CoPE-HCP clinical investigators (Supplementary)

Ashish Kotecha[1], Abhishek Kumar[2], Azara Janmohamed[3], Satheesh Nair[4]

Affiliations:

[1]Royal Devon and Exeter Hospital, Exeter, Devon, United Kingdom.

[2]Wrightington, Wigan and Leigh NHS Foundation Trust, United Kingdom.

[3]St George's University Hospitals NHS Foundation Trust, London, United Kingdom.

[4]Glan Clwyd Hospital, Betsi Cadwaladr University Health Board, Wales, United Kingdom.

Confidential

Title

The relationship between the level of (and changes in) perceived workplace support and mental health, wellbeing and burnout in healthcare professionals (HCP) during the COVID-19 pandemic: insight and mitigating strategies from the CoPE-HCP cohort study.

Authors

Imrana Siddiqui*[1,2,3] MBBS (joint first author), Jaya Gupta*[4] MRCPsych (joint first author), Iris McIntosh[5] MRCPsych, Christina Komodromos[6] BSc, Thomas Godec[7] PhD, George Collett[7] PhD, Sher Ng[8] MB BChir, Carmela Maniero[7,8,9] PhD, Sotiris Antoniou[8] MRPharmS, Rehan Khan[9] MRCOG, Vikas Kapil[7,8,9] PhD, Mohammed Y. Khanji[7,8,10] MRCP, and Ajay K. Gupta[7,8,9,11**] PhD, on behalf of COPE-HCP clinical investigators***.

Affiliations

[1]Wellbeing Hub, Newham Training Hub, London, United Kingdom.

[2] NHS NorthEast London CCG, London, United Kingdom.

[3]Woodgrange Medical Practice, London, United Kingdom.

[4]South West London and St George's Mental Health NHS Trust, London, United Kingdom.

[5]Camden & Islington Foundation Trust, London, United Kingdom.

[6]Barnet, Enfield and Haringey Mental Health NHS Trust, London, United Kingdom.

[7]William Harvey Research Institute, Queen Mary University of London, London, United Kingdom.

[8]Barts Heart Centre, St. Bartholomew's Hospital, Barts Health NHS Trust, London, United Kingdom.

[9]The Royal London Hospital, Barts Health NHS Trust, United Kingdom.

[10]. Newham University Hospital, Barts Health NHS Trust, London, United Kingdom.

[11]National Heart and Lung Institute, Imperial College London, London, United Kingdom.

*Joint first authors (contributed equally to this manuscript).

Confidential

**Corresponding and senior author: Ajay K. Gupta, William Harvey Research Institute, Queen Mary University London, London, United Kingdom. ajay.gupta@qmul.ac.uk

The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

***See supplementary document for COPE-HCP Clinical Investigators names and affiliations.

Funding Statement

Barts Charity. The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Word count: 3115

Confidential

Abstract

Background

COVID-19 pandemic is associated with psychological impact amongst healthcare professionals (HCPs). However, little is known about the relationship between workplace support (WS) and mental health and burnout amongst HCPs, and the effective strategies mitigating this impact.

Methods

In the CoPE-HCP cohort study, online surveys were distributed at baseline (July-September 2020), and at follow-up (~four months later) assessing the presence of generalized anxiety disorder (GAD), clinical insomnia, major depressive disorder (MDD), burnout (emotional exhaustion and depersonalization), and wellbeing. Both surveys assessed self-reported level of WS. For baseline and follow-up, independently, separate logistic regression models relating the level of WS to mental health and burnout were developed after adjusting for a priori confounders. Linear regression models were also developed relating the change in the perceived level of WS with the change in mental health scores from baseline and follow-up. Thematic analyses on baseline survey free-text entries were done to evaluate what constitutes effective support.

Findings

At baseline (n = 1422) and follow-up (n = 681), consistently, compared to those who felt unsupported, those who felt supported had reduced risk (odds) of GAD (baseline: 58% [95% CI of OR, 0.30-0.60], follow-up: 40% [0.36-1.00]), clinical insomnia (42% [0.40-0.85], 59% [0.23-0.72]), MDD (58% [0.30-0.59], 57% [0.27-0.69]), emotional exhaustion (65% [0.26-0.46], 58% [0.28-0.63]) and depersonalization (58% [0.28-0.61], 69% [0.19-0.50]).

In the cohort of those who responded to both surveys, the improvement in perceived level of WS from baseline was associated with significantly improved GAD-7 (adjusted difference. -0.13 [-0.25, -0.01]), PHQ-9 (-0.17 [-0.29, -0.04]), and SWEMWBS (wellbeing) (0.19 [0.10, 0.29]) scores, independent of baseline level of support.

For Peer Review Only

We identified five themes constituting effective workplace support: 1) concern/understanding for welfare, 2) information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support.

Interpretation

These findings highlight nuanced associations between perceived level of (and changes in) WS and mental health and burnout of HCPs, and identifies potential strategies constituting effective workplace support.

Trial registration

Clinicaltrials.gov (NCT04433260).

Confidential

Introduction

The coronavirus (COVID-19) pandemic has posed a significant peril to both the physical and mental health of the general population. In particular, the significant toll on healthcare professionals (HCPs) is a critical issue that, if not addressed, will impact staffing and service provisions in the future.[1, 2] The potential increased vulnerability to mental health issues amongst HCPs could be explained by the unique challenges faced by them, including vicarious trauma,[3] moral injury,[4-7] and substantially increased risk of infection.[8] Long working hours, discrimination for working in hospitals, and workplace practices may also contribute to the psychological impact.[9] Indeed, recent meta-analyses and studies have attested to this considerable toll, with reported prevalence rates of anxiety (26.1%),[10] depression (24%),[11] and burn-out (49.4%)[12] among HCPs during the pandemic. As such, high quality research identifying the factors associated with improved mental health outcomes in HCPs, and likely strategies to mitigate them, is an urgent need.[2]

Workplace support is one potential strategy. Relating to previous severe acute respiratory syndrome (SARS) outbreaks, *Brooks et al*. recommend the critical role of managers/employers in ensuring clear communication, supportive environments, specialised training, and support systems to promote psychological wellbeing.[13] Concerningly, a cross-sectional survey during the first wave of the COVID-19 pandemic (data collected from 30th March 2020 to 5th May 2020) found that most respondents (UK HCPs) felt there was inadequate wellbeing support.[14] The study, along with other small qualitative studies, also highlight the perceived value of organisational support to the mental health in HCPs.[14-19] Some cross-sectional quantitative studies support an association between workplace support and mental health in HCPs[20-24] and suggesting workplace support to mitigate the psychological burden in HCPs. However, these studies have limitations: most are cross-sectional,[20-25] some are small[21, 25] or offer a non-comprehensive assessment of mental health (and neglect issues such as burnout),[20, 22] or only focus on qualitative or quantitative aspects of support.[15, 16, 20-25] Therefore, to inform national and global policy and workplace practices, we require robust high-quality studies using comprehensive mental health assessments demonstrating improvements in mental health over time.[26]

Addressing this, the current study (part of the COVID-19 and Physical and Emotional Wellbeing of Healthcare Professionals project; CoPE-HCP)[27] examined the relationship between perceived level of workplace support and mental health outcomes: generalized anxiety

For Peer Review Only

Confidential

disorder, clinical insomnia, major depressive disorder, burnout (emotional exhaustion and depersonalization), and wellbeing twice during the pandemic (approximately four months apart). We also examined whether changes in perceived level of workplace support was associated with improved mental health and wellbeing outcomes over the four-month period. Finally, we explored what workplace support HCPs want or have found helpful.

Methods

The protocol for this cohort study is published.[27] The study was approved by the Cambridge East Research Ethics Committee (20/EE/0166), and registered in ClinicalTrials.gov (NCT04433260).

The study involved a series of online surveys distributed to HCPs (in the UK and internationally). The inclusion criteria for the study were: 1) aged 18 or older, 2) electronic consent given, and 3) self-identified as HCP staff. Recruitment was facilitated by health service employers who invited employees by email containing a link to the survey, and the participants were those who responded to that invite.

Initial consent was gained for the baseline survey, and at the end of the baseline survey, participants were then asked for their consent to receive any follow-up surveys. Further consent was gained at the follow-up survey.

The baseline survey was conducted between July and September 2020. In the UK, this corresponded to the trough of the first wave of COVID-19. The baseline survey gathered information such as age, gender, ethnicity, relationship status, educational attainment, and current mental health and physical health diagnosis (a multiple-choice closed-ended item).

Our primary predictor, workplace support, was assessed by asking participants "Do you think you received adequate support directly from your supervisors/line managers/direct employers? (Mark on scale, with 1 -as no support and 10 as full and professional support)". This was converted to a 3-level response with scores of 1-3, 4-6, and 7-10 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported' respectively. 'Felt unsupported' served as the reference group in the analysis. A subsequent free-text item was included eliciting qualitative data about what support they found most helpful or felt would be helpful, to supplement perceptions of workplace support.

Outcome ascertainment

Confidential

At each survey, we assessed for the presence of generalized anxiety disorder (using the 7-item Generalized Anxiety Disorder [GAD-7]),[28] clinical insomnia (using 7-item Insomnia Severity Index [ISI]),[29] major depressive disorder (using 9-item Patient Health Questionnaire [PHQ-9]),[30] burnout domains: emotional exhaustion and depersonalization (using single respective 7-point scale items)[32], and wellbeing (using the Short Warwick-Edinburgh Mental Wellbeing Score [SWEMWBS]).[31]

The follow-up survey (approximately four months after baseline during the second peak of the pandemic) included the same mental health assessments and the same item assessing level of workplace support (excluding free-text item). For transparency, due to survey error, the support item at follow-up provided a score between 0 and 100 (as opposed to 0-10 at baseline survey) which was similarly collapsed to a 3-level response: 0-30, 31-69, and 70-100 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported', respectively.

Statistical analysis

Statistical analyses were conducted using STATA v17.0. Baseline characteristics were compared between those who responded to the follow-up survey and are part of HCP cohort, and those who only responded to first survey and constitute the findings from baseline cross-sectional analysis.

At each survey time point, we separately assessed for the cross-sectional association between the perceived level of support and the presence of outcomes: generalized anxiety disorder, clinical insomnia, major depressive disorder, below average wellbeing, emotional exhaustion, and depersonalization, in accordance with validated cut-offs of respective tools. Logistic regression models were developed to estimate crude and adjusted odds ratios (with 95% confidence intervals, and p-values) in each perceived support group as compared to the reference group (perceived unsupported). The multivariable models were adjusted for pre-specified risk factors: age, gender, time since COVID-19 peak in the participant's region, highest level of education, relationship status, number of people living in their household, currently diagnosed mental health condition (yes/no), currently diagnosed physical health condition (yes/no), and HCP role (medical doctors [reference group] vs. healthcare assistants, nurses and midwives, and AHPs).

For cohort analysis, i.e. those who responded to both baseline and follow-up surveys, the change in mental health and burnout symptoms was calculated by subtracting the baseline raw score from the follow-up score (follow-up score was rescaled by dividing by 10) on the

Confidential

respective scales. Changes in perceived workplace support was calculated by subtracting the baseline raw score (regarding adequate workplace support) from the follow-up score. Separate unadjusted and adjusted (adjusted for the above risk factors and for baseline perceived level of support) linear regression models were conducted assessing the extent that the change in perceived level of workplace support is associated with changes in mental health and burnout symptoms over time.

Thematic analysis

The free-text item was analysed using thematic analysis[33] by four researchers (JG, IS, IM, CK). Responses were analysed inductively, meaning no pre-selected themes were used to start with, and the analysis was data-driven. First, the raw data was collated into an Excel table and each of the above researchers familiarised themselves with the data. Initial codes were generated for each entry of data and were shared amongst the researchers before being refined as a coding dictionary. Any data entries with limited detail regarding the type of support were regarded as 'unspecified' and not included in refining of codes. The data entries and refined codes were reviewed and amalgamated into key themes (selected based on salience and the apparent significance to the participants) and subthemes to best describe the data.

Results

1574 HCPs were included at baseline cross-sectional assessment, and amongst them 744 (47.3%) who responded to the follow-up survey comprised of the cohort population and also the separate cross-sectional analysis for the follow-up period only (Figure 1; Table 1).

Most of the 1574 HCPs at baseline were from the UK (n = 1321; 83.9%). Of the HCPs based outside the UK (n = 253; 16.1%), most were from North America (37.2%) followed by Asia (34.4%) and Europe (17.4%). Reporting the non-UK country where they were based was optional: of the 202 respondents, 70 (34.7%) were from the USA followed by 63 (31.2%) from India. A total of 30 different countries comprised the non-UK participants.

At baseline (n = 1574; specific number varies for each outcome), 19.9% of 1429 HCPs met the criteria for generalized anxiety disorder, 16.1% of 1418 HCPs for clinical insomnia, 24.7% of 1434 HCPs for major depressive disorder, 41.9% of 1386 HCPs for emotional exhaustion, and 13.4% of 1386 HCPs for depersonalization. At cross-sectional evaluation of the follow-up stage (n = 744; specific number varies for each outcome), we observed increased or sustained outcome rates for generalized anxiety disorder (20.8% of 723 HCPs), clinical insomnia (16.3%

For Peer Review Only

Confidential

of 722 HCPs), major depressive disorder (28.0% of 724 HCPs), emotional exhaustion (43.2% of 717 HCPs), and depersonalization (21.2% of 717 HCPs).

Baseline group and cohort population of HCPs

The baseline characteristics of those who only responded to the baseline survey (n = 1574) were mostly similar to those who responded to both surveys (n = 744), except for significant differences in self-defined ethnicity, gender identity and number of people living in the household (Table 1; Supplemental Table 1). Baseline-only responding participants had relatively higher proportions of self-assigned Asian ethnicity and male gender and belonged to the bigger household (Supplemental Table 1). Mental health outcomes were not significantly different between those who only responded to the baseline survey and those who responded to both surveys according to chi squared analysis (Supplemental Table 1).

Perceived level of support at baseline and follow-up

In independent cross-sectional assessments, 1422 participants provided valid data on perceived level of support at baseline and 681 of them provided similar data at follow-up too. As per our pre-defined 3-level categories (based on the Likert scales) measuring perceived support, 48.5% of the 1422 HCPs at baseline reported feeling supported with similar proportions observed in the follow-up sample (47.9% of 681 HCPs), whilst 21.9% of the baseline sample felt unsupported with 24.5% of the follow-up sample felt unsupported (Supplementary Table 2; see Supplementary Figure 1-3 for percentage distribution of responses for baseline and follow-up perceived level of support, and for the change in perceived support from baseline to follow-up).

Relationship between support and mental health and burnout outcomes

At baseline (Figure 2), there was a statistically significant relationship between level of support and each mental health and burnout outcome (p for trends were all <0.01 except for clinical insomnia $p = .013$). Compared with those who felt unsupported, respondents who felt supported were significantly less likely to meet the criteria for generalized anxiety disorder (adj. odds ratio 0.42, 95% CI 0.30 to 0.60), clinical insomnia (0.58, 0.40 to 0.85), major depressive disorder (0.42, 0.30 to 0.59), emotional exhaustion (0.35, 0.26 to 0.46), and depersonalisation (0.43, 0.28 to 0.64). On the SWEMWBS wellbeing measure, those who felt supported were significantly more likely to have medium or high wellbeing (3.17, 2.30 to 4.37).

Confidential

Based on 681 valid responses at follow-up (Figure 3; median 4.9 months after baseline survey), compared to those who felt unsupported, those who felt supported were significantly less likely to meet the criteria for clinical insomnia (0.34, 0.20 to 0.58), major depressive disorder (0.46, 0.30 to 0.70), emotional exhaustion (0.39, 0.27 to 0.58), and depersonalisation (0.32, 0.20 to 0.51). Similarly, on the SWEMWBS wellbeing measure, those who felt supported were more likely to have medium or high wellbeing (2.72, 1.73 to 4.27). Borderline significance was met for generalized anxiety disorder (0.60, 0.36 to 1.00) when comparing perceived supported to perceived unsupported HCPs.

Change in level of workplace support and improvement in mental health outcomes over time

In the cohort of participants with data at both baseline and follow-up (n = 681), there was a consistent association between the change in perceived level of support and the change in scores on some, but not all, mental health outcomes (Table 2). Separate adjusted linear regression models showed that a whole unit increase in change in perceived level of support was inversely associated with the change in GAD-7 anxiety scores (coefficient -0.13 [-0.25 to -0.01] p = .04), PHQ-9 depression scores (-0.17 [-0.29 to -0.04] $p < 0.01$), and positively associated with the change in SWEMWBS wellbeing scores (0.19 [0.10 to 0.29] $p < 0.001$). No significant associations were observed between change in perceived level of support and the change in ISI insomnia ($p = 0.067$) or EEDP2Q burnout scores ($p = 0.139$).

Themes: what constitutes effective support

860 free-text entries were included in the thematic analysis to illustrate what qualities/aspects of workplace support are perceived as most helpful. We identified 5 overarching themes describing: 1) concern or recognition regarding welfare, 2) information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support (see Table 3 for full details and exemplar quotes).

Interpretation

This large cohort study demonstrates that, during the COVID-19 pandemic, HCPs who felt supported at baseline (compared with those who felt unsupported) had a significantly lower risk (odds) of generalized anxiety disorder, clinical insomnia, major depressive disorder, emotional exhaustion, depersonalization, and below-average wellbeing. This association was also observed at follow-up (albeit borderline significance for generalized anxiety disorder), more than four months after baseline, demonstrating consistency and reliability in these

For Peer Review Only

Confidential

findings. Importantly, to our knowledge, this is the first study to report associations between changes in perceived level of workplace support and changes in mental health symptoms in HCPs over time during the pandemic: improvement in perceived support was significantly associated with improved scores on measures of generalized anxiety disorder, major depressive disorder, and wellbeing (independent of baseline perceived level of support), but not for insomnia or burnout. Furthermore, a unique aspect of this study is the rich qualitative data illustrating what qualities of workplace support are perceived by HCPs to be helpful during the pandemic. This inclusion of qualitative data can inform the design of intervention studies to establish a causal relationship between workplace support and mental health.

This study builds on and validates the hypothesis generated by a few recent cross-sectional studies showing associations between workplace support and mental health outcomes in HCPs during the current pandemic,[21, 22, 36] and previous outbreaks.[37] While a small cohort study in routine work environment has shown that level of co-worker and managerial support is inversely associated with general mental distress,[38] we have not found any studies – in routine or pandemic settings - that have evaluated the prospective relationship between perceived improved workplace support and changes in mental health, wellbeing, and burnout.

Most policy and guidance suggest a benefit of improving workplace support on general mental health, and indeed our findings support this notion regarding depression, anxiety, and wellbeing in HCPs. However, whilst we observe a trend between change in perceived level of support and insomnia and burnout scores over time, these associations were non-significant. This highlights the relevance of improvements in perceived workplace support to distinct mental health issues, and we speculate that other workplace factors which are not accounted for in this analysis (e.g. long working hours) are more likely to impact on burnout and insomnia.

Regarding our qualitative findings, these are consistent with previous workplace guidance for healthcare systems. The WHO has advised how HCPs and their managers can promote their psychosocial wellbeing during the COVID-19 pandemic: taking care of basic needs, ensuring staff communication is up-to-date and of high quality, use of buddy systems, psychological first aid, and ensuring staff access to mental health support services.[39] Our findings also mirror previous reviews stating that clear communication through horizontal (peer-peer) and vertical (managers/trusts-employees) networks can buffer against the psychological impact.[26] Many participants also reported daily updates being useful as a means of support. In the UK, Enabling Quality Improvement in Practice encourages embedding daily huddles into work practice with

Confidential

the goal of safety and improvement - we suggest these daily huddles should include a wellbeing 'check-in' element.

Intrinsic to workplace support is the support for managers themselves which was reflected by a few comments in our qualitative data. Previous qualitative work highlighted how managerial support was integral to more positive workplace experience during the Ebola epidemic, but also managerial stress was reflected onto the HCPs.[40] Therefore, we must consider the potential impact of managerial mental health on the quality of support delivered to employees, which was not explicitly examined in our survey.

There are some limitations to this study. First, the data was collected between July and December 2020, at the trough and second peak of the UK COVID-19 pandemic, respectively. Despite the pandemic still ongoing, our findings remain highly relevant due to the fluctuating levels of cases and persistent mental health burden in HCPs. Secondly, while we account for the time since COVID-19 peak in participants' region, non-UK participants may have experienced varying public health policies which may be a confounder. Third, there is potential selection bias because our survey was accessible online only, and the respondents may not be representative of all HCPs (those with self-identified female gender and white ethnicity were more likely to respond to the follow-up survey). However, our observed rates of mental health outcomes are similar to other large surveys in the UK general population,[34] and no significant differences were observed for mental health between baseline-only and follow-up (cohort) participants, therefore we anticipate our cohort findings to be generalisable to the healthcare workforce regardless of possible self-selection bias. Fourth, the issue of bidirectionality remains relevant despite reporting data at two time points: HCPs with lower mental health may perceive workplace support to be lower because their needs are greater. Despite this, we believe that participants primarily rate their level of support based on their observations of the available support strategies in the workplace. Finally, most free text responses were generated from a double-barrelled question asking what support was useful and what was desired. This does not invalidate the themes but we are unable to concretely distinguish between what support was helpful and what was lacking.

In conclusion, we demonstrate a consistent association between perceived level of workplace support and the mental health and wellbeing of HCPs during the pandemic. Improved perceived workplace support was associated with improved scores on anxiety, depression, and wellbeing measures over time but was not associated with insomnia or burnout. Further studies are

For Peer Review Only

Confidential

required to understand the workplace factors associated with insomnia and burnout in HCPs during the pandemic, and to understand the causal relationship between perceived workplace support and mental health in HCPs. Our findings are likely to inform significant changes in guidance and national policies targeted at improving wellbeing in HCPs during the current and future pandemics.

Declaration of interests:

AKG (chief investigator and corresponding author) declares that CoPE-HCP study received part funding from Barts Charity, and declares no other conflict of interest.

Authors contributions:

AKG is the chief investigator and corresponding author for this study had access to all of the data in the study and takes full responsibility for the integrity of the data and the accuracy of the data analysis. Below are the detailed author contributions

Conceptualization: AKG, VK, MYK, JG, IS, CM, SN

Data curation: AKG, TG, GC

Formal analysis: AKG, TG, JG, IS, IM, CK, GC

Funding acquisition: AKG, VK

Resources and software: AKG, TG

Supervision: AKG

Investigation: *all authors and investigators*

Methodology: AKG, VK, MYK, JG, IS, CM, SN, RK, SA

Project administration: AKG, GC

Writing original draft: IS, JG, AKG, IM, CK, TG, GC

Writing-review and editing: *all authors and investigators*

Funding

Barts Charity.

Role of funding source

Confidential

The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Patient and public involvement

No patients or members of the public were directly involved with the design, or conduct, or reporting, or dissemination plans of the research.

Data sharing statement

Anonymised data, data dictionary, and survey materials will be made available upon request. Study protocol is available at https://doi.org/10.3389/fpsyg.2021.616280.

Acknowledgements:

We would like to acknowledge the extensive support received from the Barts Education Academy and William Harvey Research Institute for sharing some of their resources needed to conduct this study. In particular, we wish to acknowledge the excellent contribution of the following: Julekha Khanam from Barts Health NHS Trust, Elaine Colaco and Martyn Clark from Barts Education Academy, Tania Toma from Imperial College Healthcare NHS Trust, and Ade Alele, Professor Mark Caulfield, and Amrita Ahluwalia from William Harvey Research Institute.

Transparency declaration:

AKG (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Confidential

References

1. Stuijfzand S, Deforges C, Sandoz V, Sajin C-T, Jaques C, Elmers J, et al. Psychological impact of an epidemic/pandemic on the mental health of healthcare professionals: a rapid review. BMC Public Health. 2020;20:1-18.
2. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. 2020;7(6):547-60.
3. Li Z, Ge J, Yang M, Feng J, Qiao M, Jiang R, et al. Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. Brain Behav Immun. 2020;88:916-9.
4. Wang Z, Harold KG, Tong Y, Wen J, Sui M, Liu H, et al. Moral injury in Chinese health professionals during the COVID-19 pandemic. Psychological Trauma: Theory, Research, Practice, and Policy. 2021;Advance on.
5. Zerach G, Levi-Belz Y. Moral injury and mental health outcomes among Israeli health and social care workers during the COVID-19 pandemic: a latent class analysis approach. European journal of psychotraumatology. 2021;12.
6. Lamb D, Gnanapragasam S, Greenberg N, Bhundia R, Carr E, Hotopf M, et al. Psychosocial impact of the COVID-19 pandemic on 4378 UK healthcare workers and ancillary staff: initial baseline data from a cohort study collected during the first wave of the pandemic. Occupational and Environmental Medicine. 2021;0:1-8.
7. Plouffe RA, Nazarov A, Forchuk CA, Gargala D, Deda E, Le T, et al. Impacts of morally distressing experiences on the mental health of Canadian health care workers during the COVID-19 pandemic. Eur J Psychotraumatol. 2021;12(1):1984667.
8. Shanafelt T, Ripp J, Trockel M. Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic. JAMA. 2020;323:2133-4.
9. Yang Y, Lu L, Chen T, Ye S, Kelifa MO, Cao N, et al. Healthcare Worker's Mental Health and Their Associated Predictors During the Epidemic Peak of COVID-19. Psychol Res Behav Manag. 2021;14:221-31.
10. Raoofi S, Kan FP, Rafiei S, Khani S, Hosseinifard H, Tajik F, et al. Anxiety during the COVID-19 pandemic in hospital staff: systematic review plus meta-analysis. BMJ Supportive & Palliative Care. 2021;0:1-9.
11. Olaya B, Pérez-Moreno M, Bueno-Notivol J, Gracia-García P, Lasheras I, Santabárbara J. Prevalence of Depression among Healthcare Workers during the COVID-19 Outbreak: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2021;10:3406.
12. Prasad K, McLoughlin C, Stillman M, Poplau S, Goelz E, Taylor S, et al. Prevalence and correlates of stress and burnout among U.S. healthcare workers during the COVID-19 pandemic: A national cross-sectional survey study. EClinicalMedicine. 2021;35.
13. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N. A Systematic, Thematic Review of Social and Occupational Factors Associated with Psychological Outcomes in Healthcare Employees during an Infectious Disease Outbreak. Journal of Occupational and Environmental Medicine. 2018;60:248-57.
14. Siddiqui I, Aurelio M, Gupta A, Blythe J, Khanji M. COVID-19: Causes of anxiety and wellbeing support needs of healthcare professionals in the UK: A cross-sectional survey. Clinical Medicine. 2021;21:66-72.
15. Billings J, Seif NA, Hegarty S, Ondruskova T, Soulios E, Bloomfield M, et al. What support do frontline workers want? A qualitative study of health and social care workers' experiences and views of psychosocial support during the COVID-19 pandemic. PLoS ONE. 2021;16:e0256454.
16. Kang B-A, Kwon S, You M, Lee H. Perceived sources of occupational burn-out and embitterment among front-line health workers for COVID-19 control in Gyeonggi province, South Korea: a qualitative study. Occupational and Environmental Medicine. 2021;0:1-8.

