

1 The experience of European hospital-based health care workers on following infection

2 prevention and control procedures for COVID-19

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23 *Word count manuscript (excl. references and tables):* *n = 2958*

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25 ABSTRACT

26 **Background:** Working under pandemic conditions exposes health care workers (HCWs) to
27 infection risk and psychological strain. Protecting the physical and psychological health of
28 HCWs is a key priority. This study assessed the perceptions of European hospital HCWs of
29 local infection prevention and control (IPC) procedures during the COVID-19 pandemic and
30 the impact on their emotional wellbeing.

31 **Methods:** We performed two rounds of an international cross-sectional survey, between 31
32 March and 17 April 2020 via existing research networks (round 1), and between 14 May and
33 31 August 2020 via online convenience sampling (round 2). Main outcome measures were (1)
34 behavioural determinants of HCW adherence with IPC procedures, (2) WHO-5 Well-Being
35 Index, a validated scale of 0-100 reflecting emotional wellbeing. The WHO-5 was interpreted
36 as a score below or above 50 points, a cut-off score used in previous literature to screen for
37 depression.

38 **Results:** 2,289 HCWs (round 1: n=190, round 2: n=2,099) from 40 countries in Europe
39 participated. Mean age of respondents was 42 (± 11) years, 66% were female, 47% and 39%
40 were medical doctors and nurses, respectively. 74% (n=1699) of HCWs were directly treating
41 patients with COVID-19, of which 32% (n=527) reported they were fearful of caring for these
42 patients. HCWs reported high levels of concern about COVID-19 infection risk to themselves
43 (71%) and their family (82%) as a result of their job. 40% of HCWs considered that getting
44 infected with COVID-19 was not within their control. This was more common among junior
45 than senior HCWs (46% versus 38%, P value $< .01$). Sufficient COVID-19-specific IPC training,
46 confidence in PPE use and institutional trust were positively associated with the feeling that
47 becoming infected with COVID-19 was within their control. Female HCWs were more likely

48 than males to report a WHO-5 score below 50 points (aOR 1.5 (95% confidence interval (CI)
49 1.2-1.8).

50 **Conclusions:** In Europe, the COVID-19 pandemic has had a differential impact on those
51 providing direct COVID-19 patient care, junior staff and women. Health facilities must be
52 aware of these differential impacts, build trust and provide tailored support for this vital
53 workforce during the current COVID-19 pandemic.

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56 *Keywords:* healthcare worker; infection prevention and control; COVID-19; public health

57 BACKGROUND

58 Health care workers (HCWs) provide direct treatment and care for patients with coronavirus
59 disease 2019 (COVID-19), as well as for those requiring ongoing care not related to COVID-
60 19. This role exposes them to occupational hazards that may impact their health and
61 wellbeing, including increased exposure to severe acute respiratory syndrome coronavirus-2
62 (SARS-CoV-2), burnout, and stigma [1]. Protecting the physical and psychological health of
63 HCWs is a key priority. Not only is there a moral obligation to support those willing to
64 provide medical care in a public health emergency, this support is also vital for ensuring
65 sufficient levels of skilled staff and continued functioning of health facilities during and after
66 the COVID-19 pandemic [2].

67 Studies published in the first months of the COVID-19 pandemic highlight increased
68 signs of depression, anxiety, insomnia and distress in HCWs [3–8], with a differential impact
69 on women [3,9]. United Nations Women stressed the importance of attention to potential
70 gender differences when researching the impact of the COVID-19 pandemic, as this
71 information is needed to inform policy responses [10].

72 While HCWs can acquire COVID-19 through many different routes, including via
73 infected family members or through general community transmission [11], their work in
74 health facilities clearly places them at increased risk of exposure to SARS-CoV-2 [2,12–14].
75 Standardized and robust infection prevention control (IPC) procedures are the primary
76 approach to reducing transmission in health facilities. Effective implementation of IPC
77 procedures requires engagement and commitment from those administering health facilities.
78 This includes ensuring that local policies are developed and made available; systems and
79 processes are set up for recommended procedures; sufficient and ongoing supply of

80 materials are accessible; staff have access to training and support materials; and processes
81 for monitoring staff-level adherence to local policies are in place.

