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Article

A pre/post analysis of the impact of the COVID-19 pandemic on the psychosocial work environment and recovery among healthcare workers in a large university hospital in Sweden

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Abstract

Background: The impact of the COVID-19 pandemic on workload, mental health, and well-being of healthcare workers, and particularly those on the front-line, has received considerable attention.

Design and methods: We surveyed hospital employees about their working environment during the pandemic and identified departments which were negatively affected in comparison to the pre-pandemic situation, as well as factors contributing to this.

Setting and participants We surveyed all hospital employees at Sahlgrenska University Hospital, Sweden in September 2020 and compared results across departments and to the results of a large employee survey from October 2019.

Results: The overall impact of the pandemic on perceived working conditions and possibility for recovery differed among departments. During the pandemic, healthcare workers working with COVID-19 patients reported poorer working environments than other employees. Factors significantly related to perception of work environment and recovery during the pandemic included worries of being infected, departmental transfer, and having insufficient access to personal protective equipment. Men reported better working conditions than women in all, but one item and higher age was related to better perceived working environment.

Conclusions: Our results indicate that the pandemic differentially affects hospital departments and underscores the multifactorial nature of this topic.

Contributing factors to poor perceived working environment could be addressed at times of high workload, such as during the pandemic, including providing appropriate support to managers, ensuring possibility for recovery during working hours, and acknowledging worries about infection. Young healthcare workers and staff who are relocated due to the pandemic warrant special attention.

Introduction

The coronavirus 2019 (COVID-19) pandemic has had devastating effects on global societies and many countries are now facing a second or third wave. Tremendous challenges are being put on healthcare systems around the world including an unprecedented disruption to the ordinary health care. Consequences including high workload and poor mental health among healthcare workers (HCW) during the COVID-19 pandemic has been described in several studies.¹⁻⁴ Understandably, focus has been on intensive care units (ICU) and other front-line HCW but HCW from other departments could also be affected by the situation and thus in need of support from their employer.⁵ Available studies are mainly cross-sectional which makes it difficult to draw decisive conclusions about the effect of the COVID-19 pandemic compared to before the onset of the pandemic. Even pre-pandemic, the work environment within the healthcare sector had, in many countries,

Significance for public health

The pandemic has raised the awareness of the importance of health care workers for the society and their health and well-being. The results of this study emphasize the impact of COVID-19 pandemic on the work environment and possibility for recovery among health care workers in a hospital context. Many work-related issues could be better attended to, even in the time of crisis, and the results of this study could be used to improve the well-being among health care workers. The results also show that young health care workers need special attention regarding support and possibility for recovery.

been described as troublesome with high levels of burnout, staff turnover and sick-leave rates.⁶ The COVID-19 pandemic plausibly affects HCW differently and the complex impact of the pandemic has been raised by several authors.^{2,7} It is of utmost importance to thoroughly study the pandemic's effects on HCW situations and to pinpoint which factors are related to poor psychosocial work environment. The aim of this study was to compare psychosocial work environment, including job strain, support, work engagement and recovery, among HCW in a Swedish university hospital, before and after the first wave of the COVID-19 pandemic. To our knowledge, this is the first study to include data regarding work environment among HCW collected before the pandemic. We identified which departments were negatively affected by the pandemic and assessed whether factors such as age, gender, working with COVID-19 patients, departmental transfer or worries about being infected, are related to psychosocial work environment. We expect our results to contribute knowledge that can be used to mitigate and prevent future health problems among HCW.

Design and method

Setting

The study was conducted at Sahlgrenska University Hospital, one of the largest university hospitals in Northern Europe. It provides emergency and basic care for the 700,000 inhabitants of the Gothenburg region and offers highly specialised care for the 1.7 million inhabitants of West Sweden.

Population and procedure

A web-based COVID-19 survey was administered in collaboration with the hospital's Human Resources (HR) department to all hospital employees (n=17,914) regardless of having contact with patients (COVID-19 or in general) or having non-clinical work tasks. After excluding employees (n=1399) who were absent from work during the study period, 16,515 (n=100%) were eligible for study participation (Figure 1). During the first week of September 2020, an invitation to participate was sent by e-mail including a link to an anonymous survey. One reminder was provided during the last week of September 2020. The possibility to answer the survey was approximately 5 weeks.