For Peer Review Only

17. Vera San Juan N, Aceituno D, Djellouli N, Sumray K, Regenold N, Syversen A, et al. Mental health and well-being of healthcare workers during the COVID-19 pandemic in the UK: contrasting guidelines with experiences in practice. BJPsych Open. 2020;7(1):e15.
18. Berkhout SG, Sheehan KA, Abbey SE. Individual- and Institutional-level Concerns of Health Care Workers in Canada During the COVID-19 Pandemic: A Qualitative Analysis. JAMA Netw Open. 2021;4(7):e2118425.
19. Buckley L, Berta W, Cleverley K, Widger K. Exploring Pediatric Nurses' Perspectives on Their Work Environment, Work Attitudes, and Experience of Burnout: What Really Matters? Front Pediatr. 2022;10:851001.
20. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research. 2021;21:1-11.
21. Cyr S, Marcil M-J, Marin M-F, Tardif J-C, Guay S, Guertin M-C, et al. Factors Associated With Burnout, Post-traumatic Stress and Anxio-Depressive Symptoms in Healthcare Workers 3 Months Into the COVID-19 Pandemic: An Observational Study. Frontiers in Psychiatry. 2021;12:668278.
22. Wanigasooriya K, Palimar P, Naumann DN, Ismail K, Fellows JL, Logan P, et al. Mental health symptoms in a cohort of hospital healthcare workers following the first peak of the COVID-19 pandemic in the UK. BJPsych Open. 2021;7(1).
23. Munn LT, Liu TL, Swick M, Rose R, Broyhill B, New L, et al. Original Research: Well-Being and Resilience Among Health Care Workers During the COVID-19 Pandemic: A Cross-Sectional Study. Am J Nurs. 2021;121(8):24-34.
24. Havaei F, Ma A, Staempfli S, MacPhee M. Nurses' Workplace Conditions Impacting Their Mental Health during COVID-19: A Cross-Sectional Survey Study. Healthcare (Basel). 2021;9(1).
25. Hines SE, Chin KH, Glick DR, Wickwire EM. Trends in Moral Injury, Distress, and Resilience Factors among Healthcare Workers at the Beginning of the COVID-19 Pandemic. International Journal of Environmental Research and Public Health. 2021;18:488.
26. Pollock A, Campbell P, Cheyne J, Cowie J, Davis B, McCallum J, et al. Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. Cochrane Database Syst Rev. 2020;11:CD013779.
27. Khanji MY, Maniero C, NG S, Siddiqui I, Gupta J, Crosby L, et al. Early and Mid-Term Implications of the COVID-19 Pandemic on the Physical, Behavioral and Mental Health of Healthcare Professionals: The CoPE-HCP Study Protocol. Frontiers in Psychology. 2021;12:39.
28. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-7.
29. Morin CM, Belleville G, Belanger L, Ivers H. The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep. 2011;34(5):601-8.
30. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-13.
31. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, et al. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. Health Qual Life Outcomes. 2007;5:63.
32. Li-Sauerwine S, Rebillot K, Melamed M, Addo N, Lin M. A 2-Question Summative Score Correlates with the Maslach Burnout Inventory. Western Journal of Emergency Medicine. 2020;21:617.
33. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3:77-101.
34. Shevlin M, McBride O, Murphy J, Miller JG, Hartman TK, Levita L, et al. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19 pandemic. BJPsych Open. 2020;6.

Confidential

35. Jordan J-A, Shannon C, Browne D, Carroll E, Maguire J, Kerrigan K, et al. COVID-19 Staff Wellbeing Survey: longitudinal survey of psychological well-being among health and social care staff in Northern Ireland during the COVID-19 pandemic. BJPsych Open. 2021;7:e159.
36. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research 2021;21:1-11.
37. Preti E, Di Mattei V, Perego G, Ferrari F, Mazzetti M, Taranto P, et al. The Psychological Impact of Epidemic and Pandemic Outbreaks on Healthcare Workers: Rapid Review of the Evidence. Current Psychiatry Reports. 2020;22:1-22.
38. Sconfienza C, Lindfors P, Lantz Friedrich A, Sverke M. Social support at work and mental distress: A three-wave study of normal, reversed, and reciprocal relationships. J Occup Health. 2019;61(1):91-100.
39. Mental health and psychosocial considerations during the COVID-19 outbreak [press release]. World Health Organization2020.
40. Belfroid E, Steenbergen Jv, Timen A, Ellerbroek P, Huis A, Hulscher M. Preparedness and the importance of meeting the needs of healthcare workers: a qualitative study on Ebola. Journal of Hospital Infection. 2018;98:212-8.

Confidential

For Peer Review Only

Tables and Figures

Table 1. Baseline characteristics of HCPs at baseline (n, 1574) and follow-up (n, 744).

	Response	Baseline (n, 1574) (%)	Follow-up (n, 744) (%)
Age	18-25 years	76 (4.8)	31 (4.2)
	26-35 years	390 (24.8)	175 (23.5)
	36-50 years	638 (40.5)	298 (40.1)
	51-60 years	372 (23.6)	185 (24.9)
	61-70 years	92 (5.8)	51 (6.9)
	> 70 years	6 (0.4)	4 (0.5)
Ethnicity	White	1027 (65.3)	587 (78.9)
	Asian	359 (22.8)	93 (12.5)
	Black	74 (4.7)	27 (3.6)
	Mixed	48 (3.1)	19 (2.6)
	Other	39 (2.5)	12 (1.6)
	Prefer not to say	27 (1.7)	6 (0.81)
Gender identity	Female	1105 (70.2)	562 (75.5)
	Male	447 (28.4)	178 (23.9)
	Prefer not to say	14 (0.9)	3 (0.4)
	Prefer to self-define	8 (0.5)	1 (0.1)
Relationship status	Divorced	54 (3.4)	27 (3.6)
	Prefer not to say	46 (2.9)	21 (2.8)
	Married/Living with partner or family	1048 (66.6)	496 (66.7)
	Other	52 (3.3)	22 (3.0)
	Single	374 (23.8)	178 (23.9)
Number living in household	1	210 (13.3)	104 (14.0)
	2	487 (30.9)	252 (33.9)
	3-5	799 (50.8)	367 (49.3)
	6 or more	78 (5.0)	21 (2.8)
Highest level of education	A-levels	113 (7.2)	61 (8.2)
	Bachelor's / diploma	735 (46.7)	346 (46.5)
	Master's / PhD	613 (39.0)	290 (39.0)
	Other	113 (7.2)	47 (6.3)

Note. HCP = healthcare professional. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

Confidential

For Peer Review Only

Table 2. Separate linear regressions for the association between change in perceived level of support and change in raw mental health, burnout, and wellbeing scores in HCPs from baseline to follow-up (n, 681).

	Crude			Adjusted		
	Coefficient	**95% Confidence Intervals**	**P Value**	**Coefficient ***	**95% Confidence Intervals ***	**P value ***
GAD-7	-0.10	-0.21 to 0.01	0.075	-0.13	-0.25 to -0.01	0.036
PHQ-9	-0.19	-0.30 to -0.08	0.001	-0.17	-0.29 to -0.04	0.008
ISI	-0.07	-0.19 to 0.05	0.226	-0.13	-0.26 to 0.01	0.067
EEDP2Q	-0.05	-0.12 to 0.01	0.112	-0.06	-0.13 to 0.02	0.139
SWEMWBS	0.17	0.08 to 0.27	< 0.001	0.19	0.10 to 0.29	< 0.001

Note. Crude and adjusted coefficients provided.
*adjusted for age, gender identity, education, relationship status, number living in household, currently diagnosed mental health condition, currently diagnosed physical health condition, role (medical doctor vs. HCAs, nurses, and AHPs), and baseline level of support.

1

Confidential

Table 3. Workplace support themes based on responses from HCP only*

Theme	Description	Quotes
Concern/ understanding for welfare	Genuine concern for welfare. • Managers who listened and left staff feeling understood and with consistent support were valued. • A few comments citing check-ins and appropriate training from original line-managers as being significant to their mental health when redeployed.	*"Direct check in. How am I doing, and actually listen to the answer. I have been left to get on with it, with a few platitudes "Ohh its hard"."* *"Would have wanted more recognition from management about impact and repercussions of redeployment but support from colleagues was good within the team."* *"I had no contact with my original team during my redeployment, I found this very stressful which increased my anxiety."*
	Flexibility and understanding. • Respondents appreciated managers who were understanding and flexible of personal circumstances, for example amended working arrangements due to childcare, school times, shielded family members, and personal anxiety/stress.	*"Better understanding of peoples personal situations. I am a full-time unpaid carer for partner who was told to shield for 12 weeks. Due to his condition (a Traumatic Brain Injury and Epilepsy) I was unable to leave him unsupervised for long periods of time as his seizures are fatal and in the event of one he needs medication administered to him to save his life…I requested to be able to work from home due these extenuating circumstances which was denied which caused me and my partner extreme stress…I think it needs to be looked at as a case by case basis and not as a staffing level or need as a whole."*
	Psychological support. • One-to-one confidential counselling and/or access to clinical psychologist was cited as useful for HCPs mental health.	*"Wellbeing support with a named psychologist allocated to our team right from the start."* *"I would have wanted one-on-one therapy sessions with an external professional. We were offered these with our own psychology department free of charge though often work closely with these individuals."*
Information	This broad theme generally describes HCPs requests for regular clear, consistent, and transparent communication/updates sent on a timely manner. Participants sometimes cited daily staff briefings, regular bulletins, and daily huddles as being useful modes of communication.	*"I found it really helpful to have daily or twice weekly staff team briefings with updates on PPE, procedures etc and a chance to ask questions. In the early part of the pandemic, one of the most stressful things was the sheer volume of information coming at us and constant changes to what we should be doing, what PPE we needed in which area etc."* *"Better communication - it felt like as a nurse being redeployed that we were deliberately kept in the dark about operations surrounding Covid-19 as the trust management were more paranoid about details being leaked to the press than staff welfare."*
Tangible qualities of the workplace	Adequate staffing • Several comments describing ensuring adequate staffing in response to staff sicknesses and/or heightened workload, for example.	*"Not sure. Managing staff shortages was difficult and extra work needed. Now we have burnout from covering."*
	PPE/safety • Commonly reported describing training in how to use PPE, safety protocols (e.g. social distancing), regular testing, and access to appropriate PPE.	*"At the beginning of the pandemic, the PPE was rationed strictly and that caused a lot of anxiety. Those initial contacts with patient meant those staff member developed symptoms and got ill. This caused a lot of anxiety. I fortunately had annual leave for a week and when I got back to work. The PPE was fully available and in use appropriately. Scrubs were a problem especially plus sizes, not available."*

Confidential

For Peer Review Only

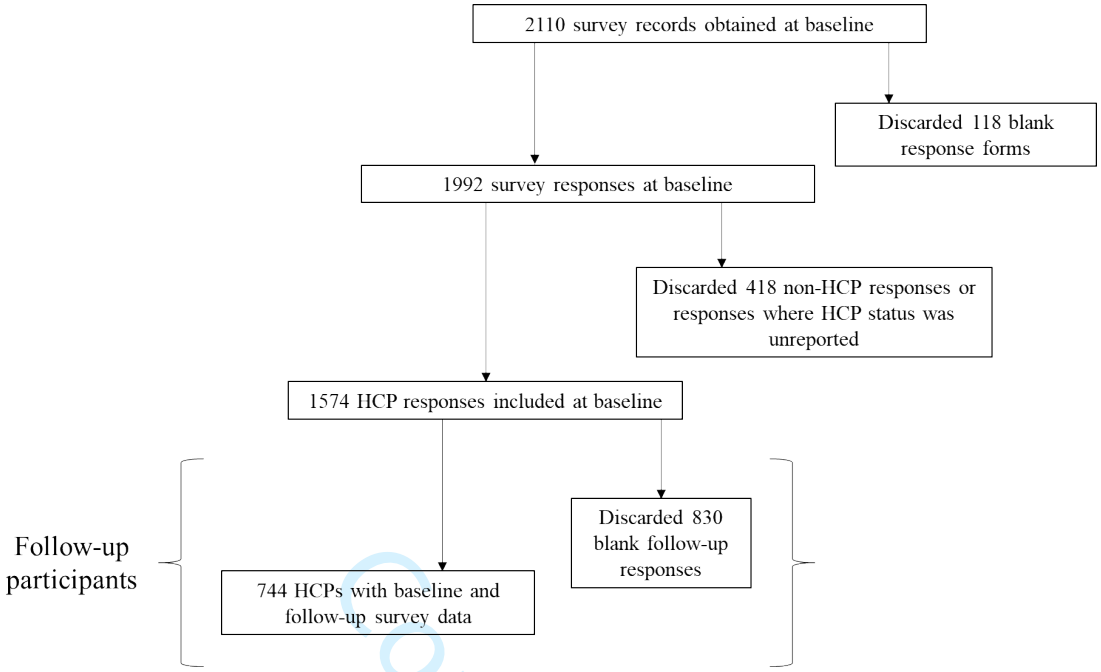
	Financial support • E.g. free lunches, and free parking so HCPs can drive (and avoid public transport) and no additional expense.	*"Most helpful - being able to drive to and park at work. Food provided at work."* *"Free meals because there was no food in the shops and also I was so tired after my shift, I couldn't cook. Not having to wash my uniform. I know my manager was doing her best to keep the unit staffed and as safe as possible."*
	Work from home support • Few HCPs described support (in terms of IT equipment, software support to facilitate working from home as being significant.	*"Not to have to pay back hours lost trying to work from home without necessary equipment needed to enable me to work from home effectively. Necessary equipment should have been provided."*
Leadership	Visibility • Staff felt there was a lack of senior managerial presence "on the ground", resulting in patient-facing staff feeling uncared for, disconnected with decision makers and that they lacked genuine understanding of the difficulties experienced.	*"Felt top senior management/directors were not visible during the peak and now- highlighting a big disconnect between the realities of working on the shop floor and those making the decisions."*
	Available/approachable • Few brief comments expressing gratitude for their managers/supervisors being approachable. • Few comments relating to being glad that supervisors were available to help, or the availability of wellbeing support services.	"*Most helpful was having a manager who was always available and actively trying to improve the situation for us all, thinking of things to change before it needed changing etc. Very grateful."*
	Reassurance • Few comments highlight the significance of receiving reassurance from their managers regarding tasks and patient care, and reassurance regarding redeployment or job security.	*"I work in intensive care. We were told "to keep patients alive and anything you do extra is a bonus". This was very comforting to me as I know I will always do my best and more to reach on everything but was this statement by our matron made me feel I could do my job to the best of my ability and not live with the guilt that I hadn't reached on certain things."*
	Higher support for managers • Some participants who were managers themselves felt there was no-one to manage or support them.	*"I am a partner & senior manager. At the height of the crisis there was no one to take to about it. I and the other partners were constantly having to support the staff team. But there was no one for us to go to."*
Peer support	Peer support was frequently stated. This was usually described as helpful and comprised a sense of camaraderie, solidarity/unity, and being open with each other. Some participants appreciated eating lunch together with team and to have informal discussions regarding emotional support. More formal modes of discussion described Balint groups, in a couple cases.	*"We are a team of 12 working in a "bubble". At the height of the pandemic we split into two teams and working alternate weeks. increased workload and very stressful but we all supported each other and ensured we were all coping!* *"Mealtimes were really important. Meals were free and my manager ensured we all went together and ate lunch together. This seemed to brighten the day and we tried not to talk about work at lunch time. For other team members, she also requested they go back to the office before home time to have a debrief.*

*N = 860.

Confidential

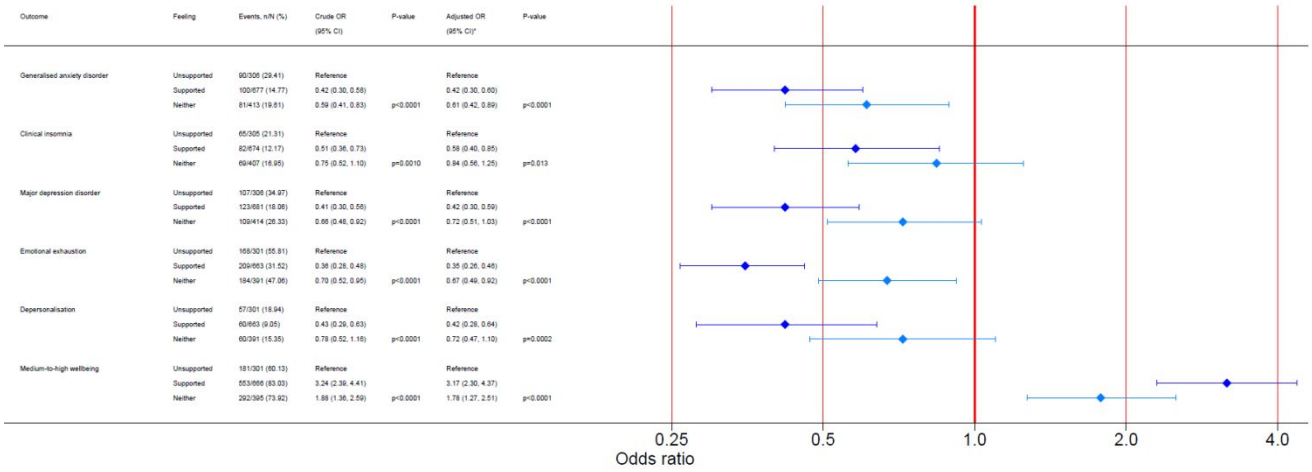
For Peer Review Only

Figure 1. Flowchart for baseline and follow-up participants.



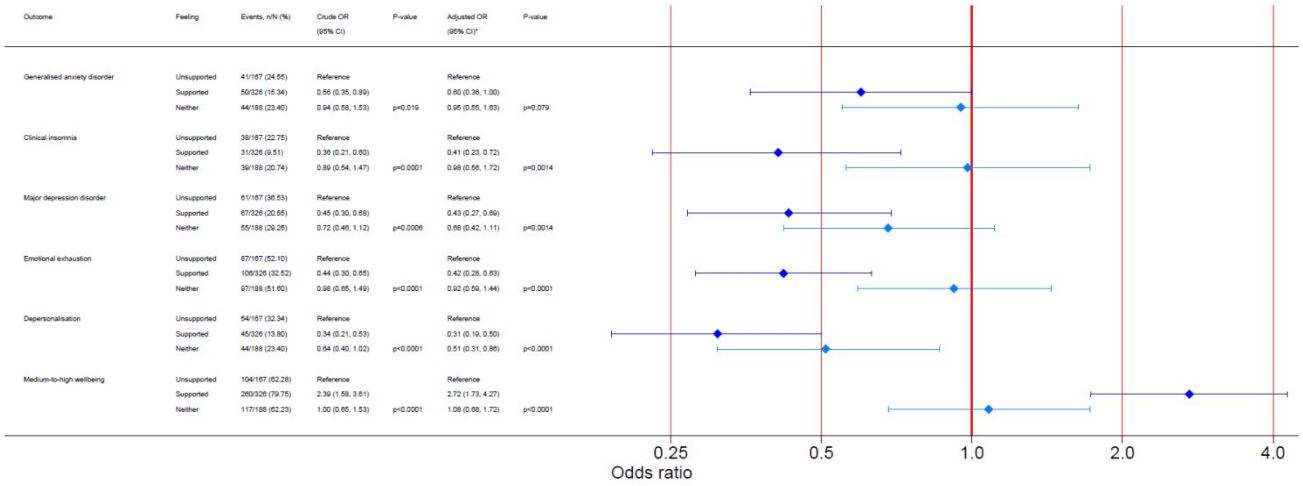
Confidential

Figure 2. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at baseline (n, 1422).



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating support to each outcome.

Figure 3. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at follow-up (n, 681).



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating change in level of support to mean scores on each outcome.

For Peer Review Only

Title

The relationship between the level of (and changes in) perceived workplace support and mental health, wellbeing and burnout in healthcare professionals (HCP) during the COVID-19 pandemic: insight and mitigating strategies from the CoPE-HCP cohort study.

Authors

Imrana Siddiqui*[1,2,3] MBBS (joint first author), Jaya Gupta*[4] MRCPsych (joint first author), Iris McIntosh[5] MRCPsych, Christina Komodromos[6] BSc, Thomas Godec[7] PhD, George Collett[7] PhD, Sher Ng[8] MB BChir, Carmela Maniero[7,8,9] PhD, Sotiris Antoniou[8] MRPharmS, Rehan Khan[9] MRCOG, Vikas Kapil[7,8,9] PhD, Mohammed Y. Khanji[7,8,10] MRCP, and Ajay K. Gupta[7,8,9,11**] PhD, on behalf of COPE-HCP clinical investigators***.

Affiliations

[1]Wellbeing Hub, Newham Training Hub, London, United Kingdom.

[2] NHS NorthEast London CCG, London, United Kingdom.

[3]Woodgrange Medical Practice, London, United Kingdom.

[4]South West London and St George's Mental Health NHS Trust, London, United Kingdom.

[5]Camden & Islington Foundation Trust, London, United Kingdom.

[6]Barnet, Enfield and Haringey Mental Health NHS Trust, London, United Kingdom.

[7]William Harvey Research Institute, Queen Mary University of London, London, United Kingdom.

[8]Barts Heart Centre, St. Bartholomew's Hospital, Barts Health NHS Trust, London, United Kingdom.

[9]The Royal London Hospital, Barts Health NHS Trust, United Kingdom.

[10]. Newham University Hospital, Barts Health NHS Trust, London, United Kingdom.

[11]National Heart and Lung Institute, Imperial College London, London, United Kingdom.

*Joint first authors (contributed equally to this manuscript).

Confidential

**Corresponding and senior author: Ajay K. Gupta, William Harvey Research Institute, Queen Mary University London, London, United Kingdom. ajay.gupta@qmul.ac.uk

The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

***See supplementary document for COPE-HCP Clinical Investigators names and affiliations.

Funding Statement

Barts Charity. The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Word count: 3115

Confidential

Abstract

Background

COVID-19 pandemic is associated with psychological impact amongst healthcare professionals (HCPs). However, little is known about the relationship between workplace support (WS) and mental health and burnout amongst HCPs, and the effective strategies mitigating this impact.

Methods

In the CoPE-HCP cohort study, online surveys were distributed at baseline (July-September 2020), and at follow-up (~four months later) assessing the presence of generalized anxiety disorder (GAD), clinical insomnia, major depressive disorder (MDD), burnout (emotional exhaustion and depersonalization), and wellbeing. Both surveys assessed self-reported level of WS. For baseline and follow-up, independently, separate logistic regression models relating the level of WS to mental health and burnout were developed after adjusting for a priori confounders. Linear regression models were also developed relating the change in the perceived level of WS with the change in mental health scores from baseline and follow-up. Thematic analyses on baseline survey free-text entries were done to evaluate what constitutes effective support.

Findings

At baseline (n = 1422) and follow-up (n = 681), consistently, compared to those who felt unsupported, those who felt supported had reduced risk (odds) of GAD (baseline: 58% [95% CI of OR, 0.30-0.60], follow-up: 40% [0.36-1.00]), clinical insomnia (42% [0.40-0.85], 59% [0.23-0.72]), MDD (58% [0.30-0.59], 57% [0.27-0.69]), emotional exhaustion (65% [0.26-0.46], 58% [0.28-0.63]) and depersonalization (58% [0.28-0.61], 69% [0.19-0.50]).

In the cohort of those who responded to both surveys, the improvement in perceived level of WS from baseline was associated with significantly improved GAD-7 (adjusted difference. -0.13 [-0.25, -0.01]), PHQ-9 (-0.17 [-0.29, -0.04]), and SWEMWBS (wellbeing) (0.19 [0.10, 0.29]) scores, independent of baseline level of support.

For Peer Review Only

We identified five themes constituting effective workplace support: 1) concern/understanding for welfare, 2) information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support.

Interpretation

These findings highlight nuanced associations between perceived level of (and changes in) WS and mental health and burnout of HCPs, and identifies potential strategies constituting effective workplace support.

Trial registration

Clinicaltrials.gov (NCT04433260).

Confidential

Introduction

The coronavirus (COVID-19) pandemic has posed a significant peril to both the physical and mental health of the general population. In particular, the significant toll on healthcare professionals (HCPs) is a critical issue that, if not addressed, will impact staffing and service provisions in the future.[1, 2] The potential increased vulnerability to mental health issues amongst HCPs could be explained by the unique challenges faced by them, including vicarious trauma,[3] moral injury,[4-7] and substantially increased risk of infection.[8] Long working hours, discrimination for working in hospitals, and workplace practices may also contribute to the psychological impact.[9] Indeed, recent meta-analyses and studies have attested to this considerable toll, with reported prevalence rates of anxiety (26.1%),[10] depression (24%),[11] and burn-out (49.4%)[12] among HCPs during the pandemic. As such, high quality research identifying the factors associated with improved mental health outcomes in HCPs, and likely strategies to mitigate them, is an urgent need.[2]

Workplace support is one potential strategy. Relating to previous severe acute respiratory syndrome (SARS) outbreaks, *Brooks et al*. recommend the critical role of managers/employers in ensuring clear communication, supportive environments, specialised training, and support systems to promote psychological wellbeing.[13] Concerningly, a cross-sectional survey during the first wave of the COVID-19 pandemic (data collected from 30th March 2020 to 5th May 2020) found that most respondents (UK HCPs) felt there was inadequate wellbeing support.[14] The study, along with other small qualitative studies, also highlight the perceived value of organisational support to the mental health in HCPs.[14-19] Some cross-sectional quantitative studies support an association between workplace support and mental health in HCPs[20-24] and suggesting workplace support to mitigate the psychological burden in HCPs. However, these studies have limitations: most are cross-sectional,[20-25] some are small[21, 25] or offer a non-comprehensive assessment of mental health (and neglect issues such as burnout),[20, 22] or only focus on qualitative or quantitative aspects of support.[15, 16, 20-25] Therefore, to inform national and global policy and workplace practices, we require robust high-quality studies using comprehensive mental health assessments demonstrating improvements in mental health over time.[26]

Addressing this, the current study (part of the COVID-19 and Physical and Emotional Wellbeing of Healthcare Professionals project; CoPE-HCP)[27] examined the relationship between perceived level of workplace support and mental health outcomes: generalized anxiety

For Peer Review Only

Confidential

disorder, clinical insomnia, major depressive disorder, burnout (emotional exhaustion and depersonalization), and wellbeing twice during the pandemic (approximately four months apart). We also examined whether changes in perceived level of workplace support was associated with improved mental health and wellbeing outcomes over the four-month period. Finally, we explored what workplace support HCPs want or have found helpful.

