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Worsening psychological wellbeing of Australian hospital clinical staff during three waves of the coronavirus (COVID-19) pandemic

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ABSTRACT

Objective. This study aimed to assess and compare the psychological wellbeing of Australian hospital clinical staff at three timepoints during the coronavirus disease 2019 (COVID-19) pandemic. **Methods.** An anonymous, online, cross-sectional survey was conducted at three timepoints during the COVID-19 pandemic (T1: May–June 2020; T2: October–December 2020; T3: November 2021–January 2022). The surveys were completed by nurses, midwives, doctors and allied health staff employed at a large metropolitan tertiary health service located in Melbourne, Australia. The Depression, Anxiety and Stress Scale (DASS-21) assessed respondents' psychological wellbeing in the past week. General linear models were used to measure the effects of survey timepoint on DASS-21 subscale scores, adjusting for selected sociodemographic and health characteristics. **Results.** A total of 1470 hospital clinical staff completed at least one survey (T1: 668 (14.7%), T2: 358 (7.9%) and T3: 444 (9.8%)). Respondents' sociodemographic characteristics were similar across the three timepoints and within professional discipline groups. Respondents' psychological wellbeing was worse at T3 compared to the earlier survey timepoints. Adjusting for respondent characteristics, depression, anxiety and stress scores were significantly higher for respondents of the third survey compared to the first ($P < 0.001$). **Conclusions.** There was a significant and persistent negative impact on the psychological wellbeing of hospital clinical staff in Australia across waves of the COVID-19 pandemic. Hospital clinical staff would benefit from ongoing and continued wellbeing support during and after pandemic waves.

Keywords: anxiety, Australia, COVID-19, depression, hospitals, longitudinal study, mental health, stress.

Introduction

There is considerable evidence about the immediate impact of the coronavirus disease 2019 (COVID-19) pandemic on the psychological wellbeing of healthcare workers. It has been reported that approximately one-quarter[1–4] to around one-third[5–7] of healthcare workers experienced psychological distress during the pandemic. Systematic and scoping reviews have revealed that healthcare workers have experienced post-traumatic stress disorder,[6,7] burnout,[6] insomnia[6] and symptoms of depression, anxiety and stress.[6–8]

To date most studies about the effect of the pandemic on healthcare workers' psychological wellbeing have been cross-sectional and collected data at only one timepoint.[6,9] The few longitudinal studies have mostly been conducted early in the pandemic (i.e. during the first 'wave' in 2020) over a limited timeframe with many only collecting data over a 4 month period.[10–13] Few have collected data over a longer time period, and these have mostly focused on a particular group of healthcare workers.[4,14–16] These studies suggest that healthcare workers have experienced psychological distress at various timepoints during the COVID-19 pandemic[4,10,11,13] and their wellbeing deteriorated as the pandemic continued.[10,13–15] Although these studies provide important evidence about the immediate impact of the pandemic on healthcare workers, little is known about the longer-term impacts. Longitudinal studies that collect data over different waves of the pandemic are required to understand the long-term impacts on hospital clinical staff including whether the effects are chronic or transient.[12] Few longitudinal studies have been conducted in Australia across different and multiple waves of the pandemic.[4,17,18]

The aim of this study was to assess the psychological wellbeing of hospital clinical staff in Australia during the COVID-19 pandemic.

The specific objectives were to assess and compare, at three different timepoints during the COVID-19 pandemic:

1. The prevalence and severity of depression, anxiety and stress among hospital clinical staff.
2. Factors significantly associated with higher levels of depression, anxiety and stress.

Methods

Design, setting and participants

The study compared data from a brief, self-administered, anonymous, online cross-sectional survey completed by hospital clinical staff (nurses, midwives, doctors and allied health staff) employed at the study health service at three different timepoints during the COVID-19 pandemic (T1: 15 May–10 June 2020, first recognised 'wave' of the pandemic in Australia; T2: 5 October–2 December 2020, second wave; and T3: 30 November 2021–24 January 2022, third wave).

The methods and some findings from surveys 1 and 2 have been previously reported.[17,19,20] Findings from survey 3 or an examination of differences between staff's wellbeing across the three survey timepoints have not been previously reported.

The study health service, Western Health, is a large public health service located in metropolitan Melbourne, Australia. Throughout the data collection, the health service provided inpatient care for COVID-19 patients. At T1 the number of clinical staff employed at the health service was approximately 4530.