The study was approved by the Swedish Ethical Review Authority (ref. 2020-04771) and participants provided informed consent. The study was conducted in compliance with the Helsinki Declaration and the General Data Protection Regulation (EU) 2016/679.

Survey and outcome measures

The survey was designed to be completed in 10-20 minutes. Demographic items including age, gender, organisational affiliation, professional role, specialist training and working hours (day-time, evening, night shifts or mixed model) were collected. Eleven items regarding work conditions were also included, addressing work demands, support, recovery and engagement (Table 1). These same items were included in an October 2019 employee survey, thus offering a pre-measure of work conditions before the COVID-19 pandemic. All items were presented as statements with five response alternatives (strongly agree, agree, neither agree or disagree, disagree and strongly disagree). Additional items about work placement during the pandemic, worries about getting infected, and access to personal protective equipment (PPE) were

included. Participants were asked to think back to how they perceived the situation during the intensive period of the pandemic in spring 2020 when answering questions about work conditions.

Statistical analysis

Individuals without informed consent (n=83), missing data on all work environment items (n=21) or missing an organisational affiliation (n=211) were excluded from analysis. Excluded individuals were evenly distributed among departments and professional roles. One administrative department had limited respondents (n=7) and was excluded due to risk of identification of individuals, resulting in 6484 responses from 69 departments. The total number of responders in 2019 was 12001 (response rate 74%). The number of ICU responders was 982 (2019) and 686 (2020).

Normality was assumed for work environment and recovery measures based on the Shapiro-Wilk test and visual inspection of histograms. Untransformed data were analysed with parametric methods. Statistical significance was set at $p < 0.05$ and two-sided confidence intervals were used.

Mixed-effects models (Proc Mixed in SAS version 9.4; SAS Institute, USA) were applied to assess the impact of the pandemic with time (2019 or 2020, nested within departments and operational areas) as a fixed effect and departments and operational areas as random effects. Hypothesis testing for fixed and random effects was performed using Wald tests and likelihood ratio tests, respectively.

Differences between departments were investigated either by adding interaction terms between the time variable and department variables, or by stratifying analyses according to the above. The percentage of responders who strongly disagreed or disagreed with the statements were calculated for all departments and for ICU departments. The impact of the pandemic and changes between these groups were analysed using the models described above.

The effect on working conditions of working with COVID-19 patients (yes or no), being transferred to another department

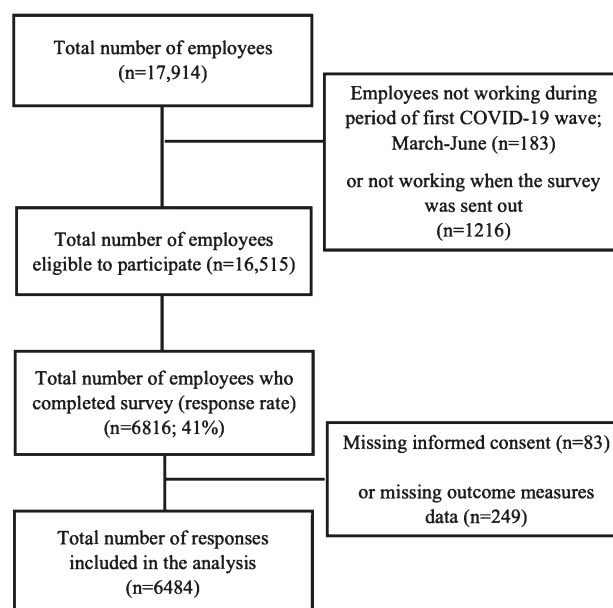


Figure 1. Flow chart showing the total number of hospital employees, the number who were eligible to participate, the response rate and the final number of responses included in the analysis.

(never, occasionally, most of the time), having a worry of becoming infected (never, rarely, occasionally, daily, many times each day), access to enough PPE while working with COVID-19 patients (often or very often, occasionally, rarely or very rarely), gender (female, male, other) and age (≤ 29 , 30-39, 40-49, 50-59 or ≥ 60 years), were investigated using mixed-effect models with the effect modifiers added as a fixed effect and department and operational area as random effects. Five items representing work conditions were selected: job demands (1 item covering quantitative demands), job resources (2 items covering competence and support), motivation (1 item) and recovery (1 item).