Methods

The protocol for this cohort study is published.[27] The study was approved by the Cambridge East Research Ethics Committee (20/EE/0166), and registered in ClinicalTrials.gov (NCT04433260).

The study involved a series of online surveys distributed to HCPs (in the UK and internationally). The inclusion criteria for the study were: 1) aged 18 or older, 2) electronic consent given, and 3) self-identified as HCP staff. Recruitment was facilitated by health service employers who invited employees by email containing a link to the survey, and the participants were those who responded to that invite.

Initial consent was gained for the baseline survey, and at the end of the baseline survey, participants were then asked for their consent to receive any follow-up surveys. Further consent was gained at the follow-up survey.

The baseline survey was conducted between July and September 2020. In the UK, this corresponded to the trough of the first wave of COVID-19. The baseline survey gathered information such as age, gender, ethnicity, relationship status, educational attainment, and current mental health and physical health diagnosis (a multiple-choice closed-ended item).

Our primary predictor, workplace support, was assessed by asking participants "Do you think you received adequate support directly from your supervisors/line managers/direct employers? (Mark on scale, with 1 -as no support and 10 as full and professional support)". This was converted to a 3-level response with scores of 1-3, 4-6, and 7-10 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported' respectively. 'Felt unsupported' served as the reference group in the analysis. A subsequent free-text item was included eliciting qualitative data about what support they found most helpful or felt would be helpful, to supplement perceptions of workplace support.

Outcome ascertainment

Confidential

At each survey, we assessed for the presence of generalized anxiety disorder (using the 7-item Generalized Anxiety Disorder [GAD-7]),[28] clinical insomnia (using 7-item Insomnia Severity Index [ISI]),[29] major depressive disorder (using 9-item Patient Health Questionnaire [PHQ-9]),[30] burnout domains: emotional exhaustion and depersonalization (using single respective 7-point scale items)[32], and wellbeing (using the Short Warwick-Edinburgh Mental Wellbeing Score [SWEMWBS]).[31]

The follow-up survey (approximately four months after baseline during the second peak of the pandemic) included the same mental health assessments and the same item assessing level of workplace support (excluding free-text item). For transparency, due to survey error, the support item at follow-up provided a score between 0 and 100 (as opposed to 0-10 at baseline survey) which was similarly collapsed to a 3-level response: 0-30, 31-69, and 70-100 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported', respectively.

Statistical analysis

Statistical analyses were conducted using STATA v17.0. Baseline characteristics were compared between those who responded to the follow-up survey and are part of HCP cohort, and those who only responded to first survey and constitute the findings from baseline cross-sectional analysis.

At each survey time point, we separately assessed for the cross-sectional association between the perceived level of support and the presence of outcomes: generalized anxiety disorder, clinical insomnia, major depressive disorder, below average wellbeing, emotional exhaustion, and depersonalization, in accordance with validated cut-offs of respective tools. Logistic regression models were developed to estimate crude and adjusted odds ratios (with 95% confidence intervals, and p-values) in each perceived support group as compared to the reference group (perceived unsupported). The multivariable models were adjusted for pre-specified risk factors: age, gender, time since COVID-19 peak in the participant's region, highest level of education, relationship status, number of people living in their household, currently diagnosed mental health condition (yes/no), currently diagnosed physical health condition (yes/no), and HCP role (medical doctors [reference group] vs. healthcare assistants, nurses and midwives, and AHPs).

For cohort analysis, i.e. those who responded to both baseline and follow-up surveys, the change in mental health and burnout symptoms was calculated by subtracting the baseline raw score from the follow-up score (follow-up score was rescaled by dividing by 10) on the

Confidential

respective scales. Changes in perceived workplace support was calculated by subtracting the baseline raw score (regarding adequate workplace support) from the follow-up score. Separate unadjusted and adjusted (adjusted for the above risk factors and for baseline perceived level of support) linear regression models were conducted assessing the extent that the change in perceived level of workplace support is associated with changes in mental health and burnout symptoms over time.

Thematic analysis

The free-text item was analysed using thematic analysis[33] by four researchers (JG, IS, IM, CK). Responses were analysed inductively, meaning no pre-selected themes were used to start with, and the analysis was data-driven. First, the raw data was collated into an Excel table and each of the above researchers familiarised themselves with the data. Initial codes were generated for each entry of data and were shared amongst the researchers before being refined as a coding dictionary. Any data entries with limited detail regarding the type of support were regarded as 'unspecified' and not included in refining of codes. The data entries and refined codes were reviewed and amalgamated into key themes (selected based on salience and the apparent significance to the participants) and subthemes to best describe the data.

Results

1574 HCPs were included at baseline cross-sectional assessment, and amongst them 744 (47.3%) who responded to the follow-up survey comprised of the cohort population and also the separate cross-sectional analysis for the follow-up period only (Figure 1; Table 1).

Most of the 1574 HCPs at baseline were from the UK (n = 1321; 83.9%). Of the HCPs based outside the UK (n = 253; 16.1%), most were from North America (37.2%) followed by Asia (34.4%) and Europe (17.4%). Reporting the non-UK country where they were based was optional: of the 202 respondents, 70 (34.7%) were from the USA followed by 63 (31.2%) from India. A total of 30 different countries comprised the non-UK participants.

At baseline (n = 1574; specific number varies for each outcome), 19.9% of 1429 HCPs met the criteria for generalized anxiety disorder, 16.1% of 1418 HCPs for clinical insomnia, 24.7% of 1434 HCPs for major depressive disorder, 41.9% of 1386 HCPs for emotional exhaustion, and 13.4% of 1386 HCPs for depersonalization. At cross-sectional evaluation of the follow-up stage (n = 744; specific number varies for each outcome), we observed increased or sustained outcome rates for generalized anxiety disorder (20.8% of 723 HCPs), clinical insomnia (16.3%

For Peer Review Only

of 722 HCPs), major depressive disorder (28.0% of 724 HCPs), emotional exhaustion (43.2% of 717 HCPs), and depersonalization (21.2% of 717 HCPs).

Baseline group and cohort population of HCPs

The baseline characteristics of those who only responded to the baseline survey (n = 1574) were mostly similar to those who responded to both surveys (n = 744), except for significant differences in self-defined ethnicity, gender identity and number of people living in the household (Table 1; Supplemental Table 1). Baseline-only responding participants had relatively higher proportions of self-assigned Asian ethnicity and male gender and belonged to the bigger household (Supplemental Table 1). Mental health outcomes were not significantly different between those who only responded to the baseline survey and those who responded to both surveys according to chi squared analysis (Supplemental Table 1).

Perceived level of support at baseline and follow-up

In independent cross-sectional assessments, 1422 participants provided valid data on perceived level of support at baseline and 681 of them provided similar data at follow-up too. As per our pre-defined 3-level categories (based on the Likert scales) measuring perceived support, 48.5% of the 1422 HCPs at baseline reported feeling supported with similar proportions observed in the follow-up sample (47.9% of 681 HCPs), whilst 21.9% of the baseline sample felt unsupported with 24.5% of the follow-up sample felt unsupported (Supplementary Table 2; see Supplementary Figure 1-3 for percentage distribution of responses for baseline and follow-up perceived level of support, and for the change in perceived support from baseline to follow-up).

Relationship between support and mental health and burnout outcomes

At baseline (Figure 2), there was a statistically significant relationship between level of support and each mental health and burnout outcome (p for trends were all <0.01 except for clinical insomnia $p = .013$). Compared with those who felt unsupported, respondents who felt supported were significantly less likely to meet the criteria for generalized anxiety disorder (adj. odds ratio 0.42, 95% CI 0.30 to 0.60), clinical insomnia (0.58, 0.40 to 0.85), major depressive disorder (0.42, 0.30 to 0.59), emotional exhaustion (0.35, 0.26 to 0.46), and depersonalisation (0.43, 0.28 to 0.64). On the SWEMWBS wellbeing measure, those who felt supported were significantly more likely to have medium or high wellbeing (3.17, 2.30 to 4.37).

Confidential

For Peer Review Only

Based on 681 valid responses at follow-up (Figure 3; median 4.9 months after baseline survey), compared to those who felt unsupported, those who felt supported were significantly less likely to meet the criteria for clinical insomnia (0.34, 0.20 to 0.58), major depressive disorder (0.46, 0.30 to 0.70), emotional exhaustion (0.39, 0.27 to 0.58), and depersonalisation (0.32, 0.20 to 0.51). Similarly, on the SWEMWBS wellbeing measure, those who felt supported were more likely to have medium or high wellbeing (2.72, 1.73 to 4.27). Borderline significance was met for generalized anxiety disorder (0.60, 0.36 to 1.00) when comparing perceived supported to perceived unsupported HCPs.

Change in level of workplace support and improvement in mental health outcomes over time

In the cohort of participants with data at both baseline and follow-up (n = 681), there was a consistent association between the change in perceived level of support and the change in scores on some, but not all, mental health outcomes (Table 2). Separate adjusted linear regression models showed that a whole unit increase in change in perceived level of support was inversely associated with the change in GAD-7 anxiety scores (coefficient -0.13 [-0.25 to -0.01] p = .04), PHQ-9 depression scores (-0.17 [-0.29 to -0.04] $p < 0.01$), and positively associated with the change in SWEMWBS wellbeing scores (0.19 [0.10 to 0.29] $p < 0.001$). No significant associations were observed between change in perceived level of support and the change in ISI insomnia ($p = 0.067$) or EEDP2Q burnout scores ($p = 0.139$).

Themes: what constitutes effective support

860 free-text entries were included in the thematic analysis to illustrate what qualities/aspects of workplace support are perceived as most helpful. We identified 5 overarching themes describing: 1) concern or recognition regarding welfare, 2) information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support (see Table 3 for full details and exemplar quotes).

Interpretation

This large cohort study demonstrates that, during the COVID-19 pandemic, HCPs who felt supported at baseline (compared with those who felt unsupported) had a significantly lower risk (odds) of generalized anxiety disorder, clinical insomnia, major depressive disorder, emotional exhaustion, depersonalization, and below-average wellbeing. This association was also observed at follow-up (albeit borderline significance for generalized anxiety disorder), more than four months after baseline, demonstrating consistency and reliability in these

For Peer Review Only

findings. Importantly, to our knowledge, this is the first study to report associations between changes in perceived level of workplace support and changes in mental health symptoms in HCPs over time during the pandemic: improvement in perceived support was significantly associated with improved scores on measures of generalized anxiety disorder, major depressive disorder, and wellbeing (independent of baseline perceived level of support), but not for insomnia or burnout. Furthermore, a unique aspect of this study is the rich qualitative data illustrating what qualities of workplace support are perceived by HCPs to be helpful during the pandemic. This inclusion of qualitative data can inform the design of intervention studies to establish a causal relationship between workplace support and mental health.

This study builds on and validates the hypothesis generated by a few recent cross-sectional studies showing associations between workplace support and mental health outcomes in HCPs during the current pandemic,[21, 22, 36] and previous outbreaks.[37] While a small cohort study in routine work environment has shown that level of co-worker and managerial support is inversely associated with general mental distress,[38] we have not found any studies – in routine or pandemic settings - that have evaluated the prospective relationship between perceived improved workplace support and changes in mental health, wellbeing, and burnout.

Most policy and guidance suggest a benefit of improving workplace support on general mental health, and indeed our findings support this notion regarding depression, anxiety, and wellbeing in HCPs. However, whilst we observe a trend between change in perceived level of support and insomnia and burnout scores over time, these associations were non-significant. This highlights the relevance of improvements in perceived workplace support to distinct mental health issues, and we speculate that other workplace factors which are not accounted for in this analysis (e.g. long working hours) are more likely to impact on burnout and insomnia.

Regarding our qualitative findings, these are consistent with previous workplace guidance for healthcare systems. The WHO has advised how HCPs and their managers can promote their psychosocial wellbeing during the COVID-19 pandemic: taking care of basic needs, ensuring staff communication is up-to-date and of high quality, use of buddy systems, psychological first aid, and ensuring staff access to mental health support services.[39] Our findings also mirror previous reviews stating that clear communication through horizontal (peer-peer) and vertical (managers/trusts-employees) networks can buffer against the psychological impact.[26] Many participants also reported daily updates being useful as a means of support. In the UK, Enabling Quality Improvement in Practice encourages embedding daily huddles into work practice with

For Peer Review Only

the goal of safety and improvement - we suggest these daily huddles should include a wellbeing 'check-in' element.

Intrinsic to workplace support is the support for managers themselves which was reflected by a few comments in our qualitative data. Previous qualitative work highlighted how managerial support was integral to more positive workplace experience during the Ebola epidemic, but also managerial stress was reflected onto the HCPs.[40] Therefore, we must consider the potential impact of managerial mental health on the quality of support delivered to employees, which was not explicitly examined in our survey.

There are some limitations to this study. First, the data was collected between July and December 2020, at the trough and second peak of the UK COVID-19 pandemic, respectively. Despite the pandemic still ongoing, our findings remain highly relevant due to the fluctuating levels of cases and persistent mental health burden in HCPs. Secondly, while we account for the time since COVID-19 peak in participants' region, non-UK participants may have experienced varying public health policies which may be a confounder. Third, there is potential selection bias because our survey was accessible online only, and the respondents may not be representative of all HCPs (those with self-identified female gender and white ethnicity were more likely to respond to the follow-up survey). However, our observed rates of mental health outcomes are similar to other large surveys in the UK general population,[34] and no significant differences were observed for mental health between baseline-only and follow-up (cohort) participants, therefore we anticipate our cohort findings to be generalisable to the healthcare workforce regardless of possible self-selection bias. Fourth, the issue of bidirectionality remains relevant despite reporting data at two time points: HCPs with lower mental health may perceive workplace support to be lower because their needs are greater. Despite this, we believe that participants primarily rate their level of support based on their observations of the available support strategies in the workplace. Finally, most free text responses were generated from a double-barrelled question asking what support was useful and what was desired. This does not invalidate the themes but we are unable to concretely distinguish between what support was helpful and what was lacking.

In conclusion, we demonstrate a consistent association between perceived level of workplace support and the mental health and wellbeing of HCPs during the pandemic. Improved perceived workplace support was associated with improved scores on anxiety, depression, and wellbeing measures over time but was not associated with insomnia or burnout. Further studies are

For Peer Review Only

required to understand the workplace factors associated with insomnia and burnout in HCPs during the pandemic, and to understand the causal relationship between perceived workplace support and mental health in HCPs. Our findings are likely to inform significant changes in guidance and national policies targeted at improving wellbeing in HCPs during the current and future pandemics.

Declaration of interests:

AKG (chief investigator and corresponding author) declares that CoPE-HCP study received part funding from Barts Charity, and declares no other conflict of interest.

Authors contributions:

AKG is the chief investigator and corresponding author for this study had access to all of the data in the study and takes full responsibility for the integrity of the data and the accuracy of the data analysis. Below are the detailed author contributions

Conceptualization: AKG, VK, MYK, JG, IS, CM, SN

Data curation: AKG, TG, GC

Formal analysis: AKG, TG, JG, IS, IM, CK, GC

Funding acquisition: AKG, VK

Resources and software: AKG, TG

Supervision: AKG

Investigation: *all authors and investigators*

Methodology: AKG, VK, MYK, JG, IS, CM, SN, RK, SA

Project administration: AKG, GC

Writing original draft: IS, JG, AKG, IM, CK, TG, GC

Writing-review and editing: *all authors and investigators*

Funding

Barts Charity.

Role of funding source

Confidential

The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Patient and public involvement

No patients or members of the public were directly involved with the design, or conduct, or reporting, or dissemination plans of the research.

Data sharing statement

Anonymised data, data dictionary, and survey materials will be made available upon request. Study protocol is available at https://doi.org/10.3389/fpsyg.2021.616280.

Acknowledgements:

We would like to acknowledge the extensive support received from the Barts Education Academy and William Harvey Research Institute for sharing some of their resources needed to conduct this study. In particular, we wish to acknowledge the excellent contribution of the following: Julekha Khanam from Barts Health NHS Trust, Elaine Colaco and Martyn Clark from Barts Education Academy, Tania Toma from Imperial College Healthcare NHS Trust, and Ade Alele, Professor Mark Caulfield, and Amrita Ahluwalia from William Harvey Research Institute.

Transparency declaration:

AKG (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Confidential

References

1. Stuijfzand S, Deforges C, Sandoz V, Sajin C-T, Jaques C, Elmers J, et al. Psychological impact of an epidemic/pandemic on the mental health of healthcare professionals: a rapid review. BMC Public Health. 2020;20:1-18.
2. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. 2020;7(6):547-60.
3. Li Z, Ge J, Yang M, Feng J, Qiao M, Jiang R, et al. Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. Brain Behav Immun. 2020;88:916-9.
4. Wang Z, Harold KG, Tong Y, Wen J, Sui M, Liu H, et al. Moral injury in Chinese health professionals during the COVID-19 pandemic. Psychological Trauma: Theory, Research, Practice, and Policy. 2021;Advance on.
5. Zerach G, Levi-Belz Y. Moral injury and mental health outcomes among Israeli health and social care workers during the COVID-19 pandemic: a latent class analysis approach. European journal of psychotraumatology. 2021;12.
6. Lamb D, Gnanapragasam S, Greenberg N, Bhundia R, Carr E, Hotopf M, et al. Psychosocial impact of the COVID-19 pandemic on 4378 UK healthcare workers and ancillary staff: initial baseline data from a cohort study collected during the first wave of the pandemic. Occupational and Environmental Medicine. 2021;0:1-8.
7. Plouffe RA, Nazarov A, Forchuk CA, Gargala D, Deda E, Le T, et al. Impacts of morally distressing experiences on the mental health of Canadian health care workers during the COVID-19 pandemic. Eur J Psychotraumatol. 2021;12(1):1984667.
8. Shanafelt T, Ripp J, Trockel M. Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic. JAMA. 2020;323:2133-4.
9. Yang Y, Lu L, Chen T, Ye S, Kelifa MO, Cao N, et al. Healthcare Worker's Mental Health and Their Associated Predictors During the Epidemic Peak of COVID-19. Psychol Res Behav Manag. 2021;14:221-31.
10. Raoofi S, Kan FP, Rafiei S, Khani S, Hosseinifard H, Tajik F, et al. Anxiety during the COVID-19 pandemic in hospital staff: systematic review plus meta-analysis. BMJ Supportive & Palliative Care. 2021;0:1-9.
11. Olaya B, Pérez-Moreno M, Bueno-Notivol J, Gracia-García P, Lasheras I, Santabárbara J. Prevalence of Depression among Healthcare Workers during the COVID-19 Outbreak: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2021;10:3406.
12. Prasad K, McLoughlin C, Stillman M, Poplau S, Goelz E, Taylor S, et al. Prevalence and correlates of stress and burnout among U.S. healthcare workers during the COVID-19 pandemic: A national cross-sectional survey study. EClinicalMedicine. 2021;35.
13. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N. A Systematic, Thematic Review of Social and Occupational Factors Associated with Psychological Outcomes in Healthcare Employees during an Infectious Disease Outbreak. Journal of Occupational and Environmental Medicine. 2018;60:248-57.
14. Siddiqui I, Aurelio M, Gupta A, Blythe J, Khanji M. COVID-19: Causes of anxiety and wellbeing support needs of healthcare professionals in the UK: A cross-sectional survey. Clinical Medicine. 2021;21:66-72.
15. Billings J, Seif NA, Hegarty S, Ondruskova T, Soulios E, Bloomfield M, et al. What support do frontline workers want? A qualitative study of health and social care workers' experiences and views of psychosocial support during the COVID-19 pandemic. PLoS ONE. 2021;16:e0256454.
16. Kang B-A, Kwon S, You M, Lee H. Perceived sources of occupational burn-out and embitterment among front-line health workers for COVID-19 control in Gyeonggi province, South Korea: a qualitative study. Occupational and Environmental Medicine. 2021;0:1-8.

For Peer Review Only

17. Vera San Juan N, Aceituno D, Djellouli N, Sumray K, Regenold N, Syversen A, et al. Mental health and well-being of healthcare workers during the COVID-19 pandemic in the UK: contrasting guidelines with experiences in practice. BJPsych Open. 2020;7(1):e15.
18. Berkhout SG, Sheehan KA, Abbey SE. Individual- and Institutional-level Concerns of Health Care Workers in Canada During the COVID-19 Pandemic: A Qualitative Analysis. JAMA Netw Open. 2021;4(7):e2118425.
19. Buckley L, Berta W, Cleverley K, Widger K. Exploring Pediatric Nurses' Perspectives on Their Work Environment, Work Attitudes, and Experience of Burnout: What Really Matters? Front Pediatr. 2022;10:851001.
20. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research. 2021;21:1-11.
21. Cyr S, Marcil M-J, Marin M-F, Tardif J-C, Guay S, Guertin M-C, et al. Factors Associated With Burnout, Post-traumatic Stress and Anxio-Depressive Symptoms in Healthcare Workers 3 Months Into the COVID-19 Pandemic: An Observational Study. Frontiers in Psychiatry. 2021;12:668278.
22. Wanigasooriya K, Palimar P, Naumann DN, Ismail K, Fellows JL, Logan P, et al. Mental health symptoms in a cohort of hospital healthcare workers following the first peak of the COVID-19 pandemic in the UK. BJPsych Open. 2021;7(1).
23. Munn LT, Liu TL, Swick M, Rose R, Broyhill B, New L, et al. Original Research: Well-Being and Resilience Among Health Care Workers During the COVID-19 Pandemic: A Cross-Sectional Study. Am J Nurs. 2021;121(8):24-34.
24. Havaei F, Ma A, Staempfli S, MacPhee M. Nurses' Workplace Conditions Impacting Their Mental Health during COVID-19: A Cross-Sectional Survey Study. Healthcare (Basel). 2021;9(1).
25. Hines SE, Chin KH, Glick DR, Wickwire EM. Trends in Moral Injury, Distress, and Resilience Factors among Healthcare Workers at the Beginning of the COVID-19 Pandemic. International Journal of Environmental Research and Public Health. 2021;18:488.
26. Pollock A, Campbell P, Cheyne J, Cowie J, Davis B, McCallum J, et al. Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. Cochrane Database Syst Rev. 2020;11:CD013779.
27. Khanji MY, Maniero C, NG S, Siddiqui I, Gupta J, Crosby L, et al. Early and Mid-Term Implications of the COVID-19 Pandemic on the Physical, Behavioral and Mental Health of Healthcare Professionals: The CoPE-HCP Study Protocol. Frontiers in Psychology. 2021;12:39.
28. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-7.
29. Morin CM, Belleville G, Belanger L, Ivers H. The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep. 2011;34(5):601-8.
30. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-13.
31. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, et al. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. Health Qual Life Outcomes. 2007;5:63.
32. Li-Sauerwine S, Rebillot K, Melamed M, Addo N, Lin M. A 2-Question Summative Score Correlates with the Maslach Burnout Inventory. Western Journal of Emergency Medicine. 2020;21:617.
33. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3:77-101.
34. Shevlin M, McBride O, Murphy J, Miller JG, Hartman TK, Levita L, et al. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19 pandemic. BJPsych Open. 2020;6.

Confidential

35. Jordan J-A, Shannon C, Browne D, Carroll E, Maguire J, Kerrigan K, et al. COVID-19 Staff Wellbeing Survey: longitudinal survey of psychological well-being among health and social care staff in Northern Ireland during the COVID-19 pandemic. BJPsych Open. 2021;7:e159.
36. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research 2021;21:1-11.
37. Preti E, Di Mattei V, Perego G, Ferrari F, Mazzetti M, Taranto P, et al. The Psychological Impact of Epidemic and Pandemic Outbreaks on Healthcare Workers: Rapid Review of the Evidence. Current Psychiatry Reports. 2020;22:1-22.
38. Sconfienza C, Lindfors P, Lantz Friedrich A, Sverke M. Social support at work and mental distress: A three-wave study of normal, reversed, and reciprocal relationships. J Occup Health. 2019;61(1):91-100.
39. Mental health and psychosocial considerations during the COVID-19 outbreak [press release]. World Health Organization2020.
40. Belfroid E, Steenbergen Jv, Timen A, Ellerbroek P, Huis A, Hulscher M. Preparedness and the importance of meeting the needs of healthcare workers: a qualitative study on Ebola. Journal of Hospital Infection. 2018;98:212-8.

Confidential

For Peer Review Only

Tables and Figures

Table 1. Baseline characteristics of HCPs at baseline (n, 1574) and follow-up (n, 744).

	Response	Baseline (n, 1574) (%)	Follow-up (n, 744) (%)
Age	18-25 years	76 (4.8)	31 (4.2)
	26-35 years	390 (24.8)	175 (23.5)
	36-50 years	638 (40.5)	298 (40.1)
	51-60 years	372 (23.6)	185 (24.9)
	61-70 years	92 (5.8)	51 (6.9)
	> 70 years	6 (0.4)	4 (0.5)
Ethnicity	White	1027 (65.3)	587 (78.9)
	Asian	359 (22.8)	93 (12.5)
	Black	74 (4.7)	27 (3.6)
	Mixed	48 (3.1)	19 (2.6)
	Other	39 (2.5)	12 (1.6)
	Prefer not to say	27 (1.7)	6 (0.81)
Gender identity	Female	1105 (70.2)	562 (75.5)
	Male	447 (28.4)	178 (23.9)
	Prefer not to say	14 (0.9)	3 (0.4)
	Prefer to self-define	8 (0.5)	1 (0.1)
Relationship status	Divorced	54 (3.4)	27 (3.6)
	Prefer not to say	46 (2.9)	21 (2.8)
	Married/Living with partner or family	1048 (66.6)	496 (66.7)
	Other	52 (3.3)	22 (3.0)
	Single	374 (23.8)	178 (23.9)
Number living in household	1	210 (13.3)	104 (14.0)
	2	487 (30.9)	252 (33.9)
	3-5	799 (50.8)	367 (49.3)
	6 or more	78 (5.0)	21 (2.8)
Highest level of education	A-levels	113 (7.2)	61 (8.2)
	Bachelor's / diploma	735 (46.7)	346 (46.5)
	Master's / PhD	613 (39.0)	290 (39.0)
	Other	113 (7.2)	47 (6.3)

Note. HCP = healthcare professional. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

Confidential

Table 2. Separate linear regressions for the association between change in perceived level of support and change in raw mental health, burnout, and wellbeing scores in HCPs from baseline to follow-up (n, 681).