Procedure

The surveys were available in Qualtrics (Qualtrics, Provo, UT, USA), an online survey platform. Convenience sampling was used at each timepoint. An invitation was sent to the group email address for each discipline (nursing/midwifery, medical and allied health staff) at each timepoint, followed by a reminder email 2–3 weeks later. The first survey was open for 4 weeks and the second and third for 8 weeks. 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 impact of similar infectious diseases (SARS; Middle East Respiratory Syndrome Coronavirus, MERS-CoV) on health service staff's psychosocial wellbeing,[19–24] and the clinical experience of the research team.

The survey took approximately 15 min to complete and included mostly fixed-response questions and assessed respondents' sociodemographic characteristics, health status and psychological distress (Table 1).

The survey was the same at each timepoint (except for the assessment of resilience in T2 and T3, and burnout only in T3) and for each clinical group except for discipline appropriate sociodemographic questions.

The surveys were anonymous but to enable longitudinal matching, respondents to each survey were asked to create a unique identification code using a specific combination of letters and numbers from their personal details (e.g. name and date of birth). The same instructions for generating this code were included in all three surveys as well as examples.

Data management and analysis

Data were analysed using IBM SPSS Statistics version 26.

Descriptive statistics were used to summarise the data.

In order to compare responses from all three surveys, data were first matched using the unique identification codes generated by the respondents. Only 116 respondents completed more than one survey and responded to requests to generate the code. Therefore, the data from the three surveys were treated as independent samples.

The distributions of respondents' sociodemographic and health characteristics in T1, T2 and T3 were compared (using chi-squared tests for categorical variables and Mann–Whitney *U*-tests for continuous variables) to identify significant differences.

DASS-21 subscale scores and proportion scoring in clinical ranges were calculated as outlined by the instrument's authors[25] in order to determine the clinical staff who have experienced 'normal', 'mild', 'moderate', 'severe' or 'extremely severe' depression, anxiety or stress. Cohen's *d* is reported, along with qualitative descriptors: small (0.20), medium (0.5), large (0.8) and very large (1.3).[26]

Differences in respondents' resilience, general health status and DASS-21 scores across the three survey timepoints were analysed using Kruskal–Wallis tests.

Table 1. Study outcome measures.

Measure	Tool	Description	Timepoint
Sociodemographic characteristics	Study-specific questions	Assessed 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.	T1–T3
General health status	Study-specific question	'In general, would you say your health is: excellent, very good, good, fair or poor?'.	T1–T3
Depression, anxiety and stress symptoms	21-item Depression, Anxiety and Stress Scales (DASS)[25]	Assessed depression, anxiety and stress symptoms during the past week. Scores on each subscale range from 0 (no distress) to 21 (most distressed). Clinical cut-off points for depression, anxiety and stress have been established.[25] In this study, Cronbach's α was: 0.901 for the depression subscale, 0.754 for anxiety and 0.886 for stress (T1); 0.908 depression, 0.798 anxiety and 0.883 stress (T2); and 0.921 depression, 0.830 anxiety and 0.897 stress (T3).	T1–T3
Resilience	The Brief Resilience Scale (BRS)[36]	Assessed how staff were coping with the challenges of the pandemic. Higher scores indicate greater resilience.	T2 and T3
Burnout	A brief single-item self-defined measure of burnout[37]	'Overall, based on your definition of burnout, how would you rate your level of burnout?' (five response options ranging from 'I have no symptoms of burnout' to 'I feel completely burned out').	T3

These categories were reduced to a binary variable ('normal/mild' vs 'moderate/severe/extremely severe) for comparison with sociodemographic and health variables. The proportion scoring in these categories across the three waves was compared using chi-squared tests.

Associations were investigated between DASS-21 subscale scores and demographic variables, employment characteristics, COVID-19 contact status, discipline group and self-rated general health status. DASS-21 subscale scores were all significantly non-normally distributed; therefore, Mann–Whitney *U*-tests, Kruskal Wallis tests or Spearman's ρ-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 subscale scores ($P < 0.05$) were included in general linear 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.

Ethics

Ethics approval was granted by the Western Health Low Risk Ethics Panel, HREC/20/WH/62913, 5 May 2020.

Results

Sample and response

A total of 668 (14.7%) clinical staff employed at the study health service completed the first survey (391 nurses and midwives, 139 allied health staff and 138 doctors), 358 (7.9%) completed the second survey (184 nurses and midwives, 74 allied health staff and 100 doctors), and 444 (9.8%) completed the third survey (285 nurses and midwives, 100 allied health staff and 59 doctors).