82 While one of the main goals of IPC guidelines is the prevention of nosocomial
83 transmission, another key aspect is that they should ensure that HCWs feel they can protect
84 themselves from getting infected. Research conducted during the SARS epidemic in 2003
85 identified how feeling prepared and having confidence to deliver effective IPC was critical to
86 protect both HCWs' physical and psychological health [15]. Understanding HCWs'
87 experiences of following local recommended IPC procedures during COVID-19 can inform
88 strategies for better engaging and supporting HCWs to protect themselves and maintain
89 their wellbeing.

90 At the start of the COVID-19 escalation in Europe, we sought to rapidly evaluate
91 HCWs' perceptions about IPC procedures in their place of work. Specifically, we aimed to: (1)
92 describe behavioural determinants associated with HCWs' following of recommended IPC
93 procedures, and (2) capture HCWs' emotional wellbeing.

94 **METHODS**

95 **Study design**

96 We performed two rounds of a cross-sectional survey among hospital HCWs in European
97 countries during the peak of the first wave of the pandemic in Europe (31 March 2020 - 17
98 April 2020, round 1) and during the aftermath of the first wave (14 May 2020 - 31 August
99 2020, round 2).

100 **Sampling and recruitment**

101 We invited European HCWs providing medical care in hospital settings. For round 1, we
102 recruited participants through two European hospital networks: Combatting Bacterial

Resistance in Europe (COMBACTE) and the Spanish Biomedical Research Networking Center (CIBER). For round 2, we recruited participants via newsletters in research networks, clinical networks and social media channels by distributing an online study flyer.

Survey tool

A data collection tool was rapidly developed for a generic World Health Organization (WHO) protocol to meet the aims of the study (see online supplementary Appendix A) [16]. Experts in the Social Science and IPC Working Group, under the COVID-19 Research Roadmap, identified a pool of items based on WHO IPC interim guidance published in March 2020 [17]. These items were developed to capture theoretically informed influences on HCWs' motivation, opportunity and ability to follow general IPC precautions. Items were designed for responses on a 7-point Likert scale, ranging from 'Strongly disagree' to 'Strongly agree'. Once identified, the Theoretical Domains Framework (TDF), previously used for studying clinician behaviour, was used as an organising framework to consider the breadth of items included [18–20]. Based on a previously validated measure, HCWs' trust in the institution where they worked was assessed by capturing three dimensions of institutional trust (competence, honesty, act in best interests of staff) [21]. Finally, the WHO-5 Well-Being Index (WHO-5) was included, a validated short and generic global rating scale measuring subjective wellbeing during the last two weeks [22]. Information was also collected on participant demographics, including experience of caring for patients with suspected or confirmed COVID-19 infection. Due to the time constraints under which this tool was developed, pre-testing, reliability tests, and validation could not be conducted prior to data collection. As a result, data collected in round 1 of this study were used to investigate the psychometric properties of the survey tool, and refine the items for data collection in round 2.

127 **Data collection**

128 The survey was only available in English. The electronic data capturing (EDC) systems Castor
129 v2020.1.9 (round 1) and Qualtrics survey platform (Provo, Utah) (round 2) were used for data
130 collection.

131 **Statistical analyses**

132 As participation was anonymous, we could not prevent HCWs participating in both survey
133 rounds. Therefore, respondents from round 2 with identical demographic information as
134 HCWs from round 1 (i.e. age, gender, country, specialism) were excluded from further
135 analyses (n=16 exclusions).

136 Descriptive statistics were used to describe HCWs' perceptions of IPC procedures
137 **(objective 1)**. Absolute numbers of respondents were provided alongside percentages, as
138 denominators differed slightly per survey item due to respondent in-survey drop out. To
139 quantify HCWs' emotional wellbeing **(objective 2)**, responses to the five WHO-5 statements
140 were summarised into a total raw score and multiplied by 4 to produce an individual total
141 score from 0 to 100, with the higher end of the scale representing best possible wellbeing
142 [23]. Interpretation of the WHO-5 Well-Being index considers that a cut-off score of <50 is
143 used when screening for clinical depression [23]. Differences in WHO-5 scores were assessed
144 in bivariate analyses for gender, job role, European region and providing COVID-19 care by
145 independent sample T-test or one-way ANOVA. To assess differences in wellbeing between
146 male and female HCWs we estimated the independent effect of gender on a WHO-5 Well-
147 Being Index below 50 points using logistic regression, including predefined control variables
148 for age, living situation (i.e. living alone or sharing a household), European region, job role,
149 hospital type and providing COVID-19 patient care.