	Crude			Adjusted		
	Coefficient	**95% Confidence Intervals**	**P Value**	**Coefficient ***	**95% Confidence Intervals ***	**P value ***
GAD-7	-0.10	-0.21 to 0.01	0.075	-0.13	-0.25 to -0.01	0.036
PHQ-9	-0.19	-0.30 to -0.08	0.001	-0.17	-0.29 to -0.04	0.008
ISI	-0.07	-0.19 to 0.05	0.226	-0.13	-0.26 to 0.01	0.067
EEDP2Q	-0.05	-0.12 to 0.01	0.112	-0.06	-0.13 to 0.02	0.139
SWEMWBS	0.17	0.08 to 0.27	< 0.001	0.19	0.10 to 0.29	< 0.001

Note. Crude and adjusted coefficients provided.
*adjusted for age, gender identity, education, relationship status, number living in household, currently diagnosed mental health condition, currently diagnosed physical health condition, role (medical doctor vs. HCAs, nurses, and AHPs), and baseline level of support.

Confidential

For Peer Review Only

Table 3. Workplace support themes based on responses from HCP only*

Theme	Description	Quotes
Concern/ understanding for welfare	Genuine concern for welfare. • Managers who listened and left staff feeling understood and with consistent support were valued. • A few comments citing check-ins and appropriate training from original line-managers as being significant to their mental health when redeployed.	*"Direct check in. How am I doing, and actually listen to the answer. I have been left to get on with it, with a few platitudes "Ohh its hard"."* *"Would have wanted more recognition from management about impact and repercussions of redeployment but support from colleagues was good within the team."* *"I had no contact with my original team during my redeployment, I found this very stressful which increased my anxiety."*
	Flexibility and understanding. • Respondents appreciated managers who were understanding and flexible of personal circumstances, for example amended working arrangements due to childcare, school times, shielded family members, and personal anxiety/stress.	*"Better understanding of peoples personal situations. I am a full-time unpaid carer for partner who was told to shield for 12 weeks. Due to his condition (a Traumatic Brain Injury and Epilepsy) I was unable to leave him unsupervised for long periods of time as his seizures are fatal and in the event of one he needs medication administered to him to save his life…I requested to be able to work from home due these extenuating circumstances which was denied which caused me and my partner extreme stress…I think it needs to be looked at as a case by case basis and not as a staffing level or need as a whole."*
	Psychological support. • One-to-one confidential counselling and/or access to clinical psychologist was cited as useful for HCPs mental health.	*"Wellbeing support with a named psychologist allocated to our team right from the start."* *"I would have wanted one-on-one therapy sessions with an external professional. We were offered these with our own psychology department free of charge though often work closely with these individuals."*
Information	This broad theme generally describes HCPs requests for regular clear, consistent, and transparent communication/updates sent on a timely manner. Participants sometimes cited daily staff briefings, regular bulletins, and daily huddles as being useful modes of communication.	*"I found it really helpful to have daily or twice weekly staff team briefings with updates on PPE, procedures etc and a chance to ask questions. In the early part of the pandemic, one of the most stressful things was the sheer volume of information coming at us and constant changes to what we should be doing, what PPE we needed in which area etc."* *"Better communication - it felt like as a nurse being redeployed that we were deliberately kept in the dark about operations surrounding Covid-19 as the trust management were more paranoid about details being leaked to the press than staff welfare."*
Tangible qualities of the workplace	Adequate staffing • Several comments describing ensuring adequate staffing in response to staff sicknesses and/or heightened workload, for example.	*"Not sure. Managing staff shortages was difficult and extra work needed. Now we have burnout from covering."*
	PPE/safety • Commonly reported describing training in how to use PPE, safety protocols (e.g. social distancing), regular testing, and access to appropriate PPE.	*"At the beginning of the pandemic, the PPE was rationed strictly and that caused a lot of anxiety. Those initial contacts with patient meant those staff member developed symptoms and got ill. This caused a lot of anxiety. I fortunately had annual leave for a week and when I got back to work. The PPE was fully available and in use appropriately. Scrubs were a problem especially plus sizes, not available."*

Confidential

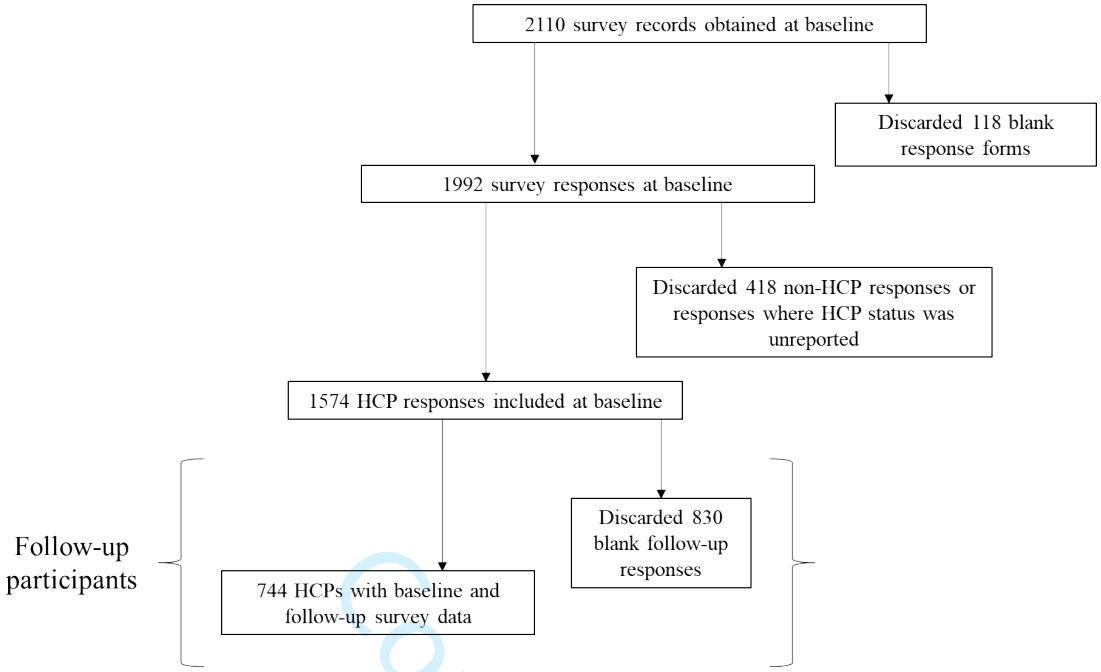
For Peer Review Only

	Financial support • E.g. free lunches, and free parking so HCPs can drive (and avoid public transport) and no additional expense.	*"Most helpful - being able to drive to and park at work. Food provided at work."* *"Free meals because there was no food in the shops and also I was so tired after my shift, I couldn't cook. Not having to wash my uniform. I know my manager was doing her best to keep the unit staffed and as safe as possible."*
	Work from home support • Few HCPs described support (in terms of IT equipment, software support to facilitate working from home as being significant.	*"Not to have to pay back hours lost trying to work from home without necessary equipment needed to enable me to work from home effectively. Necessary equipment should have been provided."*
Leadership	Visibility • Staff felt there was a lack of senior managerial presence "on the ground", resulting in patient-facing staff feeling uncared for, disconnected with decision makers and that they lacked genuine understanding of the difficulties experienced.	*"Felt top senior management/directors were not visible during the peak and now- highlighting a big disconnect between the realities of working on the shop floor and those making the decisions."*
	Available/approachable • Few brief comments expressing gratitude for their managers/supervisors being approachable. • Few comments relating to being glad that supervisors were available to help, or the availability of wellbeing support services.	"*Most helpful was having a manager who was always available and actively trying to improve the situation for us all, thinking of things to change before it needed changing etc. Very grateful."*
	Reassurance • Few comments highlight the significance of receiving reassurance from their managers regarding tasks and patient care, and reassurance regarding redeployment or job security.	*"I work in intensive care. We were told "to keep patients alive and anything you do extra is a bonus". This was very comforting to me as I know I will always do my best and more to reach on everything but was this statement by our matron made me feel I could do my job to the best of my ability and not live with the guilt that I hadn't reached on certain things."*
	Higher support for managers • Some participants who were managers themselves felt there was no-one to manage or support them.	*"I am a partner & senior manager. At the height of the crisis there was no one to take to about it. I and the other partners were constantly having to support the staff team. But there was no one for us to go to."*
Peer support	Peer support was frequently stated. This was usually described as helpful and comprised a sense of camaraderie, solidarity/unity, and being open with each other. Some participants appreciated eating lunch together with team and to have informal discussions regarding emotional support. More formal modes of discussion described Balint groups, in a couple cases.	*"We are a team of 12 working in a "bubble". At the height of the pandemic we split into two teams and working alternate weeks. increased workload and very stressful but we all supported each other and ensured we were all coping!* *"Mealtimes were really important. Meals were free and my manager ensured we all went together and ate lunch together. This seemed to brighten the day and we tried not to talk about work at lunch time. For other team members, she also requested they go back to the office before home time to have a debrief.*

*N = 860.

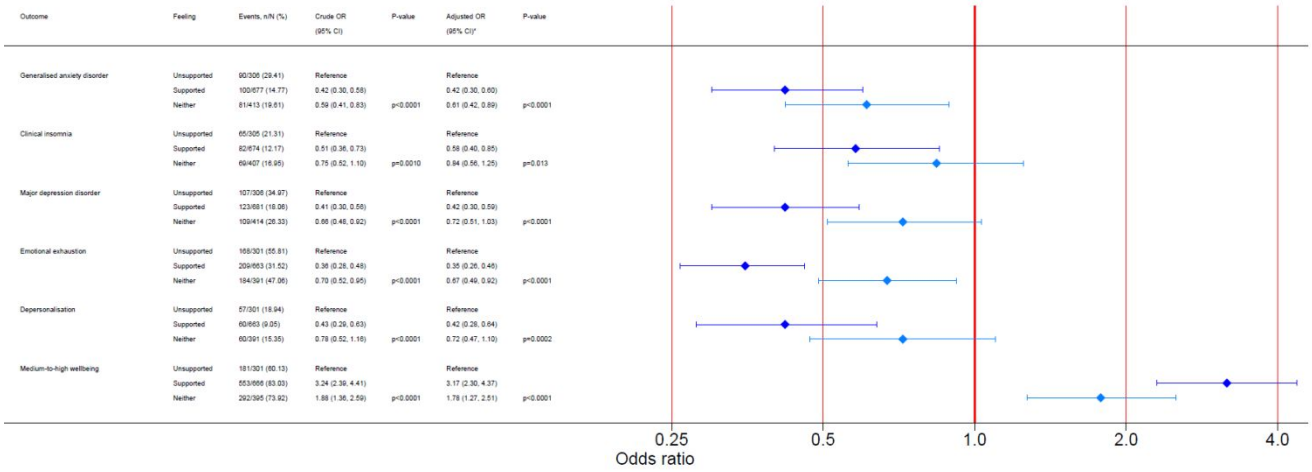
Confidential

Figure 1. Flowchart for baseline and follow-up participants.



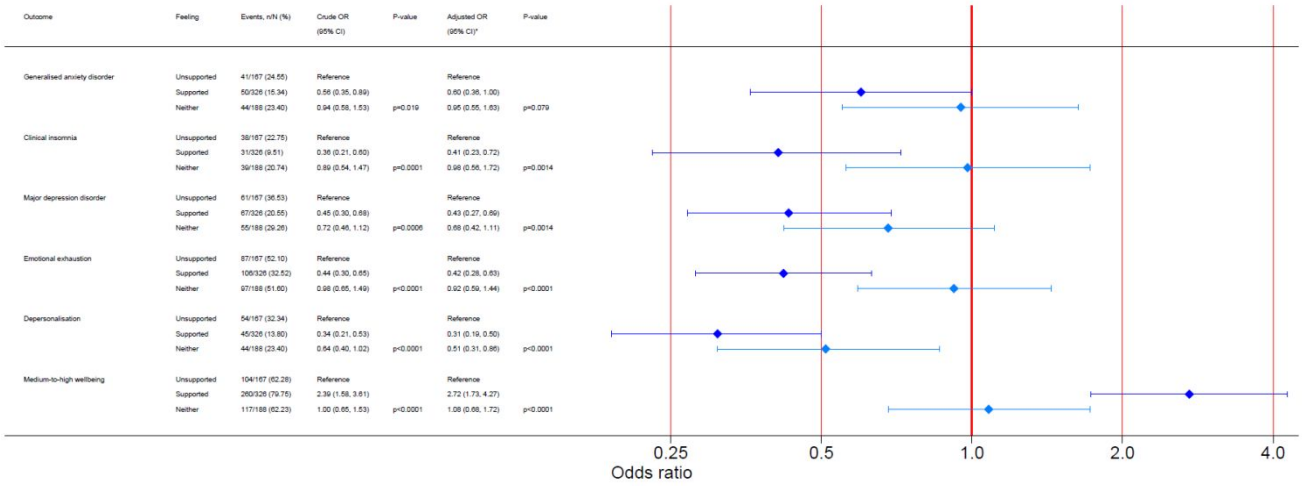
Confidential

Figure 2. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at baseline (n, 1422).



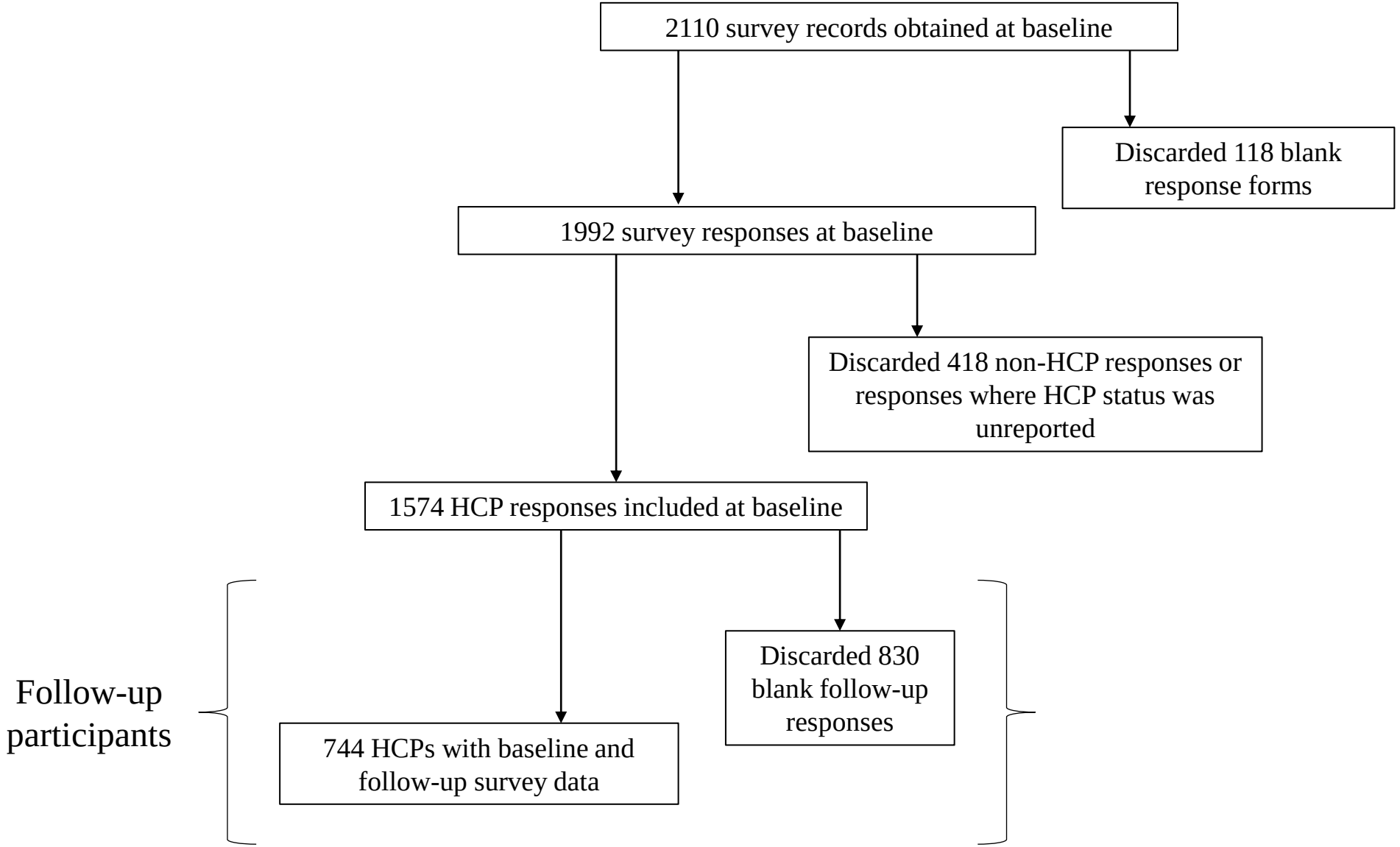
Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating support to each outcome.

Figure 3. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at follow-up (n, 681).

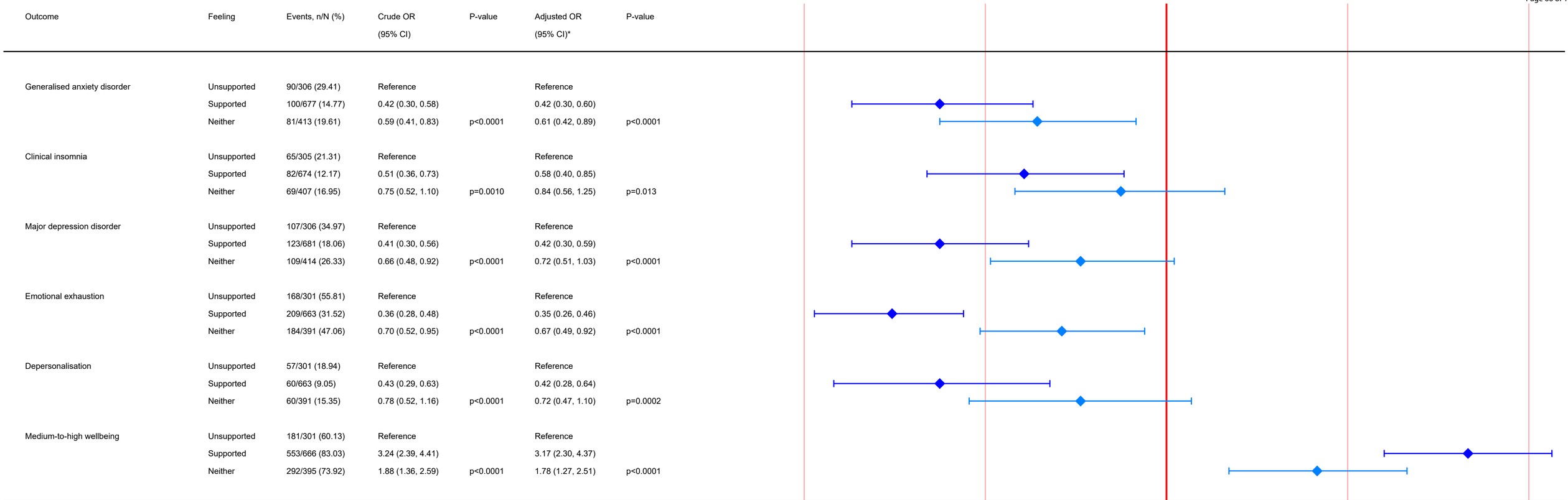


Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating change in level of support to mean scores on each outcome.

For Peer Review Only

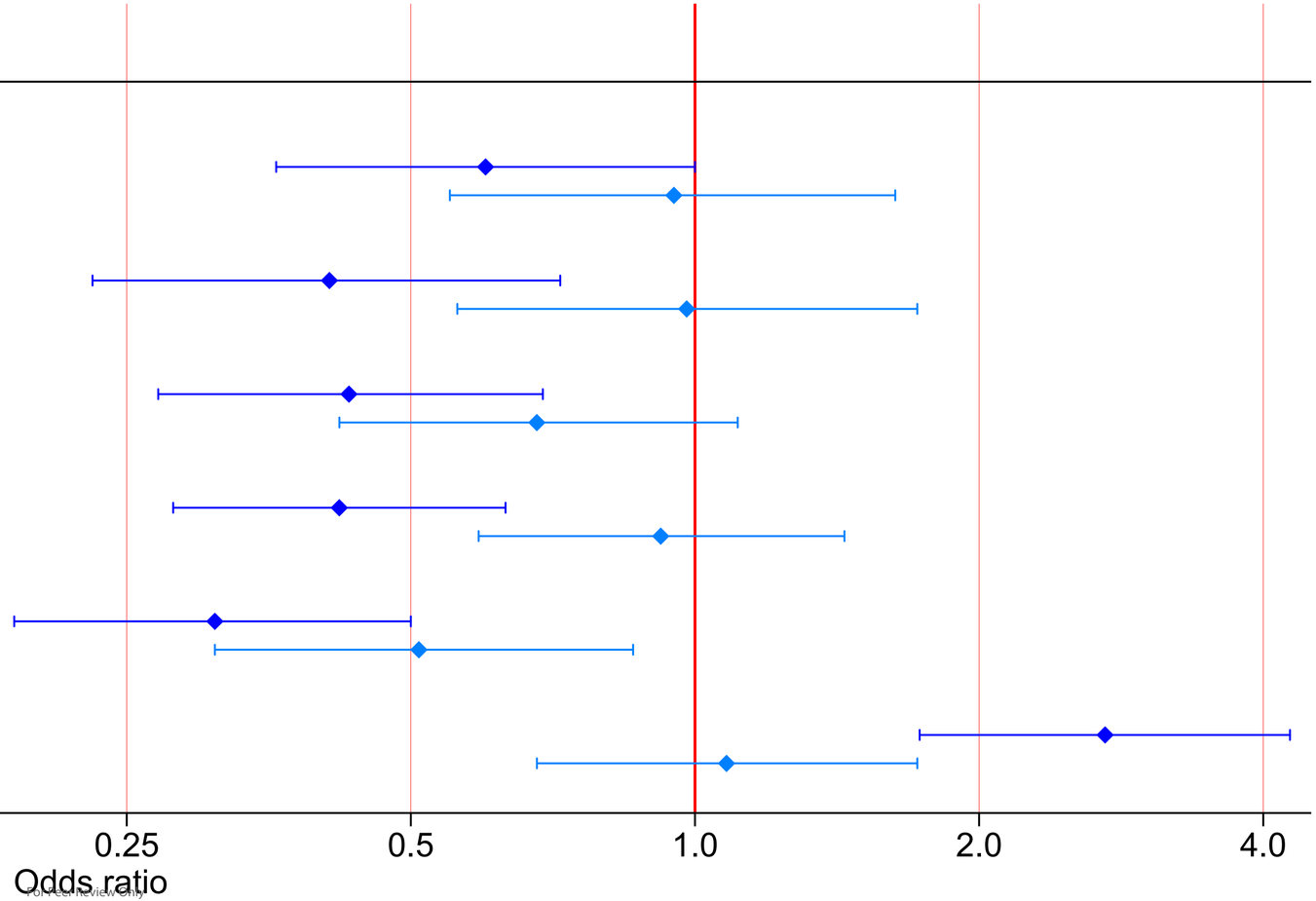

2110 survey records obtained at baseline
Discarded 118 blank response forms
1992 survey responses at baseline
Discarded 418 non-HCP responses or responses where HCP status was unreported
1574 HCP responses included at baseline
Follow-up participants
Discarded 830 blank follow-up responses
744 HCPs with baseline and follow-up survey data

Outcome	Feeling	Events, n/N (%)	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)*	P-value
Generalised anxiety disorder	Unsupported	90/306 (29.41)	Reference		Reference	
	Supported	100/677 (14.77)	0.42 (0.30, 0.58)		0.42 (0.30, 0.60)	
	Neither	81/413 (19.61)	0.59 (0.41, 0.83)	p<0.0001	0.61 (0.42, 0.89)	p<0.0001
Clinical insomnia	Unsupported	65/305 (21.31)	Reference		Reference	
	Supported	82/674 (12.17)	0.51 (0.36, 0.73)		0.58 (0.40, 0.85)	
	Neither	69/407 (16.95)	0.75 (0.52, 1.10)	p=0.0010	0.84 (0.56, 1.25)	p=0.013
Major depression disorder	Unsupported	107/306 (34.97)	Reference		Reference	
	Supported	123/681 (18.06)	0.41 (0.30, 0.56)		0.42 (0.30, 0.59)	
	Neither	109/414 (26.33)	0.66 (0.48, 0.92)	p<0.0001	0.72 (0.51, 1.03)	p<0.0001
Emotional exhaustion	Unsupported	168/301 (55.81)	Reference		Reference	
	Supported	209/663 (31.52)	0.36 (0.28, 0.48)		0.35 (0.26, 0.46)	
	Neither	184/391 (47.06)	0.70 (0.52, 0.95)	p<0.0001	0.67 (0.49, 0.92)	p<0.0001
Depersonalisation	Unsupported	57/301 (18.94)	Reference		Reference	
	Supported	60/663 (9.05)	0.43 (0.29, 0.63)		0.42 (0.28, 0.64)	
	Neither	60/391 (15.35)	0.78 (0.52, 1.16)	p<0.0001	0.72 (0.47, 1.10)	p=0.0002
Medium-to-high wellbeing	Unsupported	181/301 (60.13)	Reference		Reference	
	Supported	553/666 (83.03)	3.24 (2.39, 4.41)		3.17 (2.30, 4.37)	
	Neither	292/395 (73.92)	1.88 (1.36, 2.59)	p<0.0001	1.78 (1.27, 2.51)	p<0.0001



