Health service response and support initiatives, as perceived by clinical staff, appear to be protective of mental health; therefore, investing resources in these is essential. Although several 'well-being' initiatives to support staff were implemented during the pandemic by the health service and the Victorian State Government,<sup>30,31</sup> it appears that many health service staff would benefit from additional and/or other types of support, as well as targeted discipline-specific interventions during outbreaks of infectious disease such as the COVID-19 pandemic.

### Conclusion

The COVID-19 pandemic has had a significant effect on the psychological well-being of Australian hospital clinical staff, particularly nurses and midwives and staff who had contact with people diagnosed with COVID-19. The findings of this study indicate that hospital clinical staff would benefit from further targeted supportive interventions during the current and future outbreaks of infectious diseases.

### Competing interests

The authors have no competing interests to report.

### Acknowledgements

The authors are most grateful to the health service staff who participated in the study. This research was supported by an internal grant from the Institute of Health Transformation at Deakin University.

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