Multivariable regression was performed to examine the association between prespecified behavioral determinants and HCWs' perceived sense of control over getting infected with COVID-19. The association between the feeling of control over getting infected and a WHO-5 Well-Being score <50 was investigated using the same model as for the effect of gender, adding the sense of control statement. To evaluate psychometric properties of the data collection tool, we conducted factor analysis of data of the first round to construct indices for beliefs about effectiveness of PPE, availability of PPE at the respondent's institution, skills, and institutional trust. In all cases, Cronbach's alpha scores exceeded 0.75.

For all analyses, a two-tailed *P* value <.05 was considered statistically significant. There was no formal sample size calculation before the start of this study. Surveys with completion of only demographic and basic IPC training information (corresponding to survey completion <58%) were excluded. All analyses were performed with Statistical Package for Social Sciences V.25.0.2 (SPSS, Chicago, Illinois, USA) and R Version 3.4.1.

RESULTS

Study population

In total, 2289 hospital HCWs participated (round 1: n=190, round 2: n=2099). HCWs worked in 40 European countries, the majority in Southern Europe (n=1244, 54%) (eTable 1). Forty-eight percent (n=1088) had experience working in a clinical setting during a previous epidemic with a novel respiratory virus such as SARS, MERS-CoV or H1N1. Sixty-eight percent (n=129) and 75% (n=1570) had personally cared for a patient with suspected or confirmed COVID-19 in round 1 and 2, respectively. Detailed demographic information is provided in Table 1.

173 Wellbeing

174 There were 2180 (95%) HCWs who completed all questions about emotional
175 wellbeing. Overall mean WHO-5 Well-Being score was 56.3 (± 19.3), and was slightly higher in
176 round 2 than round 1 (56.7 ± 19.0 versus 51.9 ± 22.0 , respectively). Scores differed per region,
177 being lowest in Eastern (52.7 ± 19.9) and Southern Europe (53.4 ± 19.5), and highest in
178 Western Europe (62.1 ± 17.8) (P value $< .001$). Junior nurses and medical doctors had lower
179 scores compared to their senior counterparts (P value $< .05$) (Table 2). Prevalence of a WHO-5
180 Well-Being score below 50 points was 38% (95% confidence interval (CI) 36%-40%). Mean
181 WHO-5 was 59.6 ± 19.3 for male and 54.5 ± 19.0 for female HCWs (P value $< .001$). In
182 multivariable logistic regression, female HCWs had higher risk of WHO-5 below 50 points
183 compared to males (aOR 1.5 (95% confidence interval (CI) 1.2-1.8) (eTable 3).

184 A large proportion of HCWs reported concerns about the risk for themselves of
185 becoming ill (1568, 71%) and about the risk to their family related to COVID-19 as a result of
186 their job role (1809, 82%) (Fig 1). Thirty-two percent ($n=527$) of HCWs directly caring for
187 patients with COVID-19 reported being afraid of looking after these patients. Significant
188 additional strain to their workload due to following recommended IPC procedures was
189 reported by 86% ($n=1463$) of these HCWs. HCWs that participated in round 2 less often
190 agreed that the risk of getting infected with COVID-19 was part of their job, compared to
191 HCWs from round 1 (69% versus 84%, respectively).

192

193 *Sense of control in being infected*

194 Overall, 40% (869/2199) of HCWs indicated that they felt that that getting infected with
195 COVID-19 was outside of their control. This feeling was more prevalent in junior than in
196 senior HCWs (46% versus 38%, P value $< .01$), and was significantly associated with a WHO-5

score below 50 points (aOR 2.1, 95% CI 1.7-2.6) (data not shown). In multivariable regression, factors that were positively associated with a perceived sense of control over getting infected with COVID-19 were having received sufficient COVID-19 IPC training, having greater confidence in using PPE and perceived institutional trust (Table 3).

Behavioural influences on following infection prevention and control guidance

The majority of HCWs had received training related to general IPC procedures and indicated that there were clear policies and protocols for everyone to follow related to COVID-19 IPC procedures, namely 75% (n=1725) and 80% (n=1785), respectively (Fig 1). Twenty-three percent (n=391) of HCWs that cared for COVID-19 patients indicated they had not received sufficient training in IPC practices specific to COVID-19.