For Peer Review Only

Outcome	Feeling	Events, n/N (%)	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)*	P-value
Generalised anxiety disorder	Unsupported	41/167 (24.55)	Reference		Reference	
	Supported	50/326 (15.34)	0.56 (0.35, 0.89)		0.60 (0.36, 1.00)	
	Neither	44/188 (23.40)	0.94 (0.58, 1.53)	p=0.019	0.95 (0.55, 1.63)	p=0.079
Clinical insomnia	Unsupported	38/167 (22.75)	Reference		Reference	
	Supported	31/326 (9.51)	0.36 (0.21, 0.60)		0.41 (0.23, 0.72)	
	Neither	39/188 (20.74)	0.89 (0.54, 1.47)	p=0.0001	0.98 (0.56, 1.72)	p=0.0014
Major depression disorder	Unsupported	61/167 (36.53)	Reference		Reference	
	Supported	67/326 (20.55)	0.45 (0.30, 0.68)		0.43 (0.27, 0.69)	
	Neither	55/188 (29.26)	0.72 (0.46, 1.12)	p=0.0006	0.68 (0.42, 1.11)	p=0.0014
Emotional exhaustion	Unsupported	87/167 (52.10)	Reference		Reference	
	Supported	106/326 (32.52)	0.44 (0.30, 0.65)		0.42 (0.28, 0.63)	
	Neither	97/188 (51.60)	0.98 (0.65, 1.49)	p<0.0001	0.92 (0.59, 1.44)	p<0.0001
Depersonalisation	Unsupported	54/167 (32.34)	Reference		Reference	
	Supported	45/326 (13.80)	0.34 (0.21, 0.53)		0.31 (0.19, 0.50)	
	Neither	44/188 (23.40)	0.64 (0.40, 1.02)	p<0.0001	0.51 (0.31, 0.86)	p<0.0001
Medium-to-high wellbeing	Unsupported	104/167 (62.28)	Reference		Reference	
	Supported	260/326 (79.75)	2.39 (1.58, 3.61)		2.72 (1.73, 4.27)	
	Neither	117/188 (62.23)	1.00 (0.65, 1.53)	p<0.0001	1.08 (0.68, 1.72)	p<0.0001



For peer review only

Tables and Figures (Supplementary)

Supplemental Table 1. Chi square analysis of demographic characteristics of baseline-only HCPs and cohort HCP participants (n = 1574)

	Response	Baseline-only (n, 830) (%)	Follow-up (n, 744) (%)	Chi squared result
Age	18-25 years	45 (5.4)	31 (4.2)	6.5, $p = 0.26$
	26-35 years	215 (25.9)	175 (23.5)	
	36-50 years	340 (41.0)	298 (40.1)	
	51-60 years	187 (22.5)	185 (24.9)	
	61-70 years	41 (4.9)	51 (6.9)	
	> 70 years	2 (0.2)	4 (0.5)	
Ethnicity	White	440 (53.0)	587 (78.9)	121.7, $p < 0.001$
	Asian	266 (32.1)	93 (12.5)	
	Black	47 (5.7)	27 (3.6)	
	Mixed	29 (3.5)	19 (2.6)	
	Other	27 (3.3)	12 (1.6)	
	Prefer not to say	21 (2.5)	6 (0.81)	
Gender identity	Female	543 (65.4)	562 (75.5)	23.3, $p < 0.001$
	Male	269 (32.4)	178 (23.9)	
	Prefer not to say	11 (1.3)	3 (0.4)	
	Prefer to self-define	7 (0.8)	1 (0.1)	
Relationship status	Divorced	27 (3.3)	27 (3.6)	0.74, $p = 0.95$
	Prefer not to say	25 (3.0)	21 (2.8)	
	Married/Living w/ partner or family	552 (66.5)	496 (66.7)	
	Other	30 (3.6)	22 (3.0)	
	Single	196 (23.6)	178 (23.9)	
Number living in	1	106 (12.8)	104 (14.0)	17.9, $p < 0.001$

Confidential

For Peer Review Only

household	2	235 (28.3)	252 (33.9)	
	3-5	432 (52.1)	367 (49.3)	
	6 or more	57 (6.9)	21 (2.8)	
Highest level of education	A-levels	52 (6.3)	61 (8.2)	3.52, $p = 0.32$
	Bachelor's / diploma	389 (46.9)	346 (46.5)	
	Master's / PhD	323 (38.9)	290 (39.0)	
	Other	66 (8.0)	47 (6.3)	
Mental health outcomes	Major depressive disorder	172 (23.9)	182 (25.5)	0.54, $p = 0.46$
at baseline*	Generalised anxiety disorder	142 (19.8)	142 (19.9)	0.00, $p = 0.97$
	Clinical insomnia	103 (14.6)	125 (17.6)	2.31, $p = 0.13$
	Emotional exhaustion	298 (44.0)	282 (39.8)	2.41, $p = 0.12$
	Depersonalisation	103 (15.2)	83 (11.7)	3.59, $p = 0.06$
	High-medium wellbeing	173 (25.3)	176 (24.8)	0.04, $p = 0.84$

Note. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

*Missing data for each mental health outcome varies: 1434 participants (721 baseline-only and 713 follow-up) for major depressive disorder, 1429 (716 baseline-only and 713 follow-up) for generalised anxiety disorder, 1418 (706 baseline-only and 712 follow-up) for clinical insomnia, 1386 participants (678 baseline-only and 708 follow-up) for emotional exhaustion and depersonalisation, and 1393 (684 baseline-only and 709 follow-up) for wellbeing.

Confidential

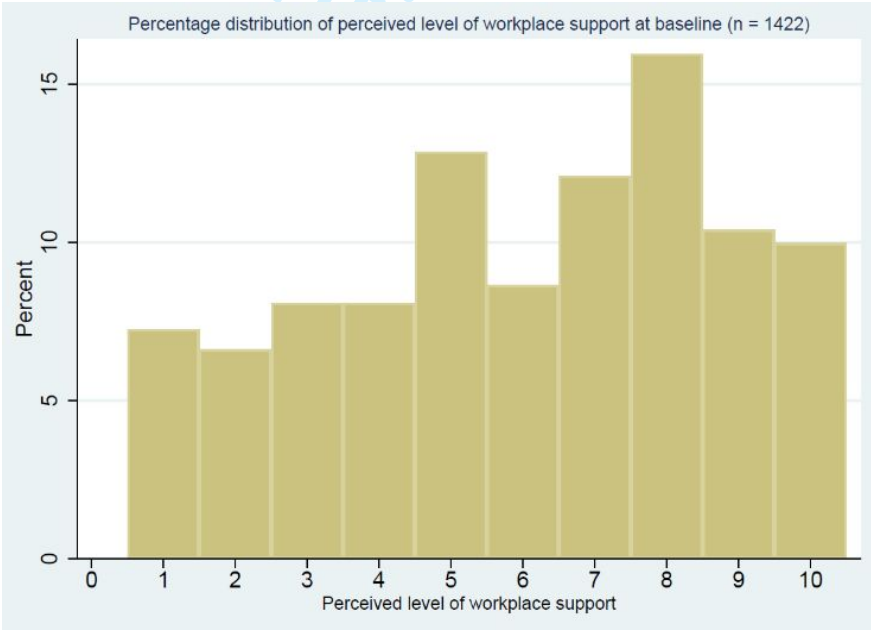
For Peer Review Only

Supplementary Table 2. Perceived level of support in HCPs at baseline (n, 1422) and follow-up (n, 681).

	Response	Baseline, n,1422 (%)	Follow-up, n,681 (%)
Do you think you received adequate support directly from your supervisors/line managers	Felt unsupported	312 (21.9%)	167 (24.5)
	Felt supported	689 (48.5%)	326 (47.9)
	Felt neither supported nor unsupported	421 (29.6%)	188 (27.6)

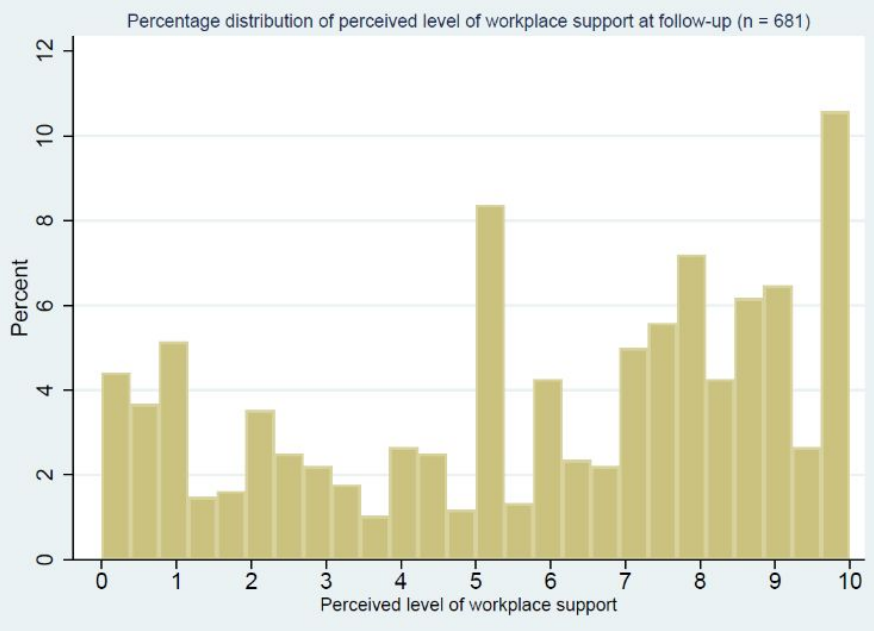
Note. Follow-up participants are those who also provided valid baseline support data.

Supplemental Figure 1. Graphical illustration of the distribution of responses for perceived level of workplace support at baseline (n = 1422).



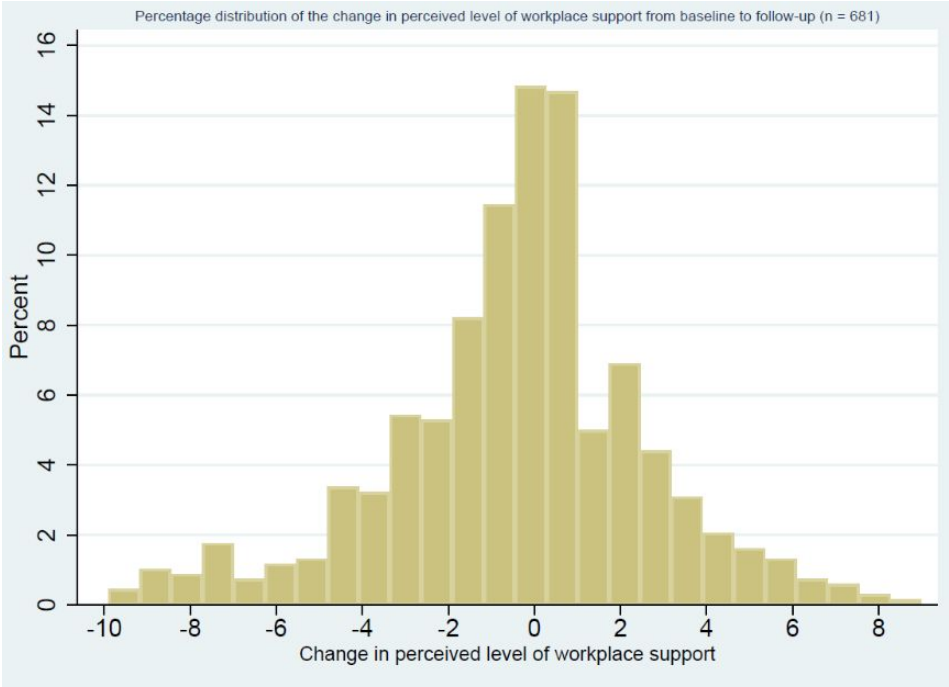
For Peer Review Only

Supplemental Figure 2. Graphical illustration of the distribution of responses for perceived level of workplace support at follow-up (n = 681).



For Peer Review Only

Supplemental Figure 3. Graphical illustration of the distribution of the change in perceived level of workplace support from baseline and follow-up (n = 681).



For Peer Review Only

Title

The relationship between ~~availability and changes to~~the level of (and changes in) perceived workplace support and mental health, wellbeing and burnout in healthcare professionals (HCP) during the COVID-19 pandemic: insight and mitigating strategies from the CoPE-HCP cohort study.

Authors

Imrana Siddiqui*[1,2,3] MBBS (joint first author), Jaya Gupta*[4] MRCPsych (joint first author), Iris McIntosh[5] MRCPsych, Christina Komodromos[6] BSc, Thomas Godec[7] PhD, George Collett[7] PhD, Sher Ng[8] MB BChir, Carmela Maniero[7,8,9] PhD, Sotiris Antoniou[8] MRPharmS, Rehan Khan[9] MRCOG, Vikas Kapil[7,8,9] PhD, Mohammed Y. Khanji[7,8,10] MRCP, and Ajay K. Gupta[7,8,9,11**] PhD, on behalf of COPE-HCP clinical investigators***.

Affiliations

[1]Wellbeing Hub, Newham Training Hub, London, United Kingdom.

[2] NHS NorthEast London CCG, London, United Kingdom.

[3]Woodgrange Medical Practice, London, United Kingdom.

[4]South West London and St George's Mental Health NHS Trust, London, United Kingdom.

[5]Camden & Islington Foundation Trust, London, United Kingdom.

[6]Barnet, Enfield and Haringey Mental Health NHS Trust, London, United Kingdom.

[7]William Harvey Research Institute, Queen Mary University of London, London, United Kingdom.

[8]Barts Heart Centre, St. Bartholomew's Hospital, Barts Health NHS Trust, London, United Kingdom.

[9]The Royal London Hospital, Barts Health NHS Trust, United Kingdom.

[10]. Newham University Hospital, Barts Health NHS Trust, London, United Kingdom.

[11]National Heart and Lung Institute, Imperial College London, London, United Kingdom.

*Joint first authors (contributed equally to this manuscript).

Confidential

**Corresponding and senior author: Ajay K. Gupta, William Harvey Research Institute, Queen Mary University London, London, United Kingdom. ajay.gupta@qmul.ac.uk

The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

***See supplementary document for COPE-HCP Clinical Investigators names and affiliations.

Funding Statement

Barts Charity. The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Word count: ~~2973~~3115

Confidential

Abstract

Background

COVID-19 pandemic is associated with psychological impact amongst healthcare professionals (HCPs). However, little is known about the relationship between ~~the availability and changes to~~ workplace support (WS) and mental health and burnout amongst HCPs, and the effective strategies mitigating this impact.

Methods

In the CoPE-HCP cohort study, ~~surveys were distributed electronically~~online surveys were distributed at baseline (July-September 2020~~; n,1721; 147 non-HCPs~~), and at follow-up (~four months later~~; n,799~~) containing validated screening tools~~ assessing the presence of generalized anxiety disorder (GAD), clinical insomnia, major depressive disorder (MDD), ~~and~~ burnout (emotional exhaustion and depersonalization), and wellbeing. Both surveys assessed self-reported level of WS. For baseline and follow-up, independently, separate logistic regression models relating the level of WS to mental health and burnout were developed after adjusting for a priori confounders. SeparateL ~~l~~inear regression models were also developed ~~then conducted, and to~~ relatinge the change in the perceived level of WS with the change in mental health scores ~~between~~ from baseline and follow-up. Thematic analyses on baseline survey free-text entries were done to evaluate what constitutes effective support.

Findings

At baseline (*n* = 1422) and follow-up (*n* = 681), consistently, compared to those who felt unsupported, those who felt supported had ~~significantly~~ reduced risk (odds) of GAD (baseline: 5~~8~~9% [95% CI of OR~~ of OR~~, 0.3~~0~~29-0.6~~0~~57], follow-up: 4~~0~~41% [0.3~~6~~8-1.0~~0~~0.92]), clinical insomnia (42%~~51%~~ [0.4~~0~~34-0.8~~5~~69], 5~~9~~66% [0.2~~3~~0-0.7~~2~~55]), MDD (58% [0.3~~0~~1-0.5~~9~~8], 5~~7~~4% [0.2~~7~~31-0.6~~9~~74]), emotional exhaustion (65% [0.26-0.46], 5~~8~~61% [0.2~~8~~7-0.6~~3~~56]) and depersonalization (58% [0.28-0.61], 6~~9~~8% [0.1~~9~~21-0.50]).

In the cohort of those who responded to both surveys, ~~At follow-up~~~~From baseline to follow-up,~~the improvement in perceived level of WS from baseline ~~(vs. baseline)~~ was associated with significantly improved GAD-7 (adjusted difference. -0.13~~1.73~~ [-0~~2~~.2~~5~~54, -0.0~~1~~91]), ~~ISI (-0.96 [-1.88, -0.04]),~~ PHQ-9 (-0.17~~1.32~~ [-0.2~~9~~2.16, -0.0~~4~~49]), ~~and EEDP2Q (burnout)~~and

For Peer Review Only

SWEMWBS (wellbeing) (0.19 ~~1.30~~ [-0.10 ~~1.82~~, -0.29 ~~79~~]) scores, independent of baseline level of support.

We identified five themes constituting ~~WS: 'managerial support' was the largest sub-theme~~effective workplace support: 1) concern/understanding for welfare, 2) information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support.

Interpretation

These findings ~~demonstrate consistent~~highlight nuanced associations between ~~WS~~ perceived level of (and changes in) WS and mental health and burnout of HCPs, and identifies potential ~~effective~~ strategies ~~to improve their wellbeing~~constituting effective workplace support.

Trial registration

Clinicaltrials.gov (NCT04433260).

Confidential

1

Confidential

For Peer Review Only

Introduction

The coronavirus (CC~~OVID-19~~) pandemic has posed a significant peril to both the physical and mental health of the general population~~, but the pervasive nature of the mental health challenges is often ignored~~. In particular, the significant toll on healthcare professionals (HCPs) is a critical issue that, if not addressed, will impact staffing and ~~threaten healthcare~~ service provisions in the future.[1, 2] The potential increased vulnerability to mental health issues amongst HCPs could be explained by the unique challenges faced by them, including vicarious trauma,[3] moral injury,[4-7] and substantially increased risk of infection.[8] Long working hours, discrimination for working in hospitals, and workplace practices may also contribute to the psychological impact.[9] Indeed, recent meta-analyses and studies have attested to this considerable toll, with reported prevalence rates of anxiety (26.1%),[10] depression (24%),[11] and burn-out (49.4%)[12] among HCPs during the ~~COVID-19~~ pandemic. As such, high quality research identifying the factors associated with improved mental health outcomes in HCPs, and likely strategies to mitigate them, is an urgent need.[2]

Workplace support is one potential strategy. ~~In a systematic review of studies relevant~~Relating to previous severe acute respiratory syndrome (SARS) outbreaks, *Brooks et al*. recommend the critical role of managers/employers in ensuring clear communication, supportive environments, specialised training, and support systems to promote psychological wellbeing.[13] Concerningly, a~~A~~ cross-sectional survey during the first wave of the COVID-19 pandemic (data collected from 30th March 2020 to 5th May 2020) found that most respondents (UK HCPs) felt there was inadequate wellbeing support.[14] The study, along with other small qualitative studies, also highlight the perceived value of organisational support to the mental health in HCPs.[14-19] Some cross-sectional quantitative studies support an association between ~~workplac~~workplacee support and mental health in HCPs[20-24] and suggesting workplace support to mitigate the psychological burden in HCPs. However, these studies have limitations: most are cross-sectional,[20-25] some are small[21, 25] or offer a non-comprehensive assessment of mental health (and neglect issues such as burnout),[20, 22] or only focus on qualitative or quantitative aspects of support.[15, 16, 20-25] Therefore, to inform national and global policy and workplace practices, we require robust high-quality studies using comprehensive mental health assessments demonstrating improvements in mental health over time.[26]

Addressing this, the current study (part of the COVID-19 and Physical and Emotional Wellbeing of Healthcare Professionals project; CoPE-HCP)[27] examined the relationship

For Peer Review Only

between perceived level of workplace support and mental health outcomes: generalized anxiety disorder, clinical insomnia, major depressive disorder, ~~wellbeing, and~~ burnout (emotional exhaustion and depersonalization), and wellbeing twice during the ~~COVID-19~~ pandemic (approximately four months apart). We also examined whether changes in perceived level of~~improved~~ workplace support was~~is~~ associated with improved mental health and wellbeing outcomes over the four-month period. Finally, we explored what workplace support HCPs want ~~and what support HCPs~~or have found helpful.~~.~~

Methods

~~CoPE-HCP is a cohort study with the study protocol~~The protocol for this cohort study is published ~~previously with details of objectives, study design, and methodology~~.[27] The study was approved by the Cambridge East~~,~~ Research Ethics Committee (20/EE/0166), and ~~corresponding details~~ registered in ClinicalTrials.gov (NCT04433260).

The study involved a series of online surveys distributed to HCPs (in the UK and internationally). The inclusion criteria for the study were: 1) aged 18 or older, 2) electronic consent given, and 3) self-identified as HCP staff. ~~The study involved a series of online surveys distributed to HCPs (in the UK and internationally) and non-HCPs (academic and research staff from universities in London, who were not working directly or indirectly with COVID-19 patients).~~ Recruitment was facilitated by health service employers who invited employees by email containing a link to the survey, and the participants were those who responded to that invite.

Initial consent was gained for the baseline survey, and at the end of the baseline survey, participants were then asked for their consent to receive any follow-up surveys. Further consent was gained at the follow-up survey. ~~.~~

The baseline survey was conducted between July and September 2020. In the UK, this corresponded to the trough of the first wave of COVID-19. The baseline survey gathered information such as age, gender, ethnicity, relationship status, ~~and~~ educational attainment, and current mental health and physical health diagnosis (a multiple-choice closed-ended item). ~~Participants were also asked to select from a range of pre-determined items regarding which types of support they found most helpful. A free-text item was included eliciting qualitative data about the support they found most helpful or felt would be helpful.~~

Confidential

Our primary predictor, workplace support, was assessed by asking participants "Do you think you received adequate support directly from your supervisors/line managers/direct employers? (Mark on scale, with 1 -as no support and 10 as full and professional support)". ~~if participants felt that they received adequate support directly from their supervisors/line managers/direct employers, indicated on a 10-point Likert scale.~~ This was converted to a 3-level response with scores of 1-3, 4-6, and 7-10 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported' respectively. 'Felt unsupported' served as the reference group in the analysis. A subsequent free-text item was included eliciting qualitative data about what support they found most helpful or felt would be helpful, to supplement perceptions of workplace support.

~~*Choice of primary* *Outcome ascertainment~~~outcome measure~~

~~The survey included standardised mental health, wellbeing, and burnout screening tools assessing~~At each survey, we assessed for the presence of generalized anxiety disorder (using the 7-item Generalized Anxiety Disorder [GAD-7]),[28] clinical insomnia (using 7-item Insomnia Severity Index [ISI]),[29] major depressive disorder (using 9-item Patient Health Questionnaire [PHQ-9]),[30] ~~wellbeing (using the Short Warwick-Edinburgh Mental Wellbeing Score [SWEMWBS]),[31] and~~ burnout domains: emotional exhaustion and depersonalization (using single respective 7-point scale items)[31], and wellbeing (using the Short Warwick-Edinburgh Mental Wellbeing Score [SWEMWBS]).[32]~~.~~

The follow-up survey (approximately four months after baseline during the second peak of the pandemic) included the same mental health assessments and~~,~~ the same item assessing level of workplace ~~suppor~~support (excluding free-text item)~~t~~. For transparency, due to survey error, the support item at follow-up provided a score between 0 and 100 (as opposed to 0-10 at baseline survey) which was similarly collapsed to a 3-level response: 0-30, 31-69, and 70-100 being labelled as 'felt unsupported', 'neither felt supported nor unsupported', and 'felt supported', respectively.~~, but additionally asked whether there had been a change in the level of support from baseline. Participants could choose 'more support', 'less support', or 'similar'.~~

Statistical analysis

Statistical analyses were conducted using STATA v17.0.~~–~~ Baseline characteristics were compared between those who responded to the follow-up survey and are part of HCP cohort,

Confidential

For Peer Review Only

and those who only responded to first survey and constitute the findings from baseline cross-sectional analysis. –.

At each survey time point, we separately assessed for the cross-sectional association between the perceived level of support and the presence of outcomes: generalized anxiety disorder, clinical insomnia, major depressive disorder, below average wellbeing, emotional exhaustion, and depersonalization, in accordance with validated cut-offs of respective tools. –Logistic regression models were developed to estimate crude and adjusted odds ratios (with 95% confidence intervals, and p-values) in each perceived support group as compared to the reference group (perceived unsupported). -TheWe multivariable models were- adjusted for pre-specified risk factors: age, gender, time since COVID-19 peak in the participant's region, highest level of education, relationship status, number of people living in their household, currently diagnosed mental health condition (yes/no), currently diagnosed physical health condition (yes/no), and HCP role (medical doctors [reference group] vs. healthcare assistants, nurses and midwives, and AHPs).

The sStatistical analyseis waeres conducted using STATA v17.0. For the descriptive data, baseline characteristics were assessed overall, and separately for HCPs and non-HCPsfor all HCPs at baseline and HCPs at both follow-up and baseline. Chi square analysis was conducted on the baseline characteristics of baseline-only and follow-up participants to examine potential cohort sample biases. Sources of support found to be most helpful were analysed separately for HCPs and non-HCPs by calculating percentages.

For baseline and follow-upcross-sectional analysis at baseline and follow-up, separate binary logistic regression models were developed for HCPs and non-HCPs combined, to relate perceived level of support with the presence of generalized anxiety disorder, clinical insomnia, major depressive disorder, below average wellbeing, emotional exhaustion, and depersonalization, .

Binary outcomes for each outcome were in accordance with validated cut-offs.

The number of events for mental health cut-offs in each group were calculated, and both Ccrude and adjusted odds ratios were estimated (with 95% confidence intervals, and p-values) in each perceived support group as compared to the reference group. The lLogistic regression analyses models were adjusted for pre-specified risk factors: age, gender, time since COVID-19 peak in the participant's region, highest level of education, relationship status, number of people living in their household, currently diagnosed mental health condition (yes/no), currently diagnosed

physical health condition (yes/no), and HCP role (medical doctors [reference group] vs. healthcare assistants, nurses and midwives, and AHPs).

For cohort analysis, iei.e.: those who responded to both baseline and follow-up surveys-, tThe changechanges in scores on mental health and wellbeingmental health and burnout symptoms was calculated by subtracting the baseline raw score from the follow-up score (follow-up score was rescaled by dividing by 10) on the respective scales. Changes in perceived workplace support was calculated by subtracting the baseline raw score (regarding adequate workplace support) from the follow-up score. measures between baseline and follow-up were assessed as continuous outcomes _across change in workplace support (vs. baseline level of support), for HCPs and non-HCPs combined. The mean (and SD) response for each outcome was calculated for baseline and four months for each support level, and the cSeparate unadjusted and adjusted (adjusted for the above risk factors and for baseline perceived level of support) linear regression models were conducted assessing the extent that the change in perceived level of workplace support is associated with changes in mental health and burnout symptoms over time.rude and adjusted mean differences were estimated (with 95% confidence intervals, and p-values) as compared to the reference group ("less support"). Unadjusted (ANOVA) and adjusted (ANCOVA; adjusted for baseline perceived level of support and baseline outcomes, and the above-mentioned adjusted factors) linear regression models were used to estimate the change in outcome scores between groups.