The respondents' sociodemographic characteristics were similar across the three survey timepoints and by discipline group. Most respondents were nurses or midwives and there was a statistically significant decrease in the proportion of nurses and midwives who were born in Australia ($P < 0.001$) and increase in those that had school-aged children ($P = 0.049$) across the survey timepoints (Table 2).

COVID-19 contact status

There was a statistically significant increase in the proportion of respondents, both overall and by professional discipline group, who had direct contact with a person with a COVID-19 diagnosis or had been diagnosed with COVID-19 from the first survey timepoint to the third ($P < 0.001$) (Table 2).

Self-reported general health status

Respondents' general health status significantly declined across the three survey timepoints ($P < 0.001$) and by discipline group (nurses/midwives $P < 0.001$; allied health staff and doctors $P = 0.005$) (Table 2).

Psychological wellbeing

The sample's mean resilience score significantly decreased from the second survey timepoint to the third, and almost

Table 2. Respondents' sociodemographic and health characteristics (*n* (%) or range, mean and s.d.).

Characteristic	Survey 1 (T1)				Survey 2 (T2)				Survey 3 (T3)			
	Nurses and midwives	Allied health staff	Doctors	Total	Nurses and midwives	Allied health staff	Doctors	Total	Nurses and midwives	Allied health staff	Doctors	Total
Sex	*n* = 372[A]	*n* = 133	*n* = 126	*n* = 631	*n* = 184	*n* = 74	*n* = 100	*n* = 358	*n* = 268	*n* = 100	*n* = 54	*n* = 417
Female	345 (93)	121 (91)	76 (60)	542 (86)	169 (92)	64 (87)	59 (59)	292 (82)	239 (89.2)	82 (86.3)	26 (48.1)	347 (83.2)
Male	27 (7)	12 (9)	50 (40)	89 (14)	15 (8)	10 (13)	41 (41)	66 (18)	29 (10.8)	13 (13.7)	28 (51.9)	70 (16.8)
Age	*n* = 370	*n* = 134	*n* = 128	*n* = 632	*n* = 184	*n* = 74	*n* = 97	*n* = 355	*n* = 266	*n* = 93	*n* = 55	*n* = 414
Range (years)	21–70	22–64	25–70	21–70	22–71	24–65	25–70	22–71	22–71	22–66	26–71	22–71
Mean (s.d.)	41.2 (12.5)	35.9 (10)	41.0 (11.0)	40.0 (11.8)	42.4 (13.4)	36.8 (9.7)	40.2 (11.1)	40.6 (12.2)	40.5 (12.4)	37.41 (10.1)	43.0 (11.3)	40.1 (11.9)
Country of birth	*n* = 371	*n* = 135	*n* = 127	*n* = 633	*n* = 182	*n* = 74	*n* = 98	*n* = 355	*n* = 285	*n* = 93	*n* = 56	*n* = 434
Australia	248 (67)	113 (84)	69 (54)	430 (68)	114 (63)	64 (87)	65 (66)	243 (69)	148 (51.9)[C]	80 (86.0)	31 (55.4)	259 (59.7)[B]
Other	123 (33)	22 (16)	58 (46)	203 (32)	68 (37)	10 (13)	33 (34)	112 (31)	137 (48.1)	13 (14.0)	25 (44.6)	175 (40.3)
Live with school-aged children	*n* = 372	*n* = 135	*n* = 127	*n* = 634	*n* = 182	*n* = 74	*n* = 100	*n* = 356	*n* = 269	*n* = 94	*n* = 55	*n* = 418
Yes	119 (32)	33 (24)	41 (32)	193 (30)	56 (31)	18 (24)	27 (27)	101 (28)	109 (40.5)[C]	28 (29.8)	17 (30.9)	154 (36.8)[B]
No	253 (68)	102 (76)	86 (68)	441 (70)	126 (69)	56 (76)	73 (73)	255 (72)	160 (59.5)	66 (70.2)	38 (69.1)	264 (63.2)
Employment status	*n* = 371	*n* = 134	*n* = 127	*n* = 632	*n* = 182	*n* = 73	*n* = 100	*n* = 355	*n* = 265	*n* = 93	*n* = 55	*n* = 413
Full-time	108 (29)	85 (63)	77 (61)	270 (43)	55 (30)	38 (52)	64 (64)	157 (44)	71 (26.8)	48 (51.6)	30 (54.5)	149 (36.1)
Part-time	232 (63)	49 (37)	50 (40)	331 (52)	112 (62)	35 (48)	36 (36)	183 (52)	168 (63.4)	45 (48.4)	25 (45.5)	238 (57.6)
Other (casual, bank, pool)	31 (8)			31 (5)	15 (8)			15 (4)	26 (9.8)			26 (6.3)
Years practised	*n* = 367	*n* = 133	*n* = 125	*n* = 625	*n* = 184	*n* = 72	*n* = 99	*n* = 355	*n* = 266	*n* = 92	*n* = 55	*n* = 413
Range (years)	0–50	0.5–40	0–47	0–50	0–47	1–41	1–48	0–48	0–49	0–37	1–48	0–49
Mean (s.d.)	16.4 (12.9)	10.7 (8.9)	16.1 (11.2)	15.1 (12.0)	18.0 (13.5)	11.8 (8.5)	15.2 (11.0)	16.0 (12.2)	15.4 (12.5)	11.7 (9.3)	17.4 (11.8)	14.9 (11.9)
Years employed (health service)	*n* = 370	*n* = 134	*n* = 128	*n* = 632	*n* = 184	*n* = 73	*n* = 98	*n* = 355	*n* = 240	*n* = 93	*n* = 54	*n* = 387
Range (years)	0–45	0–25	0–28	0–45	0–39	0–30	0–31	0–39	0–46	0–26	0.3–28	0–46
Mean (s.d.)	8.4 (8.0)	5.6 (4.8)	7.1 (7.2)	7.5 (7.4)	9.5 (9.1)	6.8 (6.7)	7.2 (7.7)	8.3 (8.3)	8.7 (8.4)	6.4 (5.8)	6.9 (8.2)	7.9 (7.9)
General health status	*n* = 358	*n* = 134	*n* = 125	*n* = 617	*n* = 184	*n* = 74	*n* = 100	*n* = 358	*n* = 252	*n* = 88	*n* = 56	*n* = 396
Good/very good/ excellent	310 (86.6)	120 (89.6)	110 (88.0)	540 (87.5)	147 (79.9)	62 (83.7)	83 (83.0)	292 (82)	171 (67.9)[C]	64 (72.7)[C]	38 (67.9)[C]	273 (68.9)[B]