Results

A total of 6816 employees responded to the survey (response rate 41%) but due to excluded data ($n=332$), 6484 individuals were finally included (Figure 1). Responders included 83% ($n=5348$) women, 17% ($n=1064$) men and 0.3% as other ($n=20$). The age distribution was 12% ≤ 29 years, 22% from 30-39 years, 23% from 40-49 years, 27% from 50-59 years and 16% ≥ 60 years. Reported professions included 30% nurses, 21% assistant nurses, 10% physicians, 12% administrative staff and 27% other professions.

Overall impact of the COVID-19 pandemic on working conditions and recovery among HCW

Compared to 2019 survey results, a statistically significant

effect of the pandemic on HCW was observed for all items except perception of recovery. In most cases, working conditions were reported to be negatively affected by the pandemic, except quantitative demands, where a higher percentage of HCW reported reasonable demands post-first-wave as compared to pre-pandemic. HCW perception that their skills were used appropriately showed a slight but significant improvement in 2020 compared to 2019 (Table 1).

Hospital departments are differentially affected by the COVID-19 pandemic

A statistically significant variation was observed for the impact of the pandemic across departments ($p>0.001$ for all items). Two of eleven survey items were analysed separately for all 69 departments to identify those reporting poorer work situations regarding job demands and recovery. A statistically significant post-first-wave decrease in perceived quantitative demands and possibility for recovery, were reported in eleven of 69 departments (Table 2). For the remaining departments, perceived job demands and possibility for recovery was either unchanged or improved during the pandemic.

Perception of work environment and recovery among all HCW versus those in ICU

The percentage of negative responses increased significantly for eight of the eleven items for all HCW ($p<0.001$) and for all

Table 1. Overall effects of the COVID-19 pandemic on working conditions and recovery at the hospital level compared to the situation before the pandemic (autumn 2019). All aspects measured were negatively affected by the pandemic except for the item, "In my work, my skills and abilities are used in the right way," which was slightly but significantly improved and the item concerning perception of recovery during working hours, which was not significantly affected on hospital level.

Survey items	Number of observations (n)	Number of groups (N)	Estimate (95% CI)	p
I know what is expected of me in my work	18 339	69	-0.53 (-0.56, -0.51)	<0.001
The quantity of my work seems reasonable	18 331	69	0.07 (0.03, 0.01)	<0.001
I am able to take part in planning how my work is to be performed	18 310	69	-0.52 (-0.55, -0.48)	<0.001
In my work, my skills and abilities are used in the right way	18 321	69	0.04 (0.01, 0.07)	0.01
My line manager helps me prioritise my work tasks as needed	18 252	69	-0.14 (-0.17, -0.10)	<0.001
I can get help and support if emotionally stressful situations arise in my work	18 199	69	-0.52 (-0.56, -0.49)	<0.001
I have scope for recovery during the work session through breaks and/or rests	18 347	69	0.01 (-0.02, 0.05)	0.5
I look forward to going to work	18 350	69	-0.63 (-0.66, -0.60)	<0.001
I can set thoughts about work aside in my free time	18 343	69	-0.43 (-0.47, -0.40)	<0.001
I have enough energy to do other things after the end of my shift	18 330	69	-0.21 (-0.25, -0.17)	<0.001
I feel rested and recovered after a couple of days off	18 352	69	-0.41 (-0.45, -0.38)	<0.001

Table 2. Departments at a university hospital where the staff report poorer work situation regarding reasonable work demands and possibility of recovery compared to before the COVID-19 pandemic.

Departments of Anaesthesiology and Intensive Care Medicine (Three different departments)

Department of Cardiothoracic Surgery and Transplant

Department of Infectious Diseases

Department of Nephrology

Department of Medicine, Geriatrics and Emergency Medicine

Department of Medicine and Emergency Medicine

Department of Prehospital Emergency

Department of Clinical Microbiology

Department of Inhouse Staffing

items among the ICU ($p<0.001$ to $p=0.01$) (Figure 2). No statistically significant differences in the distribution of negative responses between these groups were observed in 2019 except for the item “My line manager helps me prioritise my work tasks as needed” (28.6% for ICU vs 18.6% for other departments, $p=0.04$). In 2020, ICU respondents reported a higher percentage of negative responses compared to other departments for all items ($p<0.001$ to $p=0.003$).