Most HCWs (1814, 79%) felt that following IPC recommendations would protect them from becoming ill with COVID-19, and almost all (2134, 96%) intended to always use recommended PPE when taking care of patients with suspected or confirmed COVID-19, when having access to these. HCWs reported positive social influences at work, such as colleagues regularly following IPC measures and encouragement by senior medical/nurse staff to follow recommended procedures (Fig 1). Trust in their health facility to be competent, honest with staff, and act in the best interest of its staff when managing the response to COVID-19 differed per region, being 61%, 67%, 79%, 81% for Eastern, Southern, Northern and Western European HCWs, respectively.

Use and availability of personal protective equipment

Based on self-reported use of PPE at last contact with a patient suspected or confirmed with COVID-19, HCWs reported good compliance with PPE recommendations as provided by the

WHO (Fig 2). A larger proportion of HCWs in round 1 reported limited access to PPE materials at work than in round 2, namely 28% (52/183) versus 14% (293/2048), respectively. Overall, PPE that was most often reported to be in limited or no supply during the HCWs' most recent clinical shift were N95 respirators (30%), fluid-resistant gowns (25%) and eye protection (i.e. goggles) (21%) (eFigure 1).

DISCUSSION

In this study, we found that European hospital HCWs reported low levels of emotional wellbeing while providing hospital care and following local IPC recommendations during the COVID-19 pandemic, with particular concerns for those providing direct COVID-19 patient care, junior staff and women.

There is more evidence emerging on the psychological strain on HCWs working during the COVID-19 pandemic [7,24]. A recent systematic review and meta-analysis investigating the psychological impact of COVID-19 predominantly in Asia identified high levels of depression among medical staff [3]. Across Europe, we similarly identified psychological strain in hospital HCWs. Not only were there high levels of concern about HCWs' own risk of COVID-19 infection, almost all respondents were worried about the risk to their families due to their job role. One-third of HCWs reported fear of looking after COVID-19 patients. Further, when quantifying emotional wellbeing using the WHO-5 Well-Being index, we found that more than one-third of HCWs had a score which was indicative of depression [23].

It is known that health emergencies can magnify already existing structural inequities [10]. Our study highlights impacts for women in particular, who comprise the majority of all

HCWs worldwide. In general, women perform the majority of care within the home, are more likely to care for family members ill with COVID-19, and may face gender bias at work [10,25]. In our study, female HCWs reported higher levels of emotional strain compared to males, echoing findings from previous COVID-19 studies [9,26,27]. These results highlight the need for awareness of the differential psychological impacts on HCWs during the COVID-19 pandemic and future pandemics.

IPC recommendations aim to protect patients, HCWs, and the health system, and are therefore tied to risk perception as recommendations should ensure that HCWs feel protected during their work. Perceived lack of control is known to be an important stressor of mental health, and is associated with occupational burnout [28–30]. Research during the 2002-2003 SARS epidemic suggested that the combined role of three specific institutional measures impacted HCWs' risk perception (including avoidance of patients and acceptance of risk) and belief in the effectiveness of protective measures at work [31]: clear policies and protocols, available specialists, and adequate training. In our study, junior HCWs in particular felt that getting infected with COVID-19 was outside of their control. This feeling itself was associated with a WHO-5 score indicative of depression. Risk perception is complex and multifactorial. A qualitative study among frontline HCWs who chose to respond to the West Africa Ebola virus disease outbreak (2014-2016), showed that next to individual and social-level factors, institutional trust was a key risk attenuator [32]. Our multivariable analysis identified organisational and personal factors that were positively associated with feelings of having control over becoming infected, including COVID-19 IPC training, confidence in the use of PPE as well as institutional trust. These aspects may therefore be important to consider in IPC implementation.

Overall, our survey suggests that institutions should adopt a multifaceted approach in IPC preparedness and training in order to best support hospital HCWs at work during an infectious diseases pandemic. Such an approach begins with recognition of the importance of preventing and mitigating adverse impacts on wellbeing, together with the explicit assurance to protect the clinical workforce. These foundations for protecting physical and mental health protection are made through ensuring safe working conditions and accessible support.

We echo recommendations that local IPC guidelines should be clearly communicated, and HCWs should receive specific IPC training, have access to appropriate PPE, and feel confident in its use [33]. Crucially, we add that health facilities must be aware of, and address differential impacts and experiences, such as those of female and junior HCWs. Given the already-heavy burden and time pressures on HCWs, effective support must therefore be readily accessible and responsive to the different needs, pressures, and barriers experienced by different groups. Together, these measures should work to increase HCWs' feelings of self-efficacy to undertake IPC behaviors and, subsequently, their perceived safety.