(*Continued on next page*)

Table 2. (*Continued*)

Characteristic	Survey 1 (T1)				Survey 2 (T2)				Survey 3 (T3)			
	Nurses and midwives	Allied health staff	Doctors	Total	Nurses and midwives	Allied health staff	Doctors	Total	Nurses and midwives	Allied health staff	Doctors	Total
Fair/poor/ very poor	48 (13.4)	14 (10.4)	15 (12.0)	77 (12.5)	37 (20.1)	12 (16.3)	17 (17.0)	66 (18)	81 (32.1)	24 (27.3)	18 (32.1)	123 (31.1)
Resilience					*n* = 183	*n* = 74	*n* = 99	*n* = 356	*n* = 249	*n* = 88	*n* = 56	*n* = 393
BRS mean (s.d.)	Not assessed	3.5 (0.8)	3.5 (0.7)	3.6 (0.6)	3.5 (0.7)	3.3 (0.7)	3.3 (0.7)	3.5 (0.7)	3.3 (0.7)[B]			
Burnout									*n* = 251	*n* = 88	*n* = 56	*n* = 395
No symptoms	Not assessed				Not assessed				96 (38.2)	33 (37.5)	21 (37.5)	150 (38.0)
≥1 symptom									155 (61.8)	55 (62.5)	35 (62.5)	245 (62.0)
COVID-19 contact status[D]	*n* = 343	*n* = 134	*n* = 123	*n* = 600	*n* = 174	*n* = 74	*n* = 98	*n* = 346	*n* = 251	*n* = 88	*n* = 55	*n* = 394
No direct contact	272 (79.3)	122 (91.0)	95 (77.2)	489 (81.5)	85 (48.9)	50 (67.6)	43 (43.9)	178 (51.4)	110 (43.8)[C]	54 (61.4)[C]	22 (40.0)[C]	186 (47.2)[B]
Direct contact, negative test	69 (20.1)	12 (9.0)	27 (22.0)	108 (18.0)	76 (43.7)	21 (28.4)	51 (52.0)	148 (42.8)	127 (50.6)	30 (34.1)	30 (54.5)	187 (47.5)
COVID-19 diagnosis	1 (0.6)	0 (0)	1 (0.8)	3 (0.5)	13 (7.5)	3 (4.1)	4 (4.1)	20 (5.8)	14 (5.6)	4 (4.5)	3 (5.5)	21 (5.3)

[A]Owing to missing values, *n* varies for each characteristic.
[B]$P < 0.05$ (across survey timepoints).
[C]$P < 0.05$ (within professional discipline groups).
[D]Response options: no direct contact with people with known COVID-19 diagnosis; direct contact with people who have had COVID-19 diagnosis which resulted in self-isolation or testing (with a negative COVID-19 result); diagnosed with COVID-19.