Factors affecting the COVID-19 pandemic's impact on working conditions and recovery

All investigated factors were statistically significantly related to perception of work environment and recovery during the pandemic ($p=0.01$ to <0.001 , Figure 3). HCW working with COVID-19 patients reported poorer work environment than those who did not. The item regarding infection worries was significantly related to work environment and recovery in a dose-response manner ($p<0.001$). Being transferred between departments and having insufficient PPE access while caring for COVID-19 patients were significantly related to poorer perception of work environment but the impact did not increase with the occurrence of such events. Men reported better working conditions than women for all items ($p<0.001$) except for the use of competence ($p=0.4$) and higher age was significantly related to perception of better work condition for all items except for support from managers ($p=0.6$).

Discussion

To the best of our knowledge, this is the first study investigating the effects of the COVID-19 pandemic on the working environment of HCW compared to the pre-pandemic situation. We show that the pandemic affects hospital departments differentially regarding perceived work environment and recovery. As expected, HCW in ICU are negatively affected, with 70% reporting insufficient energy to do other things after work. Quantitative demands and possibility of participating in work planning are examples of other factors that were perceived by ICU staff to be affected by the pandemic. Working with COVID-19 patients, being transferred between departments, insufficient access to PPE and infection worries were significantly related to negative perception of work environment and recovery.

General negative effects of the COVID-19 pandemic on a hospital-level were detected for all investigated aspects of work conditions. Although quantitative demands were expected to be highly affected by the pandemic across the hospital, this was not observed. Rather, compared to pre-pandemic times, larger effects were observed for other factors, e.g., support from managers, ability to put work aside after working hours, clarity in expectations regarding work tasks, looking forward to going to work and recovery during the workday. Thus, solely measuring quantitative demands will not reveal the full effect of the pandemic on working conditions, highlighting the complicated and multifactorial nature of organisational and psychosocial work environment.