Previous studies have also shown the importance of managers' support and a safe workplace culture [33]. To identify where most improvements could be made, we further suggest that health facilities rapidly assess local perceptions of their HCWs on IPC recommendations and their wellbeing using the WHO data collection tool (freely available online) [16]. This would serve to identify specific key local needs that are/are not being met, enabling wellbeing support services to be better targeted and tailored, as research has shown that these are often poorly utilised by HCWs [9].

There are important limitations of the current study that should be acknowledged. First, in round 1 we chose to rapidly recruit HCWs from existing research networks where we

could accurately describe our study base population, limiting the number of HCWs we could invite for participation. Along with data collection taking place during the peak of the pandemic in Europe and restricting to a single reminder because of high clinical workload of HCWs, this ultimately led to small sample size. Therefore, round 2 was performed using convenience sampling, leading to different sampling methods used in the current study. Still, we excluded HCWs that possibly participated twice, and therefore do not expect that this influenced our results. Second, inherent to our survey design there is a risk of response bias, both on the level of demographic characteristics as well as on personal views. Third, this was a cross-sectional observational study using quantitative data, we therefore cannot draw conclusions on the direction of effects. Lastly, we were unable to triangulate responses with actual local PPE supplies and hospital infection rates.

CONCLUSIONS

In conclusion, this international cross-sectional survey examined the perceptions of European hospital HCWs on their emotional wellbeing and local recommended IPC procedures during the COVID-19 pandemic. We advocate that hospitals should provide multifaceted IPC training that accounts for behavioural determinants and tailored support that accounts for the needs of junior and female HCWs. Such training should be inclusive and accessible to all. Further, local hospital support systems should be intensified and health facilities must be aware of, address, and provision for potential differential impacts to better care for our HCWs during the current COVID-19 pandemic.

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316 LIST OF ABBREVIATIONS

317	CI	Confidence Interval
318	COVID-19	Coronavirus disease 2019
319	HCW	Health Care Worker
320	IPC	Infection prevention and Control
321	MERS-CoV	Middle East Respiratory Syndrome coronavirus
322	OR	Odds Ratio
323	PPE	Personal Protective Equipment
324	SARS-CoV-2	Severe Acute Respiratory Syndrome coronavirus 2
325	TDF	Theoretical Domains Framework
326	WHO	World Health Organization

DECLARATIONS

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted in accordance with the EU GDPR (General Data Protection Regulation) and the principles of the Declaration of Helsinki [34]. The Medical Research Ethics Committee of the University Medical Center (UMC) Utrecht (study sponsor) waived the need for official approval by the UMC Utrecht Ethics Committee (IRB correspondence number 18-574C). Electronic individual informed consent for participation in this study was obtained at the beginning of the survey. Written information about the purpose of the survey and how the data were to be used was provided to respondents upfront. For round 1, all data were analysed and stored pseudonymised, in round 2 data collection was fully anonymous.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

A generic version of the protocol and survey tool of this study is freely available via the Research & Development COVID-19 Blueprint of the World Health Organization (WHO) to be used in different clinical settings globally [16]. The dataset analysed during the current study is available from the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

This manuscript is part of the output from RECOVER (Rapid European COVID-19 Emergency research Response), which has received funding from the EU Horizon 2020 research and

innovation programme (grant agreement number 101003589). STC received additional funding from the NIHR Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance at the University of Oxford in partnership with Public Health England (PHE). The views expressed are those of the authors and not necessarily those of the National Health Service, the NIHR, the Department of Health and Social Care, or PHE. The funder had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish.

AUTHOR'S CONTRIBUTIONS

DH contributed to data collection, data analyses, data interpretation, wrote the first draft of the manuscript, contributed to final manuscript writing, and proofed the final manuscript. PH: contributed to data analyses, data interpretation, and final manuscript writing. MW: contributed to study design, data interpretation and final manuscript writing. CP: contributed to data interpretation and final manuscript writing. HG: contributed to proposal writing, study design, data interpretation. SA: contributed to study design, data interpretation and final manuscript writing. STC: contributed to study design, data interpretation and final manuscript writing. NG: initiated the research concept, was responsible for proposal writing, contributed to study design, data collection, data analysis, data interpretation and final manuscript writing. All authors read and approved the final manuscript for publication.