Table 3. Comparison of scores on DASS-21 subscales (surveys 1–3).

Scale	Survey 1 (T1) Mean (s.d.)				Survey 2 (T2) Mean (s.d.)				Survey 3 (T3) Mean (s.d.)			
	Nurses and midwives (n = 391)	Allied health staff (n = 139)	Doctors (n = 138)	Total (n = 668)	Nurses and midwives (n = 184)	Allied health staff (n = 74)	Doctors (n = 100)	Total (n = 358)	Nurses and midwives (n = 285)	Allied health staff (n = 100)	Doctors (n = 59)	Total (n = 444)
DASS-21 Depression (range 0–21)	3.25 (4.13)	3.06 (3.32)	2.59 (3.68)	3.08[A] (3.87)	4.71 (4.97)	3.59 (3.59)	3.61 (3.97)	4.17[A] (4.47)	5.4 (5.1)[B]	5.4 (5.1)	4.2 (4.3)[B]	5.24[A] (5.01)
DASS-21 Anxiety (range 0–21)	2.74 (3.02)	1.57 (2.05)	1.43 (2.08)	2.22[A] (3.20)	4.02 (4.04)	2.70 (2.75)	2.03 (2.32)	3.20[A] (3.50)	5.0 (4.2)	3.0 (3.5)[B]	2.4 (2.9)[B]	4.20[A] (4.07)
DASS-21 Stress (range 0–21)	5.23 (4.45)	4.94 (3.65)	4.81 (3.94)	5.05[A] (4.16)	6.27 (4.94)	6.14 (3.92)	5.38 (3.92)	6.00[A] (4.48)	7.1 (5.1)	8.1 (4.8)[B]	6.5 (3.9)	7.23[A] (4.89)

[A]Statistically significant at $P < 0.001$, Kruskal–Wallis tests (across timepoints).
[B]Statistically significant at $P < 0.001$, Kruskal–Wallis tests (within professional discipline group).

two-thirds of the survey three respondents reported one or more symptoms of burnout (Table 2).

The total sample's mean score on each of the DASS-21 subscales significantly increased from the first survey timepoint to the third (all $P < 0.001$) (Table 3). For nurses and midwives all DASS-21 subscale mean scores were significantly higher at the third timepoint than the first (depression $P < 0.001$, anxiety $P < 0.001$, stress $P = 0.018$); for allied health staff there was a significant increase on the Anxiety and Stress subscales (depression $P = 0.348$, anxiety $P = 0.001$, stress $P = 0.016$); and for doctors on the Depression and Anxiety subscales (depression $P = 0.007$, anxiety $P = 0.004$, stress $P = 0.198$) (Table 3).

For the total sample, the proportion of respondents who reported moderate to extremely severe symptoms of depression, anxiety and stress significantly increased from the first survey timepoint to the third (all $P < 0.001$). There was also a significant increase in the proportion of nurses and midwives and allied health staff who reported symptoms of depression, anxiety or stress over the three survey timepoints. For doctors there was a significant increase only in anxiety ($P = 0.047$) (Table 4).

In the general liner models, the main effect for survey timepoint was significant for all three DASS-21 subscales. Compared with the first survey timepoint, the second and third timepoints were associated with significantly higher depression ($P < 0.001$ for both T2 and T3), anxiety ($P < 0.001$ for both T2 and T3) and stress (T2: $P < 0.001$, T3: $P = 0.003$) mean scores. Older age and better self-rated general health status were significantly associated with lower scores on all subscales. Living with school-aged children was significantly associated with lower depression ($P = 0.002$) and anxiety ($P = 0.033$) scores. Compared with doctors, nurses and midwives had significantly higher depression ($P = 0.024$) and anxiety ($P < 0.001$) scores (Table 5).

Discussion

This was one of the first Australian studies to investigate the longer-term impact of the COVID-19 pandemic on the psychological wellbeing of hospital clinical staff. Staff were surveyed at three timepoints over a 22-month period from the beginning of the pandemic in Australia (early mid-2020) to the third wave (late 2021–early 2022). The findings indicate a considerable proportion of nurses, midwives, doctors and allied health staff experienced psychological distress during the pandemic and their psychological wellbeing was worse at the third timepoint compared to the first.