Our results echo previous studies showing that hospital depart-

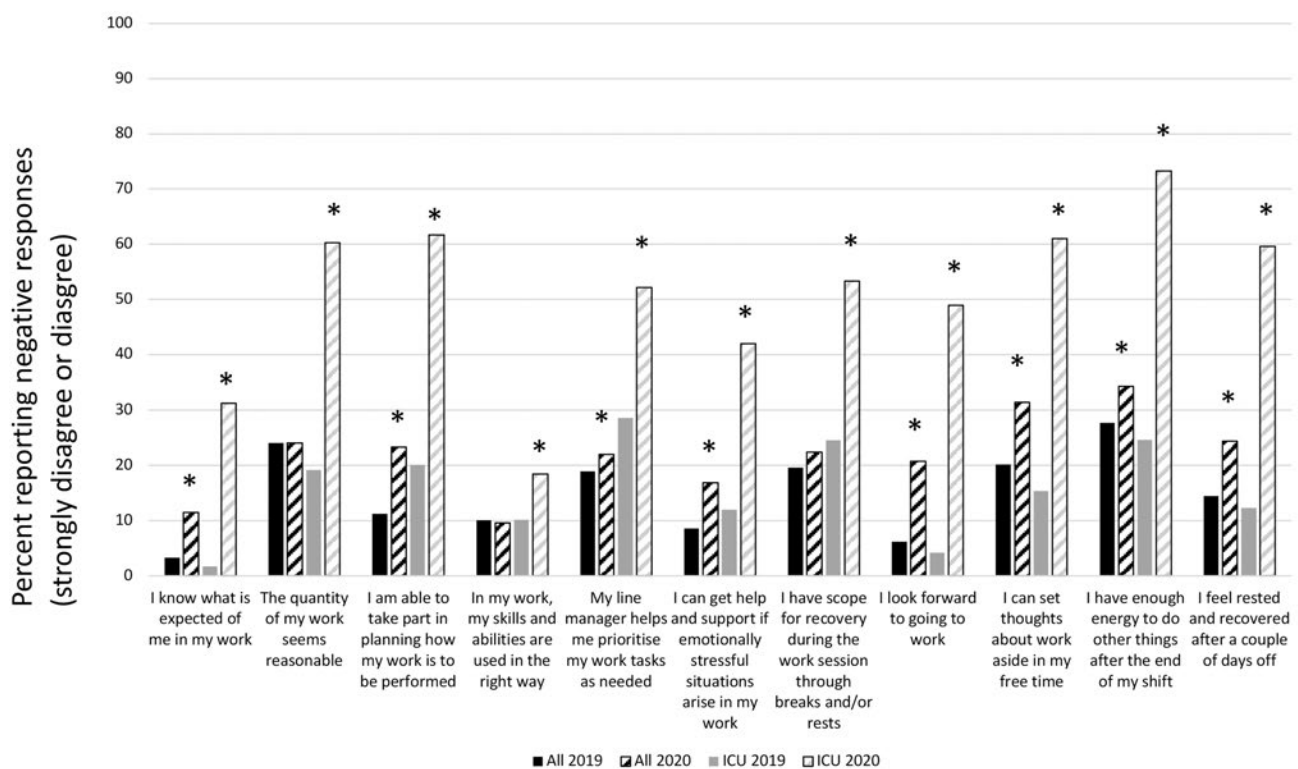


Figure 2. The percentage of HCW (all hospital workers) and ICU staff who strongly disagreed or disagreed with the statements in the survey regarding work environment and recovery, thus reporting negative situation measured before the pandemic (Autumn 2019) compared with after the first wave of the pandemic (September 2020). The percentage of negative responses increased significantly for eight of eleven items for all HCW ($p<0.001$) and for all items among the ICU ($p<0.001$ - $p=0.01$). *Significant items compared to 2019. The total number of survey responders was $n=12001$ (2019) and $n=6484$ (2020), including $n=982$ (2019) and $n=686$ (2020) from ICU.

ments are differentially affected by the COVID-19 pandemic.⁸ ICU staff reported poorer working environments than other HCW for all investigated aspects, including workload, thereby confirming previous results.⁸⁻¹⁰ Regardless of department, impactful factors which affect the HCW work situation should be reviewed. For

instance, high workload due to an increased number of COVID-19 patients and communication challenges regarding “no-visitor” policies during the pandemic are hard to influence, whereas other factors such as possibility for recovery during working hours communicating and support could be improved. Here, lack of recovery