Thematic analysis

The free-text item was analysed using A thematic analysis[33] was conducted by four researchers (JG, IS, IM, CK) for the free-text answers. Responses were analysed inductively, meaning no pre-selected themes were used to start with, and the analysis was data-driven. The analysis comprised:First, the raw data was collated into an Excel table and each of the ourabove researchers familiarisation, ed themselves with the data. Initial codes were generated for each entry of data and were shared amongst the researchers before being refined as a coding dictionary. Any data entries with limited detail regarding the type of support were regarded as 'unspecified' and not included in refining of codes. The data entries and refined codes were reviewed and amalgamated into key themes (selected based on salience and the apparent significance to the participants) and subthemes to best describe the data.generating initial codes, generating themes, reviewing themes, and defining and finalising the themes. Codes were compiled in Excel software.

For Peer Review Only

Results

~~There were 2110 survey records, of which 118 did not answer any questions, leaving 1992 responses. Of these, it was possible to identify HCPs and non-HCPs in 1721 responses that were included for baseline analysis (Supplementary Figure 1a). Of these~~ 1574 ~~(91.5%) participants were~~ HCPs were included at baseline cross-sectional assessment~~, and 147 (8.5%) participants were non-HCP~~ and amongst them 744 (47.3%) who responded to the ~~of these participants comprised the~~ follow-up survey comprised of the cohort population~~sample~~ and also the separate cross-sectional analysis for the follow-up period only (Figure 1; Table 1).~~ Supplementary Figure 1b shows those who were included in the follow-up study four months later (n,830 from 1087 survey records).~~

Most of the 1574 HCPs at baseline were from the UK (n = 1321; 83.9%). Of the HCPs based outside the UK (n = 253; 16.1%), most were from North America (37.2%) followed by Asia (34.4%) and Europe (17.4%). Reporting the non-UK country where they were based was optional: of the 202 respondents, 70 (34.7%) were from the USA followed by 63 (31.2%) from India. A total of 30 different countries comprised the non-UK participants. ~~Table 1 shows baseline characteristics of the total population, stratified by HCPs and non-HCPs. Both HCPs and non-HCPs had similar baseline characteristics, except for educational attainment, which was higher in the non-HCP group. This was unsurprising as non-HCPs were mostly university/academic staff, including PhD students. However, compared to non-HCPs, the HCP group was more ethnically diverse.~~

At baseline (n = 1574; specific number varies for each outcome~~,~~), ~~(19.2~~19.9%~~%)~~ of 1429 HCPs ~~of all respondents~~ met the criteria for generalized anxiety disorder, 16.1~~5.2~~% of 1418 HCPs for clinical insomnia, ~~23.9~~24.7% of 1434 HCPs for major depressive disorder, 41.9~~2~~% of 1386 HCPs for emotional exhaustion, and 13.4~~0~~% of 1386 HCPs for depersonalization. At cross-sectional evaluation of the follow-up stage (n = 744; specific number varies for each outcome), we observed increased or ~~Increased or~~ sustained outcome ~~prevalence~~ rates ~~were observed four months later~~at the four-month follow-up ~~(n,)~~for generalized anxiety disorder (20.8~~21.0~~% of 723 HCPs), clinical insomnia (16.3~~16.2~~% of 722 HCPs), major depressive disorder (28.0~~27.8~~% of 724 HCPs), emotional exhaustion (43.2~~42.4~~% of 717 HCPs), and depersonalization (21.2~~20.7~~% of 717 HCPs).

Baseline group and cohort population of HCPs

The b~~Chi square analysis indicated that~~aseline characteristics of those who only responded to the baseline survey (n = 1574~~, 830~~) were mostly similar to those who responded to both surveys (n = 744~~, , the cohort group~~), except for significant differences in self-defined ethnicity, gender identity and number of people living in the household (Table 1; Supplemental Table 1). Baseline-only responding participants had relatively higher proportions of self-assigned Asian ethnicity and male gender and belonged to the bigger household (Supplemental (~~T~~table 1). Mental health outcomes were not significantly different between those who only responded to the baseline survey and those who responded to both surveys according to chi squared analysis (Supplemental Table 1). ~~However these two groups the proportions of the cohort sample (baseline and follow-up; n = 744) meeting the criteria for any mental health or burnout outcomes did not differ significantly on the proportion of outcomes assessed at the baseline, or to the distribution of perceived level of support from baseline-only participants (n = 830). Regarding baseline demographic characteristics, Ssignificant differences were observed for ethnicity (p < .001), gender identity (p < .001), number), number living in household (p < .001): baseline-only participants had relatively higher proportions of Asian and male participants, and generally had more people living in the household than follow-up participants.~~

~~Perception and types of support~~Perceived level of support at baseline and follow-up

In independent cross-sectional assessments, 1422 participants provided valid data on perceived level of support at baseline and~~, with~~ 681 ~~of these participants being retained~~of them provided similar data at follow-up too. As per our pre-defined ~~self-defined~~ 3-level categories (based on ~~for~~ the Likert scales) measuring perceived support, 48.5% of the 1422 HCPs at baseline ~~and 63.4% of non-HCPs~~ reported feeling supported~~,~~ with similar proportions observed in the follow-up sample (47.9% of 681 HCPs), whilst 21.9% of the baseline sample felt unsupported with 24.5% of the follow-up sample ~~reported that they~~ felt unsupported (Supplementary Table 2~~1~~; see Supplementary Figure 1-3 for percentage distribution of responses for baseline and follow-up perceived level of support, and for the change in perceived support from baseline to follow-up). ~~at baseline (Supplementary Table 1a; n,1564). Support from friends and family, peers, and management were perceived as most helpful to HCPs and non-HCPs, compared to other sources such as media, societies, and government policies (Supplementary Figure 2).~~

Relationship between support and mental health and burnout outcomes

For Peer Review Only

At baseline (Figure 2~~1a~~), there was a statistically significant relationship between level of support and each mental health and burnout outcome (*p* for trends were all <0.0~~00~~1 except for clinical insomnia *p* = .013~~, except for clinical insomnia: p=0.0003~~). Compared with those who felt unsupported, respondents who felt supported were significantly less likely to meet the criteria for generalized anxiety disorder (adj. odds ratio 0.4~~2~~1, 95% CI 0.30~~29~~ to 0.60~~7~~), clinical insomnia (0.58~~4249~~, 0.43~~04~~ to 0.85~~69~~), major depressive disorder (0.42, 0.3~~01~~ to 0.5~~98~~), emotional exhaustion (0.35, 0.26 to 0.4~~66~~), and depersonalisation (0.43~~2~~, 0.28 to 0.6~~41~~). ~~Similarly, on~~On the SWEMWBS wellbeing measure ~~(Figure 1b)~~, those who felt supported were significantly ~~less likely to have probable depression/anxiety (0.28, 0.18 to 0.43), and more likely to meet the criteria for combined~~ more likely to have medium or high~~average/high~~ wellbeing (3.17~~51~~, 2.30~~59~~ to 4.3~~77~~) ~~and high wellbeing (2.01, 1.37 to 2.95)~~.

Based on 681 valid responses a~~A~~t follow-up (Figure 3~~2a~~; median 4.9 months after baseline survey), ~~799 valid responses (after excluding 31 who didn't answer) were available for analysis (Supplementary Table 1b, Supplementary Figure 1b). At follow-up, there was a statistically significant relationship between level of support and each mental health and burnout outcome.~~ c~~C~~ompared to those who felt unsupported, those who felt supported were significantly less likely to meet the criteria for ~~generalized anxiety disorder (0.59, 0.38 to 0.92),~~ clinical insomnia (0.34, 0.20 to 0.5~~8~~5), major depressive disorder (0.46, 0.3~~01~~ to 0.70~~69~~), emotional exhaustion (0.39, 0.27 to 0.5~~86~~), and depersonalisation (0.32, 0.2~~01~~ to 0.5~~10~~). Similarly, on the SWEMWBS wellbeing measure, those who felt supported were more likely to have medium or high wellbeing (2.72, 1.73 to 4.27). Borderline significance was met for generalized anxiety disorder (0.60, 0.36 to 1.00) when comparing perceived supported to perceived unsupported HCPs. ~~Similarly, on the SWEMWBS wellbeing measure (Figure 2b), those who felt supported were less likely to have probable depression/anxiety (0.28, 0.16 to 0.52), and more likely to have combined average/high wellbeing (2.83, 1.91 to 4.19) and high wellbeing (2.02, 1.22 to 3.33).~~

Change in level of workplace support and improvement in mental health outcomes over time

In the cohort of participants with data at both baseline and follow-up (n = 681), t~~T~~here was a consistent association between ~~perceived change in workplace support~~the change in perceived level of support and ~~at follow-up (vs. baseline level of support) and~~ the change in scores on some, but not all, mental health outcomes ~~mental health outcomes~~ (Table 2~~Figure 3; p for trends were <0.01 except for clinical insomnia where p=0.08~~). ~~In comparison to participants who~~

Confidential

~~perceived receiving less support compared to baseline, those who felt workplace support had improved had significantly improved GAD-7 (adj. -1.73, 95% CI -2.54 to -0.91), ISI (-0.96, -1.88 to -0.04), PHQ-9 (-1.32, -2.16 to -0.49), SWEMWBS (0.97, 0.37 to 1.57), and combined emotional exhaustion and depersonalization (-1.30, -1.82 to -0.79) scores.~~Separate adjusted linear regression models showed that a whole unit increase in change in perceived level of support was inversely associated with the change in GAD-7 anxiety scores (coefficient -0.13 [-0.25 to -0.01] p = .04), PHQ-9 depression scores (-0.17 [-0.29 to -0.04] p < 0.01), and positively associated with the change in SWEMWBS wellbeing scores (0.19 [0.10 to 0.29] p < 0.001). No significant associations were observed between change in perceived level of support and the change in ISI insomnia (p = 0.067) or EEDP2Q burnout scores (p = 0.139).

~~The significant association between improved perceived workplace support and improved outcome scores was independent of baseline level of support, with the interaction test for each mental health outcome being not statistically significant (interaction test p-values: GAD-7, p=0.20; ISI, p=0.63; PHQ-9, p=0.06; SWEMWBS, p=0.88, and combined emotional exhaustion and depersonalization, p=0.21).~~

Themes: what constitutes effective support

~~1870 free-text responses from 1721 respondents were analysed.~~860 free-text entries were included in the thematic analysis to illustrate what qualities/aspects of workplace support are perceived as most helpful. We identified 5 overarching themes describing: ~~Five themes relating to support were identified: 'support from others', 'basic needs and physical resources', 'information', 'psychological interventions', and a smaller theme labelled 'other support' (Supplementary Table 2). 42 sub-themes of support needs were identified. Figure 4 shows the four key themes and sub-themes.~~

~~The largest theme was 'support from others', of which 'managerial support' was the largest sub-theme, with 386 comments (Table 2). This sub-theme highlights the desire for more managerial support, both within teams and at higher levels, to provide clear communication and visibility on the ground, approachability, and genuine concern for employees. Moreover, 'peer support' was the second largest sub-theme, with 295 comments.~~1) concern or recognition regarding welfare, 2) -information, 3) tangible qualities of the workplace, 4) leadership, and 5) peer support (see Table 3 for full details and exemplar quotes).

~~Within the theme 'basic needs and physical resources', many respondents mentioned sick leave, adequate staffing numbers, working from home, and flexible working hours. 'Risk~~

For Peer Review Only

assessment and PPE' was the third largest sub-theme with 151 comments, describing thorough risk assessments and better provision of PPE. Smaller sub-themes included provision of food, parking, and childcare.

Within the 'information' theme, the largest sub-theme was having regular updates/meetings/briefings. Other comments described the need for clear signposting and policy/guidelines.

Within 'psychological interventions', most comments centred on provision of psychological therapy, but sub-themes included general wellbeing, reflective spaces, and emotional support. This theme was not as salient relative to the other themes.

Finally, the least salient theme, 'other support' (not included in illustration), describes the need for recognition for difficult work endured.

Interpretation

This large cohort study is the first study to demonstrate the impact of change in level of support on mental health outcomes in HCPs over time. It demonstrates that, during the COVID-19 pandemic, HCPs and non-HCPs who felt supported at baseline (compared with those who felt unsupported) had a significantly lower risk (odds) of presence of generalized anxiety disorder, clinical insomnia, major depressive disorder, emotional exhaustion, depersonalization, and below-average wellbeing. This association was also observed at follow-up (albeit borderline significance for generalized anxiety disorder), more than four months after baseline, demonstrating consistency and reliability in these findings. Importantly, to our knowledge, this is the first study to report associations between changes in perceived level of workplace support and changes in mental health symptoms in HCPs over time during the pandemic: we show that those who felt more supported at the workplace (vs the level of support at baseline) at the follow-up surveyimprovement in perceived support was significantly had significantlyassociated with improved scores on all mental health outcomes assessedmeasures of generalized anxiety disorder, major depressive disorder, and wellbeing (independent of baseline perceived level of support), but not for insomnia or burnout, compared to those who felt workplace support to have reduced from the baseline. Furthermore, This finding indicates the important causal association between workplace support and mental health of professionals. Importantly, this association was consistent regardless of the baseline level of support an

Confidential

~~individual received. Given that most participants in this study were HCPs, we discuss these findings in the light of improving mental health in the healthcare workforce. a~~A ~~nother~~ unique aspect of this study is the rich qualitative data illustrating what qualities of workplace support are perceived by HCPs to be helpful during the pandemic. This inclusion of qualitative data can inform the design of intervention studies to establish a causal relationship between workplace support and mental health.

~~the central role of managerial and workplace support in the mental health of HCPs. Managerial support in all its forms - team leaders, supervisors, line managers, senior managers, trust leaders (hospital chief executives), and the NHS (healthcare management organisations) itself was perceived as integral to HCPs wellbeing.~~

~~We found high prevalence of various mental health outcomes amongst HCPs and non-HCPs, which are similar to the prevalence of depression and anxiety in the UK general population during the pandemic,~~[34] ~~but appear markedly lower than in Northern Irish health and social care professionals for depression, anxiety, and insomnia.~~[35] ~~Moreover, the prevalence rates at baseline and four months later for generalized anxiety disorder and major depressive disorder are similar to those obtained during April to June 2020 in NHS workers in London (23.2% for generalized anxiety disorder and 27.3% for major depressive disorder).~~[6]

This study builds on and validates the hypothesis generated by a few recent cross-sectional studies showing associations between workplace~~/occupational~~ support and mental health outcomes in HCPs during the current pandemic,[21, 22, 34] and previous ~~SARS~~ outbreaks.[35] While a small cohort study in routine work environment has shown that level of ~~social support (~~co-worker~~s~~ and managerial support~~)~~ is inversely associated with general mental distress,[36] we have not found any studies – in routine or pandemic settings - that have evaluated the ~~causal and~~ prospective relationship between perceived improved workplace support and ~~different mental health outcomes~~changes in mental health, wellbeing, and burnout. ~~A novel aspect is our demonstration that improved support is associated with significantly improved mental health outcomes, independent of baseline level of support. This has immense bearing on mitigating the loss of trained HCPs to adverse mental health impact. Whilst targeting those at increased risk of mental health impact (perhaps those who are patient facing) is a reasonable strategy, our findings highlight the importance of persisting with overall efforts targeting all groups regardless of support and satisfaction level.~~

Confidential

Most policy and guidance suggest a benefit of improving workplace support on general mental health, and indeed our findings support this notion regarding depression, anxiety, and wellbeing in HCPs. However, whilst we observe a trend between change in perceived level of support and insomnia and burnout scores over time, these associations were non-significant ~~for these domains~~. This highlights the relevance of improvements in perceived workplace support to distinct mental health issues, and we speculate that other workplace factors which are not accounted for in this analysis (e.g. long working hours) are more likely to impact on burnout and insomnia.

Regarding our qualitative findings, these ~~data, our findings~~ are consistent with previous workplace guidance for healthcare systems. The WHO has advised how HCPs and their managers can promote their psychosocial wellbeing during the COVID-19 pandemic: taking care of basic needs, ensuring staff communication is up-to-date and of high quality, use of buddy systems, psychological first aid, and ensuring staff access to mental health support services.[37] Our findings also mirror previous reviews stating that clear communication through horizontal (peer-peer) and vertical (managers/trusts-employees) networks can buffer against the psychological impact.[26] ~~Our findings support the notion that managerial/workplace support improves mental health in HCPs, and mirror previous reviews stating that clear communication through horizontal (peer-peer) and vertical (managers/trusts-employees) networks can buffer against the psychological impact.[26] Additionally, we recommend that organisations actively encourage employees to engage with external sources of support, including family and friends, exercise, faith, and spiritual support.~~

Many participants also reported daily updates being useful ~~and desired them~~ as a means of support. In the UK, Enabling Quality Improvement in Practice encourages embedding daily huddles into work practice with the goal of safety and improvement -~~.~~ w~~W~~e suggest these daily huddles should include a wellbeing 'check-in' element. ~~to improve work practices.~~

Intrinsic to workplace support is the support for managers themselves which was reflected by a few comments in our qualitative data~~(this was also identified in the 'managerial support' sub-theme)~~. ~~These changes require a culture shift within organisations which may not be quickly achieved. P~~Previous qualitative work highlighted how managerial support was integral to more positive workplace experience during the Ebola epidemic, but also managerial stress was reflected onto the HCPs.[38] Therefore, we must consider the potential impact of managerial

Confidential

mental health on the quality of support delivered to employees, which was not explicitly examined in our survey.

There are some limitations to this study. First, the data was collected between July and December 2020, at the trough and second peak of the UK COVID-19 pandemic, respectively. Despite the pandemic still ongoing, our findings remain highly relevant due to the ~~rising~~ fluctuating levels of cases and ~~increasing~~ persistent mental health burden ~~i~~on HCPs. Secondly, while we account for the time since COVID-19 peak in participants' region, non-UK participants may have experienced varying public health policies which may be a confounder. Third, there is potential selection bias because our survey was accessible online only, and ~~. Therefore, it is arguable that those who responded to the baseline and follow-up surveys~~the respondents ~~may~~ may not be representative of all HCPs (those with self-identified female gender and white ethnicity were more likely to respond to the follow-up survey). However, our observed ~~prevalence~~ rates ~~of~~for mental health ~~conditions~~ outcomes are similar to other large surveys in the UK general population,[39] and no significant differences were observed for mental health between baseline-only and follow-up (cohort) participants, therefore we anticipate our cohort findings to be generalisable to the healthcare ~~and wider~~ workforce regardless of ~~the~~ possible self-selection ~~when opting to participate or not in this study~~bias. ~~Fourth, another possible limitation is that our follow-up participants are less than half of the number of participants at baseline. Those who responded at follow-up have similar age, education, and relationship background, but those with self-identified female gender and white ethnicity were more likely to respond to the follow-up survey.~~ Fourth, the issue of bidirectionality remains relevant despite reporting data at two time points: HCPs with lower mental health may perceive workplace support to be lower because their needs are greater. Despite this, we believe that participants primarily rate their level of support based on their observations of the available support strategies in the workplace. Finally, most free text responses were generated from a double-barrelled question asking what support was useful and what was desired. This does not invalidate the themes ~~generated~~ but we are unable to concretely distinguish between what support was helpful and what was lacking.

In conclusion, we demonstrate a consistent association between perceived level of workplace support and the mental health and wellbeing of HCPs during the pandemic ~~and non-HCPs~~. Improved perceived workplace support was associated with improved scores on ~~mental health measures~~anxiety, depression, and wellbeing measures over time ~~(Supplementary Figure 3)~~but was not associated with insomnia or burnout. Further studies are required to understand the

For Peer Review Only

workplace factors associated with insomnia and burnout in HCPs during the pandemic, and to understand the causal relationship between perceived workplace support and mental health in HCPs. Our findings are likely to inform significant changes in ~~further~~ guidance and national policies targeted at improving wellbeing ~~of both~~in HCPs ~~and non-HCPs~~ during the current and future pandemics.

Declaration of interests:

AKG (chief investigator and corresponding author) declares that CoPE-HCP study received part funding from Barts Charity, and declares no other conflict of interest.

Authors contributions:

AKG is the chief investigator and corresponding author for this study had access to all of the data in the study and takes full responsibility for the integrity of the data and the accuracy of the data analysis. Below are the detailed author contributions

Conceptualization: AKG, VK, MYK, JG, IS, CM, SN

Data curation: AKG, TG, GC

Formal analysis: AKG, TG, JG, IS, IM, CK, GC

Funding acquisition: AKG, VK

Resources and software: AKG, TG

Supervision: AKG

Investigation: *all authors and investigators*

Methodology: AKG, VK, MYK, JG, IS, CM, SN, RK, SA

Project administration: AKG, GC

Writing original draft: IS, JG, AKG, IM, CK, TG, GC

Writing-review and editing: *all authors and investigators*

Funding

Barts Charity.

Role of funding source

Confidential

The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Patient and public involvement

No patients or members of the public were directly involved with the design, or conduct, or reporting, or dissemination plans of the research.

Data sharing statement

Anonymised data, data dictionary, and survey materials will be made available upon request. Study protocol is available at https://doi.org/10.3389/fpsyg.2021.616280.

Acknowledgements:

We would like to acknowledge the extensive support received from the Barts Education Academy and William Harvey Research Institute for sharing some of their resources needed to conduct this study. In particular, we wish to acknowledge the excellent contribution of the following: Julekha Khanam from Barts Health NHS Trust, Elaine Colaco and Martyn Clark from Barts Education Academy, Tania Toma from Imperial College Healthcare NHS Trust, and Ade Alele, Professor Mark Caulfield, and Amrita Ahluwalia from William Harvey Research Institute.

Transparency declaration:

AGKG (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Confidential

References

1. Stuijfzand S, Deforges C, Sandoz V, Sajin C-T, Jaques C, Elmers J, et al. Psychological impact of an epidemic/pandemic on the mental health of healthcare professionals: a rapid review. BMC Public Health. 2020;20:1-18.
2. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. 2020;7(6):547-60.
3. Li Z, Ge J, Yang M, Feng J, Qiao M, Jiang R, et al. Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. Brain Behav Immun. 2020;88:916-9.
4. Wang Z, Harold KG, Tong Y, Wen J, Sui M, Liu H, et al. Moral injury in Chinese health professionals during the COVID-19 pandemic. Psychological Trauma: Theory, Research, Practice, and Policy. 2021;Advance on.
5. Zerach G, Levi-Belz Y. Moral injury and mental health outcomes among Israeli health and social care workers during the COVID-19 pandemic: a latent class analysis approach. European journal of psychotraumatology. 2021;12.
6. Lamb D, Gnanapragasam S, Greenberg N, Bhundia R, Carr E, Hotopf M, et al. Psychosocial impact of the COVID-19 pandemic on 4378 UK healthcare workers and ancillary staff: initial baseline data from a cohort study collected during the first wave of the pandemic. Occupational and Environmental Medicine. 2021;0:1-8.
7. Plouffe RA, Nazarov A, Forchuk CA, Gargala D, Deda E, Le T, et al. Impacts of morally distressing experiences on the mental health of Canadian health care workers during the COVID-19 pandemic. Eur J Psychotraumatol. 2021;12(1):1984667.
8. Shanafelt T, Ripp J, Trockel M. Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic. JAMA. 2020;323:2133-4.
9. Yang Y, Lu L, Chen T, Ye S, Kelifa MO, Cao N, et al. Healthcare Worker's Mental Health and Their Associated Predictors During the Epidemic Peak of COVID-19. Psychol Res Behav Manag. 2021;14:221-31.
10. Raoofi S, Kan FP, Rafiei S, Khani S, Hosseinifard H, Tajik F, et al. Anxiety during the COVID-19 pandemic in hospital staff: systematic review plus meta-analysis. BMJ Supportive & Palliative Care. 2021;0:1-9.
11. Olaya B, Pérez-Moreno M, Bueno-Notivol J, Gracia-García P, Lasheras I, Santabárbara J. Prevalence of Depression among Healthcare Workers during the COVID-19 Outbreak: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2021;10:3406.
12. Prasad K, McLoughlin C, Stillman M, Poplau S, Goelz E, Taylor S, et al. Prevalence and correlates of stress and burnout among U.S. healthcare workers during the COVID-19 pandemic: A national cross-sectional survey study. EClinicalMedicine. 2021;35.
13. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N. A Systematic, Thematic Review of Social and Occupational Factors Associated with Psychological Outcomes in Healthcare Employees during an Infectious Disease Outbreak. Journal of Occupational and Environmental Medicine. 2018;60:248-57.
14. Siddiqui I, Aurelio M, Gupta A, Blythe J, Khanji M. COVID-19: Causes of anxiety and wellbeing support needs of healthcare professionals in the UK: A cross-sectional survey. Clinical Medicine. 2021;21:66-72.
15. Billings J, Seif NA, Hegarty S, Ondruskova T, Soulios E, Bloomfield M, et al. What support do frontline workers want? A qualitative study of health and social care workers' experiences and views of psychosocial support during the COVID-19 pandemic. PLoS ONE. 2021;16:e0256454.
16. Kang B-A, Kwon S, You M, Lee H. Perceived sources of occupational burn-out and embitterment among front-line health workers for COVID-19 control in Gyeonggi province, South Korea: a qualitative study. Occupational and Environmental Medicine. 2021;0:1-8.