The proportion of respondents who reported moderate to extreme symptoms of depression, anxiety and stress significantly increased from just over one in 10 to around a third as the pandemic progressed. The findings may reflect the continued risk of COVID-19 infection faced by healthcare

Table 4. Proportion of respondents in clinical ranges on DASS-21 subscales (surveys 1–3).

Scale	Ranges for clinical cut-off points	Survey 1 (T1) (*n*,%)				Survey 2 (T2) (*n*,%)				Survey 3 (T3) (*n*,%)			
		Nurses and midwives (*n* = 346–353)	Allied health staff (*n* = 131–134)	Doctors (*n* = 120–125)	Total (*n* = 600–697)	Nurses and midwives (*n* = 178–180)	Allied health staff (*n* = 71–73)	Doctors (*n* = 97–98)	Total (*n* = 348–351)	Nurses and midwives (*n* = 247–250)	Allied health staff (*n* = 88)	Doctors (*n* = 56)	Total (*n* = 391–394)
DASS-21 Depression (range 0– 21)	Normal (0–4)	268 (77.5)	103 (76.9)	96 (76.8)	567 (77.2)	109 (60.9)	49 (69.0)	68 (69.4)	226 (64.9)	139 (55.8)	47 (53.4)	35 (62.5)	221 (56.2)
	Mild (5–6)	24 (6.9)	17 (12.7)	10 (8.0)	51 (8.4)	24 (13.4)	13 (18.3)	10 (10.2)	47 (13.5)	21 (8.4)	12 (13.6)	7 (12.5)	40 (10.2)
	Moderate (7–10)	25 (7.2)	8 (6.0)	13 (10.4)	46 (7.6)	21 (11.7)	5 (7.0)	13 (13.3)	39 (11.2)	51 (20.5)	14 (15.9)	9 (16.1)	74 (18.8)
	Severe (11–13)	12 (3.5)	3 (2.2)	3 (2.4)	18 (3.0)	11 (6.1)	2 (2.8)	5 (5.1)	18 (5.2)	14 (5.6)	6 (6.8)	2 (3.6)	22 (5.6)
	Extremely severe (14+)	17 (4.9)	3 (2.2)	3 (2.4)	23 (3.8)	14 (7.8)	2 (2.8)	2 (2.0)	18 (5.2)	24 (9.6)	9 (10.2)	3 (5.4)	36 (9.2)
	Moderate, Severe or Extremely severe (7+)	54 (15.6)	14 (10.4)	19 (15.2)	87 (14.4)	46 (25.7)	9 (12.7)	20 (20.4)	75 (21.6)	89 (35.7)	29 (32.9)	14 (25.1)	132 (33.6)
DASS-21 Anxiety (range 0– 21)	Normal (0–3)	250 (70.8)	116 (88.5)	103 (83.7)	469 (77.3)	101 (56.7)	54 (74.0)	77 (79.4)	232 (66.7)	112 (44.8)	64 (72.7)	40 (71.4)	216 (54.8)
	Mild (4–5)	49 (13.9)	8 (6.1)	10 (8.1)	67 (11.0)	34 (19.1)	9 (12.3)	14 (14.4)	57 (16.4)	41 (16.4)	8 (9.1)	6 (10.7)	55 (14.0)
	Moderate (6–7)	23 (6.5)	4 (3.1)	7 (5.7)	34 (5.6)	17 (9.6)	5 (6.8)	3 (3.1)	25 (7.2)	39 (15.6)	5 (5.7)	6 (10.7)	50 (12.7)
	Severe (8–9)	17 (4.8)	2 (1.5)	3 (2.4)	22 (3.6)	9 (5.1)	2 (2.7)	1 (1.0)	12 (3.4)	25 (10.0)	4 (4.5)	3 (5.4)	32 (8.1)
	Extremely severe (10+)	14 (4.0)	1 (0.8)	0 (0.0)	15 (2.5)	17 (9.6)	3 (4.1)	2 (2.1)	22 (6.3)	33 (13.2)	7 (8.0)	1 (1.8)	41 (10.4)
	Moderate, Severe or Extremely severe (6+)	54 (15.3)	7 (5.3)	10 (8.1)	71 (11.7)	43 (24.2)	10 (13.7)	6 (6.2)	59 (17.0)	97 (38.8)	16 (18.2)	10 (17.9)	123 (31.2)
DASS-21 Stress (range 0–21)	Normal (0–3)	262 (75.5)	104 (78.2)	92 (76.7)	458 (76.3)	124 (68.9)	48 (65.8)	75 (76.5)	247 (70.4)	148 (59.9)	49 (55.7)	38 (67.9)	235 (60.1)
	Mild (4–5)	34 (9.8)	12 (9.0)	13 (10.8)	59 (9.8)	15 (8.3)	8 (11.0)	10 (10.2)	33 (9.4)	24 (9.7)	7 (8.0)	8 (14.3)	39 (10.0)
	Moderate (6–7)	26 (7.5)	11 (8.3)	10 (8.3)	47 (7.8)	17 (9.4)	11 (15.1)	8 (8.2)	36 (10.3)	39 (15.8)	15 (17.0)	3 (5.4)	57 (14.6)
	Severe (8–9)	15 (4.3)	6 (4.5)	4 (3.3)	25 (4.2)	16 (8.9)	6 (8.2)	4 (4.1)	26 (7.4)	21 (8.5)	12 (13.6)	6 (10.7)	39 (10.0)
	Extremely severe (10+)	10 (2.9)	0 (0.0)	1 (0.8)	11 (1.8)	8 (4.4)	0 (0.0)	1 (1.0)	9 (2.6)	15 (6.1)	5 (5.7)	1 (1.8)	21 (5.4)
	Moderate, Severe or Extremely severe (6+)	51 (14.7)	17 (12.8)	15 (12.5)	83 (13.8)	41 (22.8)	17 (23.3)	13 (13.3)	71 (20.2)	75 (30.4)	32 (36.3)	10 (17.9)	117 (30.0)