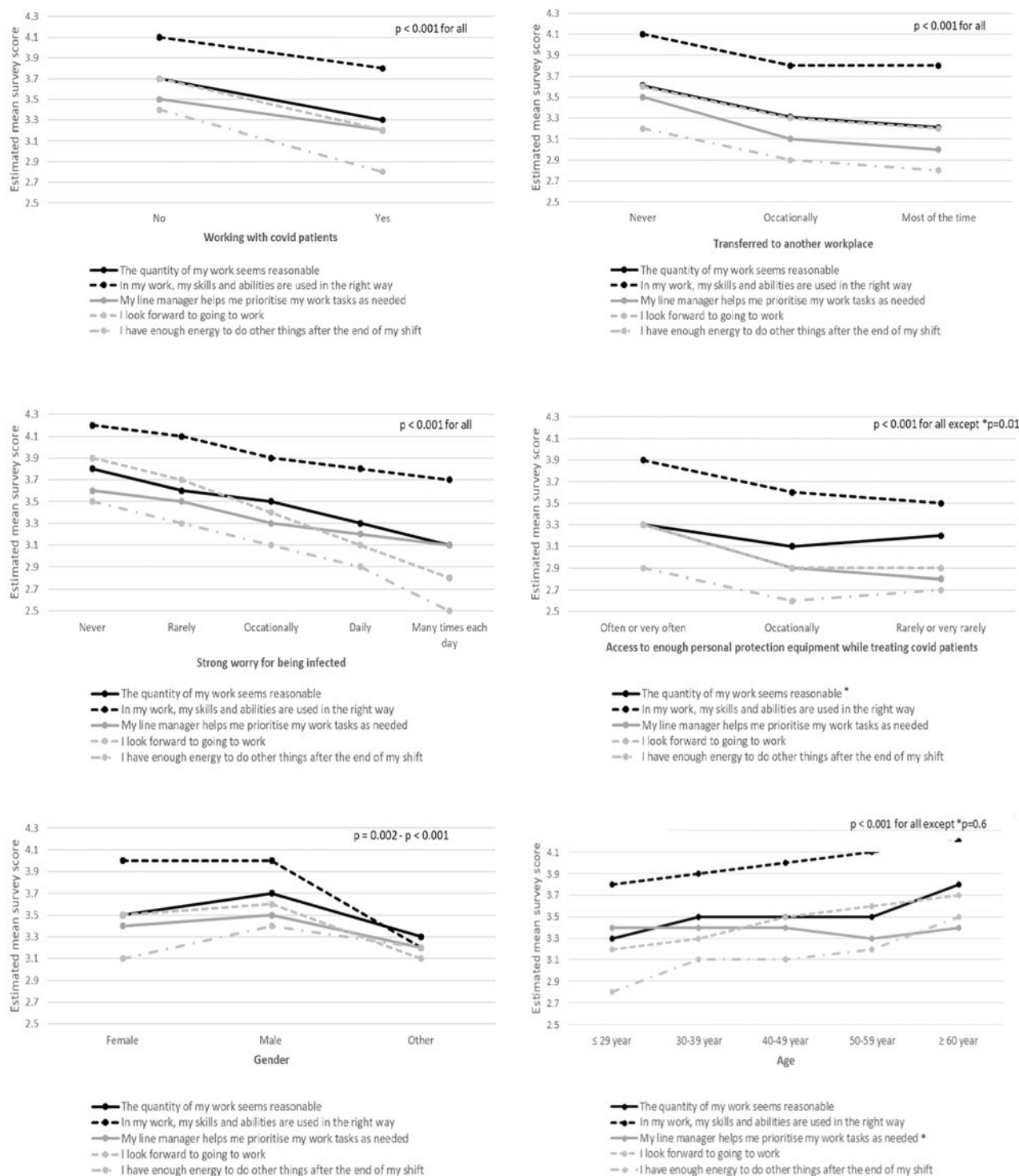


Figure 3. Relationship between five selected work environment items, representing the items measured in this study and factors of potential importance for how work environment and recovery is perceived. All factors analysed were significantly related to perception of work environment. Higher mean score means better perceived work environment.

was particularly evident among those working with COVID-19 patients. Recovery is both an individual and organisational matter.^{11,12} Thus, improving attributes related to positive workplace culture, such as good interpersonal relationships and effective communication, could contribute to better recovery among HCW, and such factors are even possible to address in times of high workload during the COVID-19 pandemic.¹¹ The general perception regarding lack of managerial support is important to consider. The significance of managerial support in times of crisis has been raised in several studies and particularly the role of first-line managers in the working environment.¹³ Creating good working conditions for managers affects the work environment for both managers and their subordinates.¹⁴ This includes organisational pre-conditions such as adequate span of control, reasonable balance between demands and control and reasonable administrative support.^{15,16} These factors are relevant to discuss regardless of the ongoing crisis since the managers' situation within the public sector in Sweden, including the healthcare sector, has been in focus long before the pandemic.^{17,18} The importance of supportive measures from managers and other functions during the pandemic has been raised by several authors.^{19,20} The rapid conversion to COVID-19 care, including new routines, increased safety measures, adaptation of premises, transfer of staff, organisation of rapid training, and worries about infection among staff are some of many factors affecting the work situation for front-line managers and thus plausibly influencing the possibility for these managers to support their staff. Besides supporting managers, encouraging other supportive measures such as sense of coherence, feedback and team reflections could be enhanced, particularly during extraordinary times.^{21,22} The organisation could also enhance the focus on health-protective factors including clear communication and organisational support as well as social support and personal sense of control.²² The work-related aspect least affected by the pandemic was respondent competence. The general perception reported by HCW both on a hospital level and at the ICU was that their skills were appropriately applied. During the pandemic, the skills, knowledge and decision latitude of HCW have been put in focus, which raises the importance of HCW involvement in future organisation of health care.²³ Several factors affected the HCW's perception of their work situation and possibility for recovery, including infection worries and being transferred between departments. Studies have shown that infection worries can substantially affect mental health outcomes and well-being.^{24,25} Here, we show that worries about infection also impact how psychosocial work environment and recovery are perceived. Thus, infection worries among HCW are important to acknowledge and legitimize in the healthcare setting. This issue has been discussed as one of many ethical dilemmas among HCW regarding the balance between the ethical duty to care for patients and concerns of contracting COVID-19 and spreading it to aged parents or spouses belonging to a risk group.²⁶