For Peer Review Only

17. Vera San Juan N, Aceituno D, Djellouli N, Sumray K, Regenold N, Syversen A, et al. Mental health and well-being of healthcare workers during the COVID-19 pandemic in the UK: contrasting guidelines with experiences in practice. BJPsych Open. 2020;7(1):e15.
18. Berkhout SG, Sheehan KA, Abbey SE. Individual- and Institutional-level Concerns of Health Care Workers in Canada During the COVID-19 Pandemic: A Qualitative Analysis. JAMA Netw Open. 2021;4(7):e2118425.
19. Buckley L, Berta W, Cleverley K, Widger K. Exploring Pediatric Nurses' Perspectives on Their Work Environment, Work Attitudes, and Experience of Burnout: What Really Matters? Front Pediatr. 2022;10:851001.
20. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research. 2021;21:1-11.
21. Cyr S, Marcil M-J, Marin M-F, Tardif J-C, Guay S, Guertin M-C, et al. Factors Associated With Burnout, Post-traumatic Stress and Anxio-Depressive Symptoms in Healthcare Workers 3 Months Into the COVID-19 Pandemic: An Observational Study. Frontiers in Psychiatry. 2021;12:668278.
22. Wanigasooriya K, Palimar P, Naumann DN, Ismail K, Fellows JL, Logan P, et al. Mental health symptoms in a cohort of hospital healthcare workers following the first peak of the COVID-19 pandemic in the UK. BJPsych Open. 2021;7(1).
23. Munn LT, Liu TL, Swick M, Rose R, Broyhill B, New L, et al. Original Research: Well-Being and Resilience Among Health Care Workers During the COVID-19 Pandemic: A Cross-Sectional Study. Am J Nurs. 2021;121(8):24-34.
24. Havaei F, Ma A, Staempfli S, MacPhee M. Nurses' Workplace Conditions Impacting Their Mental Health during COVID-19: A Cross-Sectional Survey Study. Healthcare (Basel). 2021;9(1).
25. Hines SE, Chin KH, Glick DR, Wickwire EM. Trends in Moral Injury, Distress, and Resilience Factors among Healthcare Workers at the Beginning of the COVID-19 Pandemic. International Journal of Environmental Research and Public Health. 2021;18:488.
26. Pollock A, Campbell P, Cheyne J, Cowie J, Davis B, McCallum J, et al. Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. Cochrane Database Syst Rev. 2020;11:CD013779.
27. Khanji MY, Maniero C, NG S, Siddiqui I, Gupta J, Crosby L, et al. Early and Mid-Term Implications of the COVID-19 Pandemic on the Physical, Behavioral and Mental Health of Healthcare Professionals: The CoPE-HCP Study Protocol. Frontiers in Psychology. 2021;12:39.
28. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-7.
29. Morin CM, Belleville G, Belanger L, Ivers H. The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep. 2011;34(5):601-8.
30. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-13.
31. Li-Sauerwine S, Rebillot K, Melamed M, Addo N, Lin M. A 2-Question Summative Score Correlates with the Maslach Burnout Inventory. Western Journal of Emergency Medicine. 2020;21:617.
32. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, et al. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. Health Qual Life Outcomes. 2007;5:63.
33. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3:77-101.
34. Khajuria A, Tomaszewski W, Liu Z, Chen J-h, Mehdian R, Fleming S, et al. Workplace factors associated with mental health of healthcare workers during the COVID-19 pandemic: an international cross-sectional study. BMC Health Services Research 2021;21:1-11.

Confidential

35. Preti E, Di Mattei V, Perego G, Ferrari F, Mazzetti M, Taranto P, et al. The Psychological Impact of Epidemic and Pandemic Outbreaks on Healthcare Workers: Rapid Review of the Evidence. Current Psychiatry Reports. 2020;22:1-22.
36. Sconfienza C, Lindfors P, Lantz Friedrich A, Sverke M. Social support at work and mental distress: A three-wave study of normal, reversed, and reciprocal relationships. J Occup Health. 2019;61(1):91-100.
37. Mental health and psychosocial considerations during the COVID-19 outbreak [press release]. World Health Organization2020.
38. Belfroid E, Steenbergen Jv, Timen A, Ellerbroek P, Huis A, Hulscher M. Preparedness and the importance of meeting the needs of healthcare workers: a qualitative study on Ebola. Journal of Hospital Infection. 2018;98:212-8.
39. Shevlin M, McBride O, Murphy J, Miller JG, Hartman TK, Levita L, et al. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19 pandemic. BJPsych Open. 2020;6.

Confidential

For Peer Review Only

Tables and Figures

Table 1. Baseline characteristics of HCP and non-HCP group (n,1721).

	Response	HCP, n, 1574 (%)	Non-HCP, n,147 (%)	Overall, n, 1721 (%)
Age	18-25 years	76 (4.8%)	8 (5.4%)	84 (4.9%)
	26-35 years	390 (24.8%)	49 (33.3%)	439 (25.5%)
	36-50 years	638 (40.5%)	56 (38.1%)	694 (40.3%)
	51-60 years	372 (23.6%)	25 (17.0%)	397 (23.1%)
	61-70 years	92 (5.8%)	7 (4.8%)	99 (5.8%)
	> 70 years	6 (0.4%)	2 (1.4%)	8 (0.5%)
Ethnicity	White	1027 (65.3%)	109 (74.2%)	1136 (66.0%)
	Asian	359 (22.8%)	25 (17.0%)	384 (22.3%)
	Black	74 (4.7%)	4 (2.7%)	78 (4.5%)
	Mixed	48 (3.1%)	3 (2.0%)	51 (3.0%)
	Other	39 (2.5%)	3 (2.0%)	42 (2.4%)
	Prefer not to say	27 (1.7%)	3 (2.0%)	30 (1.7%)
Gender identity	Female	1105 (70.2%)	109 (74.2%)	1214 (70.5%)
	Male	447 (28.4%)	36 (24.5%)	483 (28.1%)
	Prefer not to say	14 (0.9%)	2 (1.4%)	16 (0.9%)
	Prefer to self-define	8 (0.5%)	0 (0.0%)	8 (0.5%)
Relationship status	Divorced	54 (3.4%)	2 (1.4%)	56 (3.3%)
	Prefer not to say	46 (2.9%)	3 (2.0%)	49 (2.9%)
	Married/Living with partner or family	1048 (66.6%)	93 (63.3%)	1141 (66.3%)
	Other	52 (3.3%)	8 (5.4%)	60 (4.0%)
	Single	374 (23.8%)	41 (27.9%)	415 (24.1%)
Number living in household	1	210 (13.3%)	17 (11.6%)	227 (13.2%)
	2	487 (30.9%)	55 (37.4%)	542 (31.5%)
	3-5	799 (50.8%)	68 (46.3%)	867 (50.4%)
	6 or more	78 (5.0%)	7 (4.8%)	85 (4.9%)
Highest level of education	A-levels	113 (7.2%)	8 (5.4%)	121 (7.0%)
	Bachelor's / diploma	735 (46.7%)	36 (24.5%)	771 (44.8%)
	Master's / PhD	613 (39.0%)	102 (69.4%)	715 (41.6%)
	Other	113 (7.2%)	1 (0.7%)	114 (6.6%)

Note. HCP = healthcare professional. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

Confidential

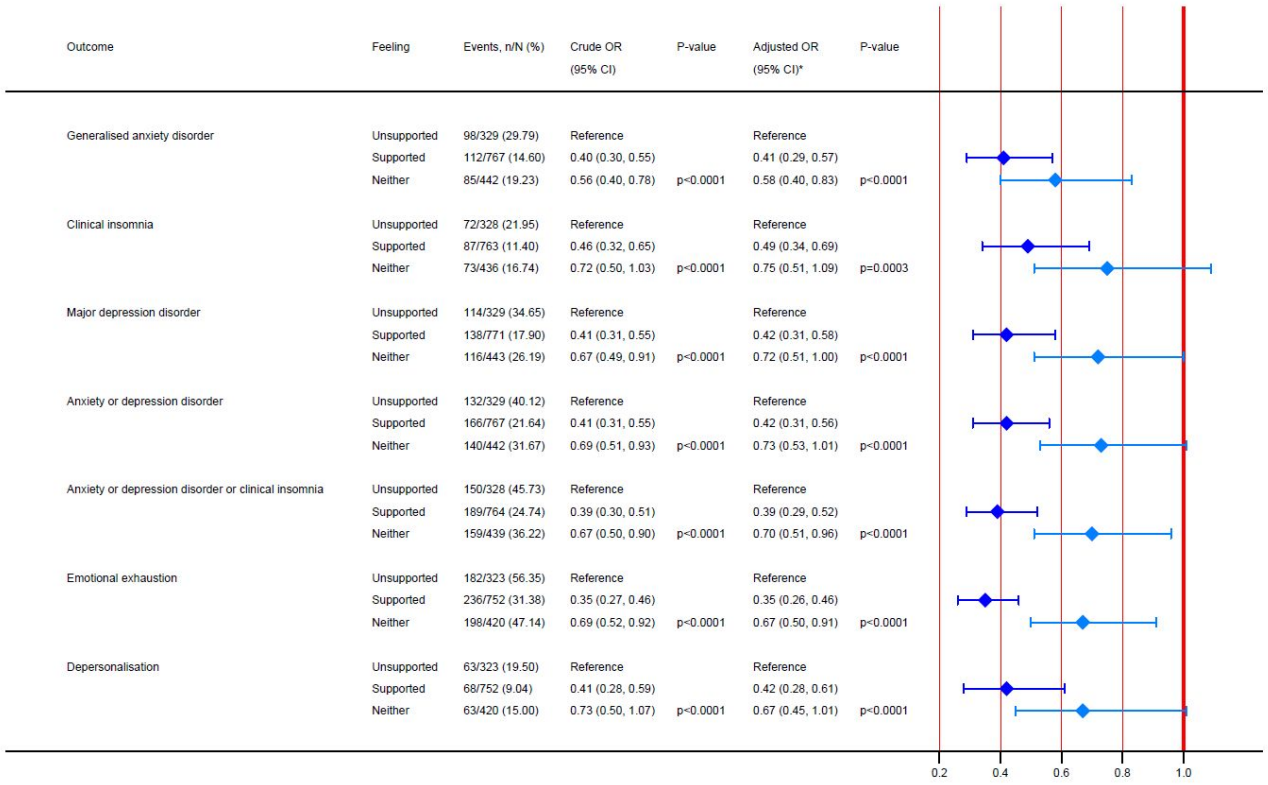
For Peer Review Only

Table 2. Managerial Support Sub-theme.

	Description	Quotes
General support	The largest proportion of comments cited a need for general support from managers or its helpfulness.	*"Better support from direct supervisor"* and *"My line manager and supervisor as mentioned above was also of great support"*
Communication	Many comments cited a general lack of communication, but some specified a lack and desire for: • Regular contact and/or check-ins. • Clarity and speed with decisions. • Consistency in messages. • Honesty/Transparency.	*"Would have liked communication from our managers regarding the situation….."*
		"I would have appreciated if Management would have been open in regards to what's happening within the team …… Everyone was scared that information has been kept secret ……"
Visibility/ availability	Staff felt there was a lack of managerial presence "on the ground", resulting in patient-facing staff feeling uncared for, disconnected with decision makers and that they lacked genuine understanding of the difficulties experienced.	*"Felt top senior management/directors were not visible during the peak and now- highlighting a big disconnect between the realities of working on the shop floor and those making the decisions."*
Understanding of personal circumstances/ flexibility	Respondents appreciated managers who were understanding and flexible of personal circumstances.	*"More support from line managers, and flexibility in those initial days…."*
Genuine concern for welfare/ listening	Many comments regarding feeling dismissed and invalidated by managers when raising concerns or asking for support.	*"Upper management at the Trust … had no idea about the hell happening on the ground. They were dismissive and almost acted like we were being outrageous when we raised concerns about poor quality patient care and concerns about our own health …"*
	Of those who found managerial support helpful, the most common subtheme that emerged was having a genuine concern for staff welfare. Managers who listened and left staff feeling understood and with consistent support were valued.	*"I felt listened by my team and service management, which made me less anxious!"*
	Mirroring this, many respondents felt there was no recognition, acknowledgement or empathy for the increased stress levels and consequential personal and professional impact.	*"It would have been helpful to have those senior to myself…. listen ……."*
Approachable/ helpful	Support often cited as helpful was managers being approachable and solution-focused, available to talk to when needed and ensuring safety was prioritised.	*"Most helpful was having a manager who was always available and actively trying to improve the situation for us all, thinking of things to change before it needed changing etc. Very grateful"*
Support for Managers from Trusts/local leadership	Staff also reported a desire for stronger local leadership and hospital management. Some respondents raised the problem of blame culture.	*"Organisationally there has increasingly been a culture of lack of protection and shifting blame to staff members"*
	There were a handful of participants who were managers themselves, they felt there was no-one to manage or support them.	*"I am a partner & senior manager. At the height of the crisis there was no one to take to about it. I and the other partners were constantly having to support the staff team. But there was no one for us to go to."*

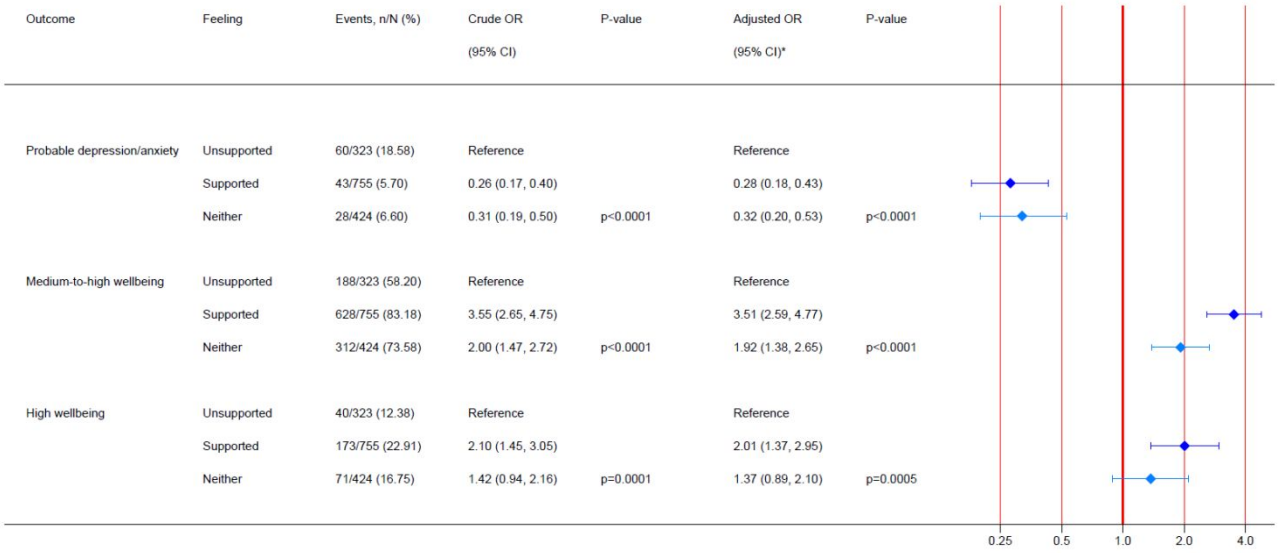
Confidential

Figure 1a. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst all participants (n,1721; HCPs and non-HCPs) at baseline.



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, pre-existing mental health condition, and pre-existing physical health condition. P values are for global trend relating support to each outcome.

Figure 1b. Wellbeing outcomes (SWEMWBS) based on level of perceived support at baseline (n,1502).

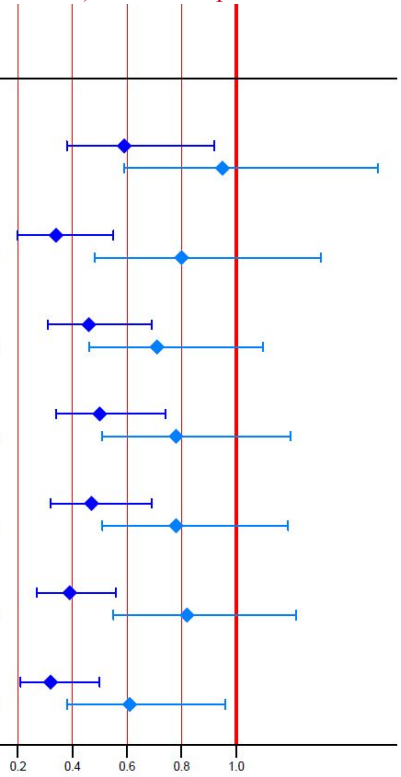


Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, pre-existing mental health condition, and pre-existing physical health condition. P values are for global trend relating support to each outcome.

For Peer Review Only

Figure 2a. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst all participants (n,799; HCPs and non-HCPs) at follow-up.

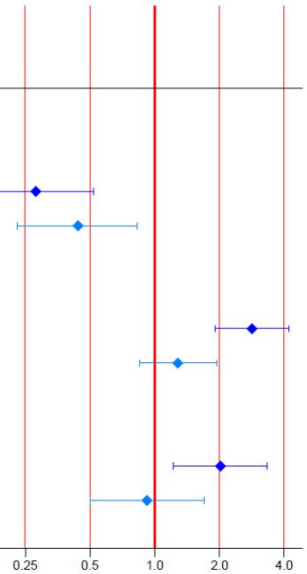
Outcome	Feeling	Events, n/N (%)	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)*	P-value
Generalised anxiety disorder	Unsupported	52/203 (25.62)	Reference		Reference	
	Supported	62/376 (16.49)	0.57 (0.38, 0.87)		0.59 (0.38, 0.92)	
	Neither	54/220 (24.55)	0.94 (0.61, 1.47)	p=0.012	0.95 (0.59, 1.52)	p=0.028
Clinical insomnia	Unsupported	48/203 (23.65)	Reference		Reference	
	Supported	37/376 (9.84)	0.35 (0.22, 0.56)		0.34 (0.20, 0.55)	
	Neither	44/220 (20.00)	0.81 (0.51, 1.28)	p<0.0001	0.80 (0.48, 1.31)	p<0.0001
Major depression disorder	Unsupported	75/203 (36.95)	Reference		Reference	
	Supported	81/376 (21.54)	0.47 (0.32, 0.68)		0.46 (0.31, 0.69)	
	Neither	66/220 (30.00)	0.73 (0.49, 1.10)	p=0.0003	0.71 (0.46, 1.10)	p=0.0006
Anxiety or depression disorder	Unsupported	83/203 (40.89)	Reference		Reference	
	Supported	98/376 (26.06)	0.51 (0.35, 0.73)		0.50 (0.34, 0.74)	
	Neither	78/220 (35.45)	0.79 (0.54, 1.18)	p=0.0008	0.78 (0.51, 1.20)	p=0.0014
Anxiety or depression disorder or clinical insomnia	Unsupported	90/203 (44.33)	Reference		Reference	
	Supported	104/376 (27.66)	0.48 (0.34, 0.69)		0.47 (0.32, 0.69)	
	Neither	85/220 (38.64)	0.79 (0.54, 1.16)	p=0.0001	0.78 (0.51, 1.19)	p=0.0003
Emotional exhaustion	Unsupported	108/203 (53.20)	Reference		Reference	
	Supported	120/376 (31.91)	0.41 (0.29, 0.59)		0.39 (0.27, 0.56)	
	Neither	111/220 (50.45)	0.90 (0.61, 1.31)	p<0.0001	0.82 (0.55, 1.22)	p<0.0001
Depersonalisation	Unsupported	62/203 (30.54)	Reference		Reference	
	Supported	50/376 (13.30)	0.35 (0.23, 0.53)		0.32 (0.21, 0.50)	
	Neither	53/220 (24.09)	0.72 (0.47, 1.11)	p<0.0001	0.61 (0.38, 0.96)	p<0.0001



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, pre-existing mental health condition, and pre-existing physical health condition. P values are for global trend relating support to each outcome.

Figure 2b. Wellbeing outcomes (SWEMWBS) based on level of perceived support at follow-up (n,799).

Outcome	Feeling	Events, n/N (%)	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)*	P-value
Probable depression/anxiety	Unsupported	35/203 (17.24)	Reference		Reference	
	Supported	22/376 (5.85)	0.30 (0.17, 0.52)		0.28 (0.16, 0.52)	
	Neither	20/220 (9.09)	0.48 (0.27, 0.86)	p=0.0001	0.44 (0.23, 0.83)	p=0.0002
Medium-to-high wellbeing	Unsupported	120/203 (59.11)	Reference		Reference	
	Supported	296/376 (78.72)	2.56 (1.76, 3.72)		2.83 (1.91, 4.19)	
	Neither	140/220 (63.64)	1.21 (0.82, 1.79)	p<0.0001	1.28 (0.85, 1.94)	p<0.0001
High wellbeing	Unsupported	27/203 (13.30)	Reference		Reference	
	Supported	82/376 (21.81)	1.82 (1.13, 2.92)		2.02 (1.22, 3.33)	
	Neither	25/220 (11.36)	0.84 (0.47, 1.49)	p=0.0016	0.92 (0.50, 1.70)	p=0.0013

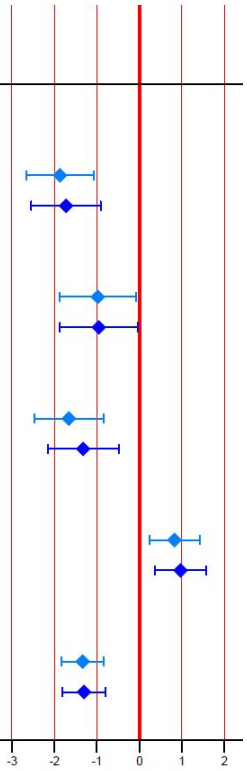


Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, pre-existing mental health condition, and pre-existing physical health condition. P values are for global trend relating support to each outcome.

For Peer Review Only

Figure 3. Change in mental health and wellbeing outcomes between baseline and follow-up, by change in level of support reported at follow-up (n,771).

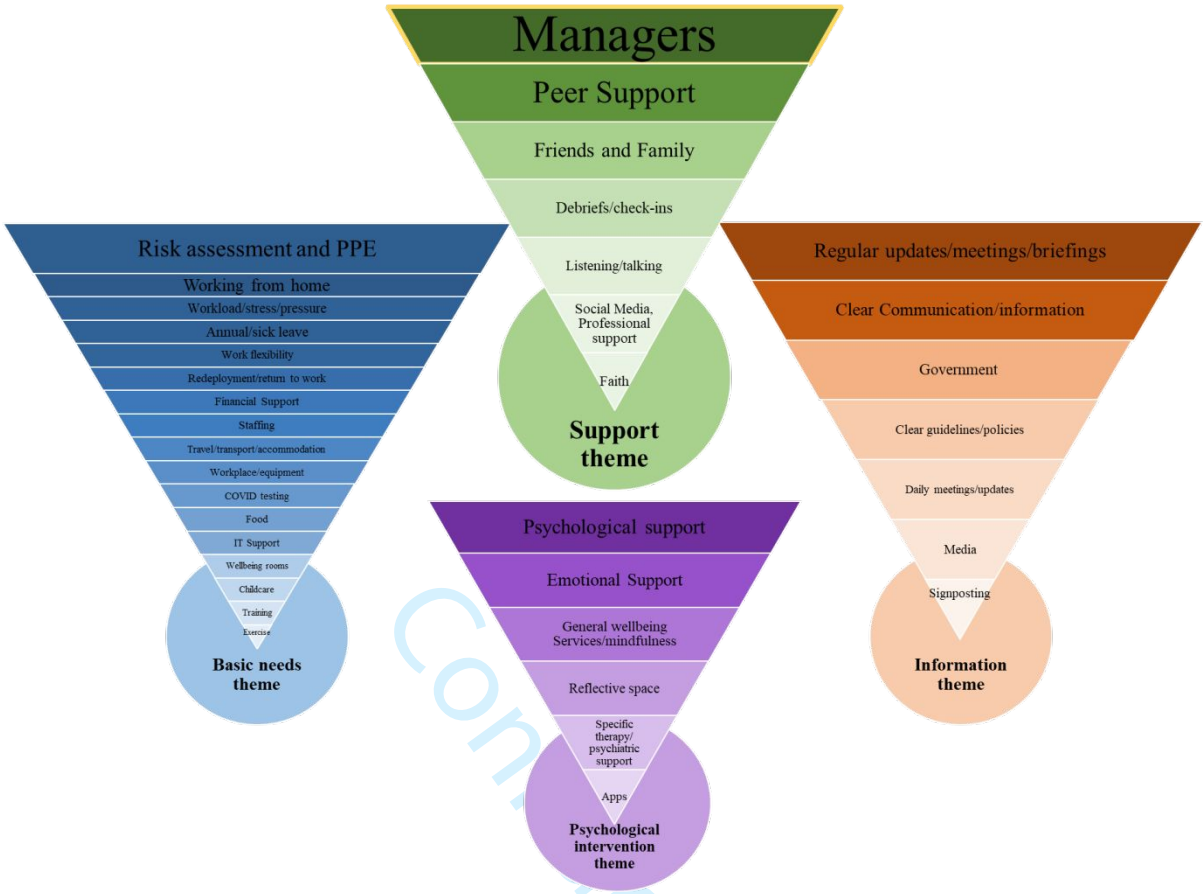
Outcome	Feeling	Baseline Mean (SD)	Follow-up Mean (SD)	Change Mean (SD)	Crude difference (95% CI)	P-value	Adjusted difference (95% CI)*	P-value
GAD-7 anxiety score	Less supported (n=142)	6.85 (5.66)	7.85 (5.76)	1.00 (4.64)	Reference		Reference	
	Similar (n=355)	5.45 (5.22)	5.30 (5.00)	-0.16 (4.12)	-1.16 (-2.00 to -0.31)		-1.87 (-2.67 to -1.07)	
	More supported (n=274)	5.50 (5.22)	5.39 (4.93)	-0.11 (4.47)	-1.11 (-1.99 to -0.23)	p=0.019	-1.73 (-2.54 to -0.91)	p<0.0001
ISI-7 sleep deprivation score	Less supported (n=142)	9.54 (5.94)	10.19 (6.91)	0.65 (5.54)	Reference		Reference	
	Similar (n=354)	8.15 (5.91)	8.18 (5.81)	0.03 (4.43)	-0.62 (-1.55 to 0.30)		-0.98 (-1.88 to -0.08)	
	More supported (n=273)	7.95 (5.85)	8.02 (5.44)	0.08 (4.71)	-0.58 (-1.54 to 0.39)	p=0.39	-0.96 (-1.88 to -0.04)	p=0.078
PHQ-9 depression score	Less supported (n=142)	7.86 (6.55)	8.88 (6.62)	1.02 (5.38)	Reference		Reference	
	Similar (n=355)	6.20 (5.40)	6.27 (5.19)	0.07 (4.28)	-0.95 (-1.83 to -0.07)		-1.66 (-2.48 to -0.84)	
	More supported (n=274)	5.97 (5.44)	6.37 (5.06)	0.40 (4.27)	-0.62 (-1.54 to 0.29)	p=0.11	-1.32 (-2.16 to -0.49)	p=0.0004
SWEMWBS wellbeing score	Less supported (n=141)	20.53 (3.57)	19.98 (3.89)	-0.55 (2.99)	Reference		Reference	
	Similar (n=354)	21.38 (3.46)	21.35 (3.90)	-0.02 (3.08)	0.53 (-0.06 to 1.12)		0.83 (0.24 to 1.41)	
	More supported (n=271)	21.59 (3.47)	21.71 (3.94)	0.11 (2.97)	0.67 (0.05 to 1.28)	p=0.097	0.97 (0.37 to 1.57)	p=0.0054
EEDP2Q summative score	Less supported (n=141)	5.06 (2.96)	6.35 (3.49)	1.29 (3.04)	Reference		Reference	
	Similar (n=354)	4.43 (2.92)	4.74 (3.07)	0.31 (2.37)	-0.98 (-1.49 to -0.47)		-1.34 (-1.83 to -0.84)	
	More supported (n=270)	3.94 (2.80)	4.43 (2.92)	0.48 (2.65)	-0.81 (-1.34 to -0.28)	p=70.3e-04	-1.30 (-1.82 to -0.79)	p<0.0001



Note. Adjusted for baseline perceived level of support and baseline outcomes, age, gender, time since COVID peak in subject's region, level of education, number living in household, relationship status, pre-existing mental health condition, and pre-existing physical health condition. P values are for global trend relating change in level of support to mean scores on each outcome.