Table 5. Impact of wave (survey timepoint) and occupational group on respondents' depression, anxiety and stress scores.

Variable	Depression						Anxiety						Stress					
	B	Std error	t	*P*	OR (95% CI)	Partial η^2	B	Std error	t	*P*	OR (95% CI)	Partial η^2	B	Std error	t	*P*	OR (95% CI)	Partial η^2
Sex																		
Female	0.35	0.34	1.04	0.299	−0.031, 1.02	0.001	0.28	0.25	1.13	0.260	−0.21, 0.78	0.001	0.42	0.35	1.19	0.236	−0.27, 1.10	0.001
Male (ref)																		
Age	−0.05	0.02	−2.23	**0.023**	−0.09, −0.01	0.004	−0.07	0.02	−4.01	**<0.001**	−0.10, −0.04	0.012	−0.06	0.02	−2.47	**0.014**	−0.11, −0.01	0.005
Years clinical experience	0.02	0.02	0.73	0.465	−0.03, 0.06	0.000	0.01	0.02	0.72	0.473	−0.02, 0.05	0.000	0.01	0.02	0.42	0.676	−0.04, 0.06	0.000
Self-rated general health																		
Fair/poor	2.86	0.30	9.60	**<0.001**	2.27, 3.44	0.066	1.86	0.22	8.44	**<0.001**	1.43, 2.30	0.052	2.27	0.31	7.39	**<0.001**	1.67, 2.87	0.040
Good/excellent (ref)																		
Live with school-aged children																		
Yes	−0.79	0.25	−3.14	**0.002**	−1.29, −0.30	0.007	−0.40	0.19	−2.13	**0.033**	−0.77, −0.03	0.003	−0.45	0.26	−1.73	0.084	−0.96, 0.06	0.002
No (ref)																		
Group																		
Nurses and midwives	0.72	0.32	2.26	**0.024**	0.10, 1.35	0.004	1.72	0.24	7.25	**<0.001**	0.61, 1.43	0.018	0.41	0.33	1.25	0.21	−0.24, 1.06	0.001
Allied health staff	0.25	0.37	0.67	0.504	−0.48, 0.98	0.000	−0.05	0.28	−0.19	0.853	−0.59, 0.49	0.000	0.42	0.38	1.09	0.277	−0.33, 1.17	0.001
Medical staff (ref)																		
Survey																		
3	1.72	0.28	6.12	**<0.001**	1.17, 2.27	0.028	1.61	0.21	7.74	**<0.001**	1.20, 2.01	0.44	1.82	0.29	6.28	<0.001	1.25, 2.39	0.029
2	0.99	0.28	3.53	**<0.001**	0.44, 1.55	0.009	1.02	0.21	4.86	**<0.001**	0.61, 1.43	0.018	0.87	0.29	2.97	0.003	0.29, 1.44	0.007
1 (ref)																		