Being transferred to another department was significantly related to poor perception of the work situation. Previous studies confirm that staff relocation or changes in roles or tasks pose an increased risk of psychological strain.^{2,21} Transferring HCW between departments has been essential during the pandemic to ensure enough front-line workers in COVID-19 departments. These relocations often create uncertainty and thus good communication, clear directives and managerial support are needed, highlighting the importance of securing time for managers to organise the work and support their subordinates. Age was also significantly related to perception of work environment and older workers perceived their work environment and recovery more positively than

younger workers. Experienced staff have reported higher resilience and better mental health than staff with less experience.² Thus, special attention regarding support for younger HCW should be considered during crises like the pandemic.

The major strength of this study is that a pre-pandemic measure of work condition was available. It should be noted that data were collected on a department level and thus individual data cannot be followed over time. Another strength is that the pandemic data collection was conducted during a relatively calm period between the first and second wave, which started around November 2020 in Sweden. This increases the possibility that respondents could reflect over their working situation without simultaneously having a high workload caring for COVID-19 patients. One study limitation is the relatively low response rate (41%), although this rate is similar to other survey studies. The response rate may be partly explained by employees feeling that the survey was not aimed towards them, since they were not working directly with COVID-19 patients, and thus they refrained from responding. In line with this we noticed the response rate was somewhat higher among front-line workers compared with e.g. administrative staff. Regardless, caution regarding generalisability of the data should be exercised.

Conclusion

Hospital departments are differentially affected by the COVID-19 pandemic regarding work environment and recovery. Front-line departments such as ICU were largely affected in all investigated aspects of work environment, including workload and lack of recovery and managerial support. Several identified factors concerned how work environment and recovery is perceived and many factors could be addressed even at times of high workload, such as during the ongoing pandemic. This includes providing appropriate support to managers, ensuring recovery during working hours and acknowledging and discussing worries about infection. Special attention should be given to younger HCW and to the organisation of staff relocation to ensure a promotive work environment. HR and occupational health care could support managers regarding these aspects, thereby providing managers with more time to organise the work and support their staff.

References

1. Liu C-Y, Yang Y-z, Zhang X-M, et al. The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. *Epidemiol Infect.* 2020;148:e98.
2. Cipolotti L, Chan E, Murphy P, et al. Factors contributing to the distress, concerns, and needs of UK Neuroscience health care workers during the COVID-19 pandemic. *Psychol Psychother* 2020;94:536-43.
3. Firew T, Sano ED, Lee JW, et al. Protecting the front line: a cross-sectional survey analysis of the occupational factors contributing to healthcare workers' infection and psychological distress during the COVID-19 pandemic in the USA. *BMJ Open* 2020;10:e042752.
4. Rossi R, Soccì V, Pacitti F, et al. Mental health outcomes among frontline and second-line health care workers during the coronavirus disease 2019 (COVID-19) pandemic in Italy. *JAMA Network Open* 2020;3:e2010185-e.
5. Evanoff BA, Strickland JR, Dale AM, et al. Work-related and