Confidential

Figure 4. Results of thematic analysis (pictorial representation) of free-text entries from baseline survey



Note. Colours of each theme correspond with themes detailed in Supplementary Table 2. The inverted pyramids indicate the size of the sub-theme, with the broadest section indicating larger themes. The gold outline around 'Managers' denotes largest sub-theme (See Table 2 for details). 'Other support' is omitted from this figure due to the limited number of subthemes and relative size of the theme.

Table 1. Baseline cCharacteristics of HCPs at baseline (n, 1574) and follow-up (n, 744).

	Response	Baseline (n, 1574) (%)	Follow-up (n, 744) (%)
Age	18-25 years	76 (4.8)	31 (4.2)
	26-35 years	390 (24.8)	175 (23.5)
	36-50 years	638 (40.5)	298 (40.1)
	51-60 years	372 (23.6)	185 (24.9)
	61-70 years	92 (5.8)	51 (6.9)
	> 70 years	6 (0.4)	4 (0.5)
Ethnicity	White	1027 (65.3)	587 (78.9)
	Asian	359 (22.8)	93 (12.5)
	Black	74 (4.7)	27 (3.6)
	Mixed	48 (3.1)	19 (2.6)
	Other	39 (2.5)	12 (1.6)

For Peer Review Only

	Prefer not to say	27 (1.7)	6 (0.81)
Gender identity	Female	1105 (70.2)	562 (75.5)
	Male	447 (28.4)	178 (23.9)
	Prefer not to say	14 (0.9)	3 (0.4)
	Prefer to self-define	8 (0.5)	1 (0.1)
Relationship status	Divorced	54 (3.4)	27 (3.6)
	Prefer not to say	46 (2.9)	21 (2.8)
	Married/Living with partner or family	1048 (66.6)	496 (66.7)
	Other	52 (3.3)	22 (3.0)
	Single	374 (23.8)	178 (23.9)
Number living in household	1	210 (13.3)	104 (14.0)
	2	487 (30.9)	252 (33.9)
	3-5	799 (50.8)	367 (49.3)
	6 or more	78 (5.0)	21 (2.8)
Highest level of education	A-levels	113 (7.2)	61 (8.2)
	Bachelor's / diploma	735 (46.7)	346 (46.5)
	Master's / PhD	613 (39.0)	290 (39.0)
	Other	113 (7.2)	47 (6.3)

Note. HCP = healthcare professional. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

1

2

Confidential

For Peer Review Only

Table 2. Separate linear regressions for the association between change in perceived level of support and change in raw mental health, burnout, and wellbeing scores in HCPs from baseline to follow-up (n, 681).

	Crude			Adjusted		
	Coefficient	**95% Confidence Intervals**	**P Value**	**Coefficient ***	**95% Confidence Intervals ***	**P value ***
GAD-7	-0.10	-0.21 to 0.01	0.075	-0.13	-0.25 to -0.01	0.036
PHQ-9	-0.19	-0.30 to -0.08	0.001	-0.17	-0.29 to -0.04	0.008
ISI	-0.07	-0.19 to 0.05	0.226	-0.13	-0.26 to 0.01	0.067
EEDP2Q	-0.05	-0.12 to 0.01	0.112	-0.06	-0.13 to 0.02	0.139
SWEMWBS	0.17	0.08 to 0.27	< 0.001	0.19	0.10 to 0.29	< 0.001

Note. Crude and adjusted coefficients provided.
*adjusted for age, gender identity, education, relationship status, number living in household, currently diagnosed mental health condition, currently diagnosed physical health condition, role (medical doctor vs. HCAs, nurses, and AHPs), and baseline level of support.

1

Confidential

Table 3. Workplace support themes based on 681responses from HCP only* ~~entries.~~

Theme	Description	Quotes
Concern/ understanding for welfare	Genuine concern for welfare. • Managers who listened and left staff feeling understood and with consistent support were valued. • A few comments citing check-ins and appropriate training from original line-managers as being significant to their mental health when redeployed.	*"Direct check in. How am I doing, and actually listen to the answer. I have been left to get on with it, with a few platitudes "Ohh its hard"."* *"Would have wanted more recognition from management about impact and repercussions of redeployment but support from colleagues was good within the team."* *"I had no contact with my original team during my redeployment, I found this very stressful which increased my anxiety."*
	Flexibility and understanding. • Respondents appreciated managers who were understanding and flexible of personal circumstances, for example amended working arrangements due to childcare, school times, shielded family members, and personal anxiety/stress.	*"Better understanding of peoples personal situations. I am a full-time unpaid carer for partner who was told to shield for 12 weeks. Due to his condition (a Traumatic Brain Injury and Epilepsy) I was unable to leave him unsupervised for long periods of time as his seizures are fatal and in the event of one he needs medication administered to him to save his life…I requested to be able to work from home due these extenuating circumstances which was denied which caused me and my partner extreme stress…I think it needs to be looked at as a case by case basis and not as a staffing level or need as a whole."*
	Psychological support. • One-to-one confidential counselling and/or access to clinical psychologist was cited as useful for HCPs mental health.	*"Wellbeing support with a named psychologist allocated to our team right from the start."* *"I would have wanted one-on-one therapy sessions with an external professional. We were offered these with our own psychology department free of charge though often work closely with these individuals."*
Information	This broad theme generally describes HCPs requests for regular clear, consistent, and transparent communication/updates sent on a timely manner. Participants sometimes cited daily staff briefings, regular bulletins, and daily huddles as being useful modes of communication.	*"I found it really helpful to have daily or twice weekly staff team briefings with updates on PPE, procedures etc and a chance to ask questions. In the early part of the pandemic, one of the most stressful things was the sheer volume of information coming at us and constant changes to what we should be doing, what PPE we needed in which area etc."* *"Better communication - it felt like as a nurse being redeployed that we were deliberately kept in the dark about operations surrounding Covid-19 as the trust management were more paranoid about details being leaked to the press than staff welfare."*
Tangible qualities of the workplace	Adequate staffing • Several comments describing ensuring adequate staffing in response to staff sicknesses and/or heightened workload, for example.	*"Not sure. Managing staff shortages was difficult and extra work needed. Now we have burnout from covering."*
	PPE/safety • Commonly reported describing training in how to use PPE, safety protocols (e.g. social distancing), regular testing, and access to appropriate PPE.	*"At the beginning of the pandemic, the PPE was rationed strictly and that caused a lot of anxiety. Those initial contacts with patient meant those staff member developed symptoms and got ill. This caused a lot of anxiety. I fortunately had annual leave for a week and when I got back to work. The PPE was fully available and in use appropriately. Scrubs were a problem especially plus sizes, not available."*

Confidential

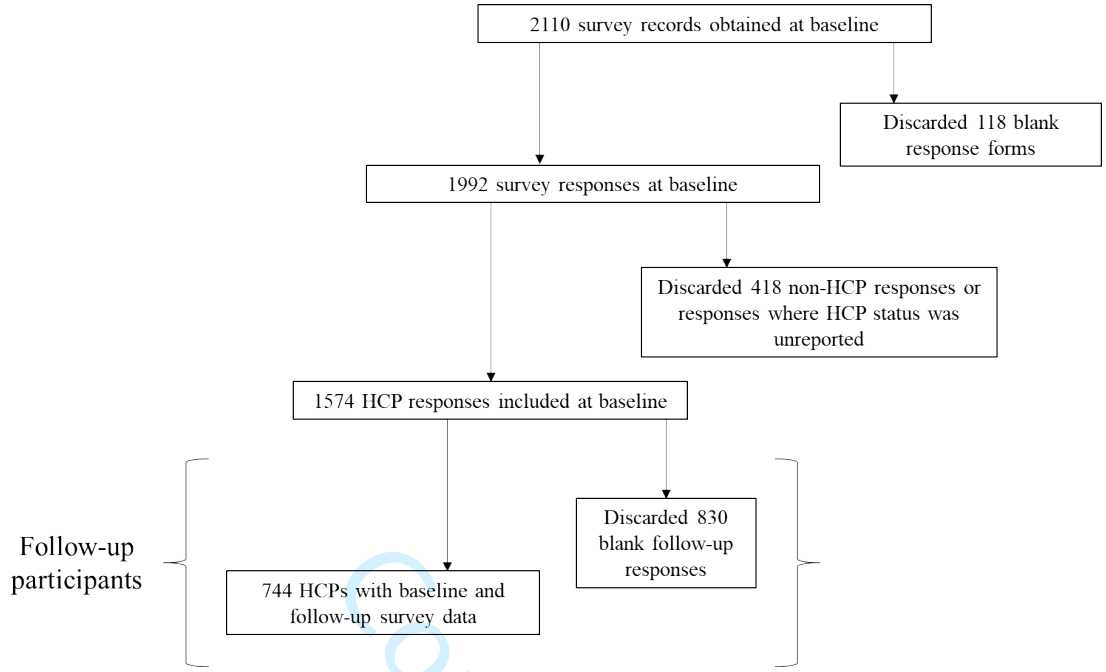
For Peer Review Only

	Financial support • E.g. free lunches, and free parking so HCPs can drive (and avoid public transport) and no additional expense.	*"Most helpful - being able to drive to and park at work. Food provided at work."* *"Free meals because there was no food in the shops and also I was so tired after my shift, I couldn't cook. Not having to wash my uniform. I know my manager was doing her best to keep the unit staffed and as safe as possible."*
	Work from home support • Few HCPs described support (in terms of IT equipment, software support to facilitate working from home as being significant.	*"Not to have to pay back hours lost trying to work from home without necessary equipment needed to enable me to work from home effectively. Necessary equipment should have been provided."*
Leadership	Visibility • Staff felt there was a lack of senior managerial presence "on the ground", resulting in patient-facing staff feeling uncared for, disconnected with decision makers and that they lacked genuine understanding of the difficulties experienced.	*"Felt top senior management/directors were not visible during the peak and now- highlighting a big disconnect between the realities of working on the shop floor and those making the decisions."*
	Available/approachable • Few brief comments expressing gratitude for their managers/supervisors being approachable. • Few comments relating to being glad that supervisors were available to help, or the availability of wellbeing support services.	*"Most helpful was having a manager who was always available and actively trying to improve the situation for us all, thinking of things to change before it needed changing etc. Very grateful."*
	Reassurance • Few comments highlight the significance of receiving reassurance from their managers regarding tasks and patient care, and reassurance regarding redeployment or job security.	*"I work in intensive care. We were told "to keep patients alive and anything you do extra is a bonus". This was very comforting to me as I know I will always do my best and more to reach on everything but was this statement by our matron made me feel I could do my job to the best of my ability and not live with the guilt that I hadn't reached on certain things."*
	Higher support for managers • Some participants who were managers themselves felt there was no-one to manage or support them.	*"I am a partner & senior manager. At the height of the crisis there was no one to take to about it. I and the other partners were constantly having to support the staff team. But there was no one for us to go to."*
Peer support	Peer support was frequently stated. This was usually described as helpful and comprised a sense of camaraderie, solidarity/unity, and being open with each other. Some participants appreciated eating lunch together with team and to have informal discussions regarding emotional support. More formal modes of discussion described Balint groups, in a couple cases.	*"We are a team of 12 working in a "bubble". At the height of the pandemic we split into two teams and working alternate weeks. increased workload and very stressful but we all supported each other and ensured we were all coping!* *"Mealtimes were really important. Meals were free and my manager ensured we all went together and ate lunch together. This seemed to brighten the day and we tried not to talk about work at lunch time. For other team members, she also requested they go back to the office before home time to have a debrief.*

*N = 860.

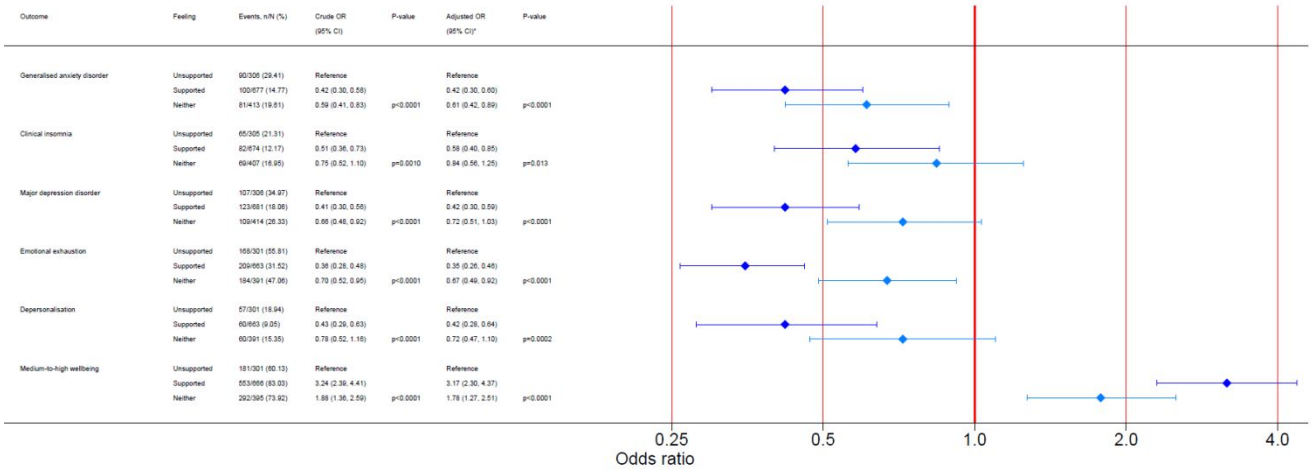
Confidential

Figure 1. Flowchart for baseline and follow-up participants.



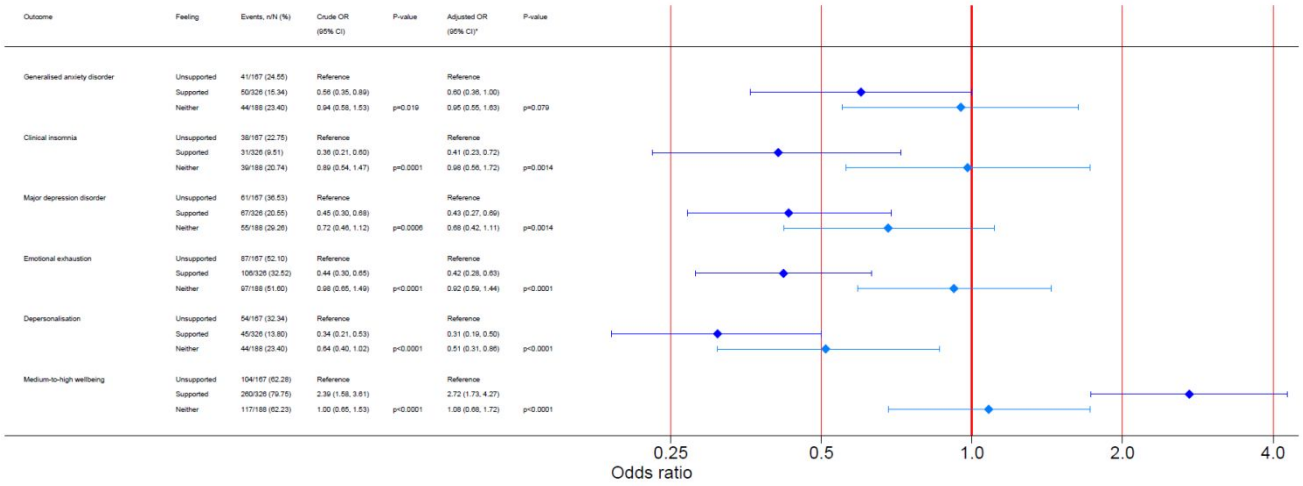
Confidential

Figure 2. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at baseline (n, 1422).



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating support to each outcome.

Figure 3. Forest plot displaying the odds ratio (risk) of various mental health and burnout outcomes by perceived level of workplace support amongst HCPs at follow-up (n, 681).



Note. Adjusted for age, gender, time elapsed since COVID-19 peak in subject's region, highest level of education, relationship status, number living in household, current mental health diagnosis, current physical health diagnosis, and role. P values are for global trend relating change in level of support to mean scores on each outcome.

For Peer Review Only

Tables and Figures (Supplementary)

Supplemental Table 1. Chi square analysis of demographic characteristics of baseline-only HCPs and cohort HCP participants (n = 1574)

	Response	Baseline-only (n, 830) (%)	Follow-up (n, 744) (%)	Chi squared result
Age	18-25 years	45 (5.4)	31 (4.2)	6.5, $p = 0.26$
-	26-35 years	215 (25.9)	175 (23.5)	
-	36-50 years	340 (41.0)	298 (40.1)	
-	51-60 years	187 (22.5)	185 (24.9)	
-	61-70 years	41 (4.9)	51 (6.9)	
-	> 70 years	2 (0.2)	4 (0.5)	
Ethnicity	White	440 (53.0)	587 (78.9)	121.7, $p < 0.001$
-	Asian	266 (32.1)	93 (12.5)	
-	Black	47 (5.7)	27 (3.6)	
-	Mixed	29 (3.5)	19 (2.6)	
-	Other	27 (3.3)	12 (1.6)	
	Prefer not to say	21 (2.5)	6 (0.81)	
Gender identity	Female	543 (65.4)	562 (75.5)	23.3, $p < 0.001$
-	Male	269 (32.4)	178 (23.9)	
-	Prefer not to say	11 (1.3)	3 (0.4)	
-	Prefer to self-define	7 (0.8)	1 (0.1)	
Relationship status	Divorced	27 (3.3)	27 (3.6)	0.74, $p = 0.95$
-	Prefer not to say	25 (3.0)	21 (2.8)	
-	Married/Living w/ partner or family	552 (66.5)	496 (66.7)	
-	Other	30 (3.6)	22 (3.0)	
-	Single	196 (23.6)	178 (23.9)	
Number living in	1	106 (12.8)	104 (14.0)	17.9, $p < 0.001$

Confidential

For Peer Review Only

household	2	235 (28.3)	252 (33.9)	
	3-5	432 (52.1)	367 (49.3)	
	6 or more	57 (6.9)	21 (2.8)	
Highest level of education	A-levels	52 (6.3)	61 (8.2)	3.52, $p = 0.32$
	Bachelor's / diploma	389 (46.9)	346 (46.5)	
	Master's / PhD	323 (38.9)	290 (39.0)	
	Other	66 (8.0)	47 (6.3)	
Mental health outcomes at baseline*	Major depressive disorder	172 (23.9)	182 (25.5)	0.54, $p = 0.46$
	Generalised anxiety disorder	142 (19.8)	142 (19.9)	0.00, $p = 0.97$
	Clinical insomnia	103 (14.6)	125 (17.6)	2.31, $p = 0.13$
	Emotional exhaustion	298 (44.0)	282 (39.8)	2.41, $p = 0.12$
	Depersonalisation	103 (15.2)	83 (11.7)	3.59, $p = 0.06$
	High-medium wellbeing	173 (25.3)	176 (24.8)	0.04, $p = 0.84$

Note. All demographic data is self-reported. 'Asian' category includes South Asian, Chinese, and any other Asian background. 'Mixed' category includes mixed Black and White, mixed Asian and White, and mixed any other/multiple ethnic backgrounds.

*Missing data for each mental health outcome varies: 1434 participants (721 baseline-only and 713 follow-up) for major depressive disorder, 1429 (716 baseline-only and 713 follow-up) for generalised anxiety disorder, 1418 (706 baseline-only and 712 follow-up) for clinical insomnia, 1386 participants (678 baseline-only and 708 follow-up) for emotional exhaustion and depersonalisation, and 1393 (684 baseline-only and 709 follow-up) for wellbeing.

Confidential

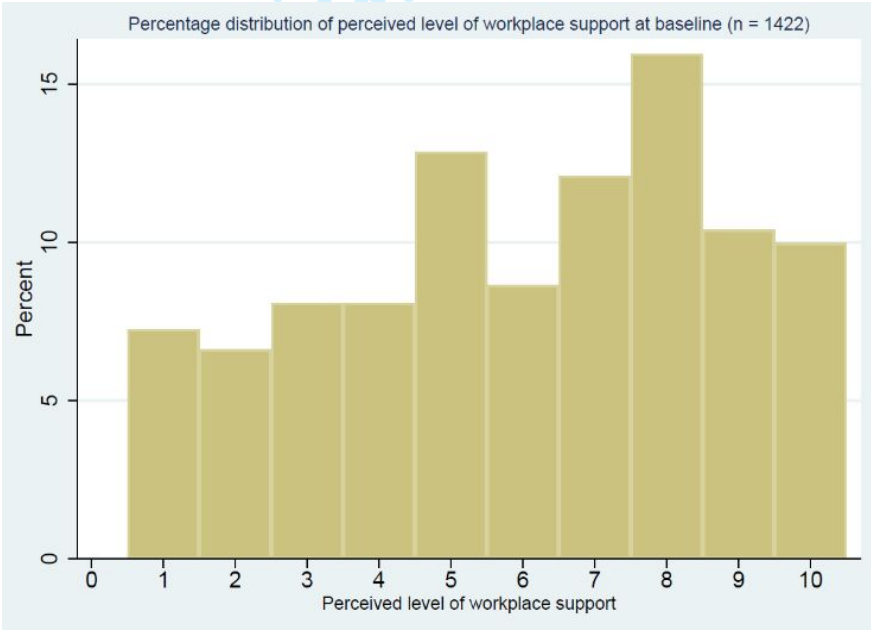
For Peer Review Only

Supplementary Table 2. Perceived level of support in HCPs at baseline (n, 1422) and follow-up (n, 681).

	Response	Baseline, n,1422 (%)	Follow-up, n,681 (%)
Do you think you received adequate support directly from your supervisors/line managers	Felt unsupported	312 (21.9%)	167 (24.5)
	Felt supported	689 (48.5%)	326 (47.9)
	Felt neither supported nor unsupported	421 (29.6%)	188 (27.6)

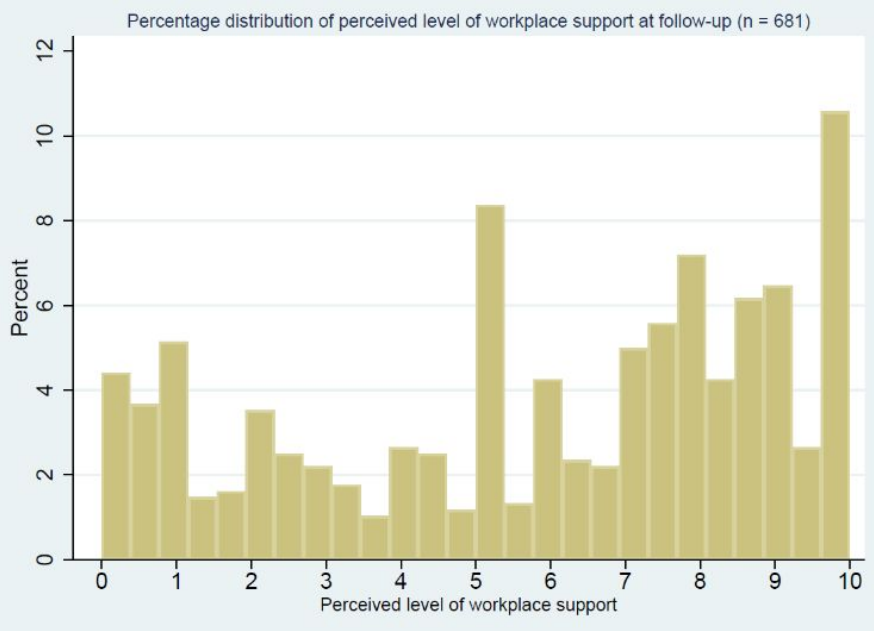
Note. Follow-up participants are those who also provided valid baseline support data.

Supplemental Figure 1. Graphical illustration of the distribution of responses for perceived level of workplace support at baseline (n = 1422).



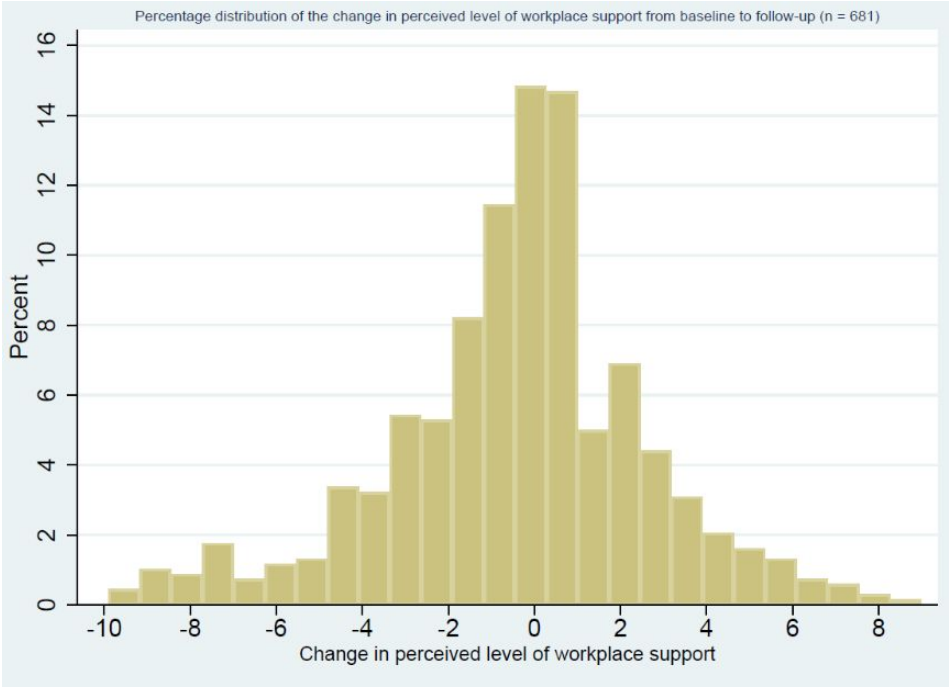
For Peer Review Only

Supplemental Figure 2. Graphical illustration of the distribution of responses for perceived level of workplace support at follow-up (n = 681).



For Peer Review Only

Supplemental Figure 3. Graphical illustration of the distribution of the change in perceived level of workplace support from baseline and follow-up (n = 681).



For Peer Review Only