B, Unstandardised coefficient; OR, odds ratio; CI, confidence intervals; η^2, eta squared; ref, reference category. The *P*-values in bold are significant.

workers during the pandemic as well as their concerns about transmitting infection to their colleagues, family and friends, and increased workloads.[6,13,27–29]

Our findings indicate that the psychological wellbeing of hospital clinical staff was worse later in the pandemic compared to the beginning. Some other longitudinal studies have also reported persistent mental health impacts on frontline healthcare workers despite changes in, and subsidence of, pandemic waves.[4,13,14] In contrast, others have found variation in healthcare worker wellbeing over the duration of the pandemic. A recent Australian study reported a slight improvement in healthcare worker wellbeing after the initial 2 years[18] and a study in the UK found the proportion of healthcare workers reporting common mental disorders was greater during periods when demands on the healthcare system increased due to factors such as higher COVID-19 case numbers and associated staff shortages.[30] These differences may reflect the fact that our study focused on the wellbeing of hospital clinical staff who continued to provide care for COVID-19 inpatients even as wider community restrictions receded and, therefore, their fears about infection and other COVID-19 related concerns may have persisted. The variation in data collection timepoints may also account for the difference in findings across the studies.

Nurses and midwives reported significantly worse psychological wellbeing than doctors and allied health staff, and the proportion of nurses and midwives and allied health staff who reported symptoms of depression, anxiety or stress increased over the three survey timepoints. These results probably reflect the direct, intense and sustained contact hospital nurses, midwives and allied health staff had with COVID-19 inpatients which made them particularly vulnerable to infection.

This study found that respondents from each professional discipline group reported an increase in symptoms of anxiety as the pandemic progressed. Nurses and allied health staff also reported an increase in stress symptoms, and nurses and doctors experienced an increase in depressive symptoms. Many allied health staff were redeployed to other work areas or performed different work tasks than they would normally do during the pandemic.[27] As suggested by others,[31] these changes in their work roles and work environment may have resulted in allied health staff reporting higher levels of stress than other healthcare workers. Studies conducted prior to the COVID-19 pandemic have found a high prevalence of psychological distress including depression and anxiety among doctors.[32] The potential moral dilemmas, heavy workloads, long hours and ongoing uncertainty about the COVID-19 pandemic may have contributed to the increase in depressive symptoms reported by the doctors in this study.

As found in other studies,[33,34] living with school-aged children was associated with lower levels of depression and anxiety among healthcare workers in this study. These findings suggest that living with others is protective of psychological wellbeing.[34,35]

Strengths and limitations

Large and diverse samples of hospital clinical staff including nurses, midwives, doctors and allied health staff were surveyed at three timepoints during the COVID-19 pandemic, and validated instruments were used to assess psychological wellbeing. This provided evidence about the long-term impact of the pandemic on the psychological wellbeing of hospital clinical staff.

Although the response rate for each survey was relatively low, the rates are similar to those of other studies that used unsolicited surveys during an infectious disease outbreak.[22] Due to infection control protocols at the health service, staff could only be invited to participate via email and the surveys had to be completed online. It was not possible to accurately determine the number of staff who received the link to the surveys, thus our conservative estimation of the response rate at each timepoint was based on the total number of clinical staff in the health service.

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

Due to the small number of respondents who generated a unique identification code and completed more than one survey, responses were not matched across all three survey timepoints. Accordingly, the sample is different at each survey timepoint, but respondents' sociodemographic characteristics were similar across all three timepoints.

It is possible that other factors, which were not assessed in this study, contributed to the worsening psychological wellbeing of hospital clinical staff as the pandemic continued. These may include high workload, staff turnover and potential economic impacts of COVID-19. Nevertheless, the study has identified several variables significantly associated with poorer wellbeing.

Implications for health policy and practice

The findings of this study indicate that there was a significant and persistent negative impact on the psychological wellbeing and general health status of hospital clinical staff across waves of the COVID-19 pandemic. Health services should be cognisant of the potential for hospital clinical staff to experience deteriorating mental health during and between pandemic waves,[13] and provide ongoing and continued wellbeing support.

Conclusion

There was a significant and persistent negative impact on the psychological wellbeing of hospital clinical staff in

Australia across waves of the COVID-19 pandemic. Hospital clinical staff would benefit from ongoing and continued wellbeing support during and after pandemic waves.

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Data availability. The data that support this study will be shared upon reasonable request to the corresponding author.

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