- personal factors associated with mental well-being during the COVID-19 response: Survey of health care and other workers. *J Med Internet Res* 2020;22:e21366.
6. Brand SL, Thompson Coon J, Fleming LE, et al. Whole-system approaches to improving the health and wellbeing of healthcare workers: A systematic review. *PLoS One* 2017;12:e0188418.
 7. Spiller TR, Méan M, Ernst J, et al. Development of health care workers' mental health during the SARS-CoV-2 pandemic in Switzerland: two cross-sectional studies. *Psychol Med* 2020;1-4.
 8. Felice C, Di Tanna GL, Zanusi G, Grossi U. Impact of COVID-19 Outbreak on healthcare workers in Italy: Results from a national e-survey. *J Community Health* 2020;45:675-83.
 9. Kramer V, Papazova I, Thoma A, et al. Subjective burden and perspectives of German healthcare workers during the COVID-19 pandemic. *Eur Arch Psychiatry Clin Neurosci* 2021;271:271-81.
 10. Shoja E, Aghamohammadi V, Bazayr H, et al. Covid-19 effects on the workload of Iranian healthcare workers. *BMC Public Health* 2020;20:1636.
 11. Baker WE. Emotional energy, relational energy, and organizational energy: Toward a multilevel model. *Annu Rev Organ Psychol Organ Behav* 2019;6:373-95.
 12. Ejlerstsson L, Heijbel B, Brorsson A, Andersson HI. Is it possible to gain energy at work? A questionnaire study in primary health care. *Prim Health Care Res Dev* 2020;21:e65.
 13. Vanhaecht K, Seys D, Bruyneel L, et al. COVID-19 is having a destructive impact on health-care workers' mental well-being. *Int J Qual Health Care* 2020;33:mzaa158.
 14. Corin L, Björk L. Job demands and job resources in human service managerial work: an external assessment through work content analysis. *Nord J Work Life Stud* 2016;6:3-28.
 15. Holm-Petersen C, Østergaard S, Andersen Per Bo N. Size does matter – span of control in hospitals. *J Health Organ Manag* 2017;31:192-206.
 16. Meyer RM, O'Brien-Pallas L, Doran D, et al. Front-line managers as boundary spanners: effects of span and time on nurse supervision satisfaction. *J Nurs Manag* 2011;19:611-22.
 17. Andreasson J, Ahlstrom L, Eriksson ALD. The importance of healthcare managers' organizational preconditions and support resources for their appraisal of planned change and its outcomes. *J Hosp Adm* 2017;6:25-33.
 18. Berntson E, Wallin L, Härenstam A. Typical situations for managers in the Swedish public sector: Cluster analysis of working conditions using the job demands-resources model. *Int Public Manag J* 2012;15:100-30.
 19. Adams JG, Walls RM. Supporting the health care workforce during the COVID-19 global epidemic. *JAMA* 2020;323:1439-40.
 20. Dehnavieh R, Kalavani K. Management-supportive measures for managers of healthcare organizations during the COVID-19 epidemic. *Infect Control Hosp Epidemiol* 2020;41:878.
 21. Tam CWC, Pang EPF, Lam LCW, Chiu HFK. Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. *Psychol Med* 2004;34:1197-204.
 22. De Brier N, Stroobants S, Vandekerckhove P, De Buck E. Factors affecting mental health of health care workers during coronavirus disease outbreaks (SARS, MERS & COVID-19): A rapid systematic review. *PLoS One* 2020;15:e0244052.
 23. Nilsen P, Seing I, Ericsson C, et al. Characteristics of successful changes in health care organizations: an interview study with physicians, registered nurses and assistant nurses. *BMC Health Serv Res* 2020;20:147.
 24. Dai Y, Hu G, Xiong H, et al. Psychological impact of the coronavirus disease 2019 (COVID-19) outbreak on healthcare workers in China. *medRxiv* 2020:2020.03.03.20030874.
 25. Nabe-Nielsen K, Nilsson CJ, Juul-Madsen M, et al. COVID-19 risk management at the workplace, fear of infection and fear of transmission of infection among frontline employees. *Occup Environ Med* 2021;78:248-54.
 26. Menon V, Kumar Padhy S. Ethical dilemmas faced by health care workers during COVID-19 pandemic: Issues, implications and suggestions. *Asian J Psychiatr* 2020;51:102116.
 27. Cai W, Lian B, Song X, et al. A cross-sectional study on mental health among health care workers during the outbreak of Corona Virus Disease 2019. *Asian J Psychiatr* 2020;51:102111.

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Key words: COVID-19; health care workers; hospital staff; work environment.

Ethical approval: The study was approved by the Swedish Ethical Review Authority (ref. 2020-04771) and participants provided informed consent. The study was conducted in compliance with the Helsinki Declaration and the General Data Protection Regulation (EU) 2016/679.

Availability of data and material: The datasets used and analysed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest: All authors declare that they have no competing interests.

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Contributions: IJ, AD, HW, LÅ, CF, planned the initial study protocol and conducted the data collection; MA, conducted all statistical analysis; IJ, major responsibility for writing the manuscript. All authors participated in the planning of the manuscript and data analysis, and contributed to the writing of the final version of the manuscript.

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