ACKNOWLEDGEMENTS

We would sincerely like to thank Cristina Prat (UMC Utrecht, Netherlands), Javier Muñoz Bravo (CIBER, www.ciberes.org) and Branka Nikolic (Clinic Narodni Front, Serbia) for their important contributions in the distribution of this survey. We would also like to thank Jelle Lyskawa (UMC Utrecht, Netherlands) and Melanie Hoste (University of Antwerp, Belgium) for kindly assisting in the execution of this study. We acknowledge Alice Simniceanu, April Baller,

374 Benedetta Allegranzi, Maria Clara Padoveze, Yolanda Bayugo (World Health Organization) for
375 key contributions to the development of the WHO study protocol. Lastly, we would like to
376 express our gratitude to all responding health care workers who took the time to participate
377 in our study, despite the busy times at the outlook of the COVID-19 pandemic.
378

Table 1. Demographic information of all participating hospital health care workers (HCWs).

	Hospital HCWs N = 2289 (%)^a
Age, mean (±SD)	42 (11)
Female	1509 (66)
Region¹	
Southern Europe	1244 (54)
Western Europe	658 (29)
Northern Europe	329 (14)
Eastern Europe	57 (3)
Living with others	1916 (85)
Informal care responsibilities for any other adults	614 (27)
Academic hospital	1570 (70)
Medical specialty	
Acute care (anaesthesiology, ER, ICU)	748 (33)
Internal medicine	506 (22)
Surgery	226 (10)
Paediatrics	144 (6)
Other	665 (29)
Job role	
Junior nurse	240 (11)
Senior nurse	657 (29)
Senior medical doctor	803 (35)
Junior medical doctor	269 (12)
Junior allied health professional	31 (1)
Senior allied health professional	66 (3)
Other	223 (10)
Daily patient contact	1844 (81)
Direct COVID-19 patient care	1699 (74)

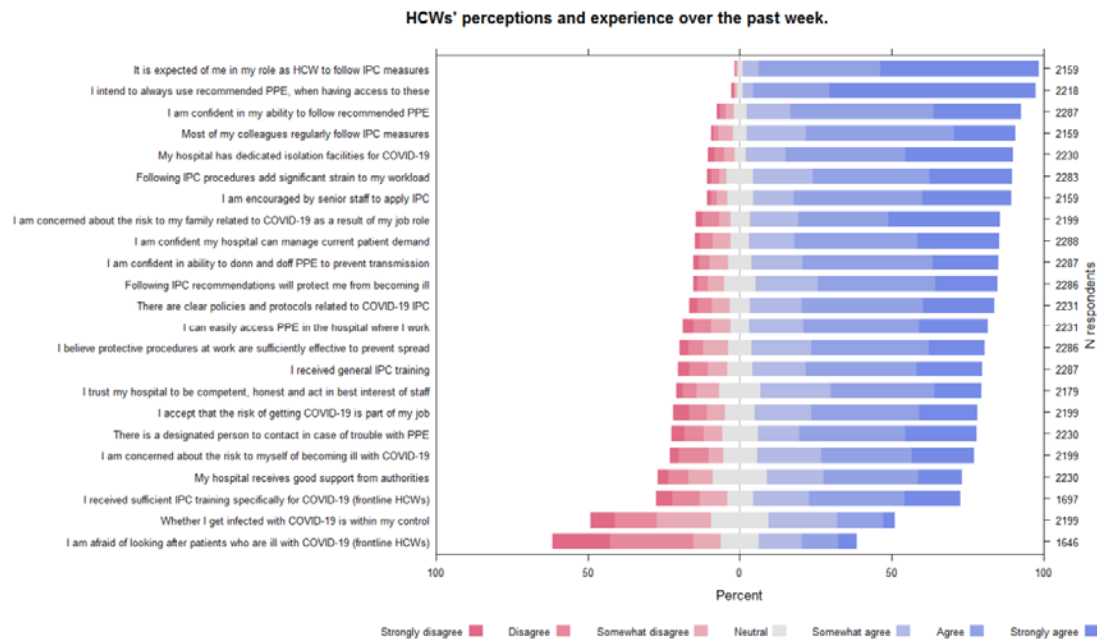
COVID-19, coronavirus diseases 2019; ER, emergency room; HCW, health care worker, ICU, intensive care unit; IQR, interquartile range; SD, standard deviation

^a Sub division of Europe adapted from the United Nations; for the current study, Cyprus, Israel and Turkey were categorized as Southern Europe [35].

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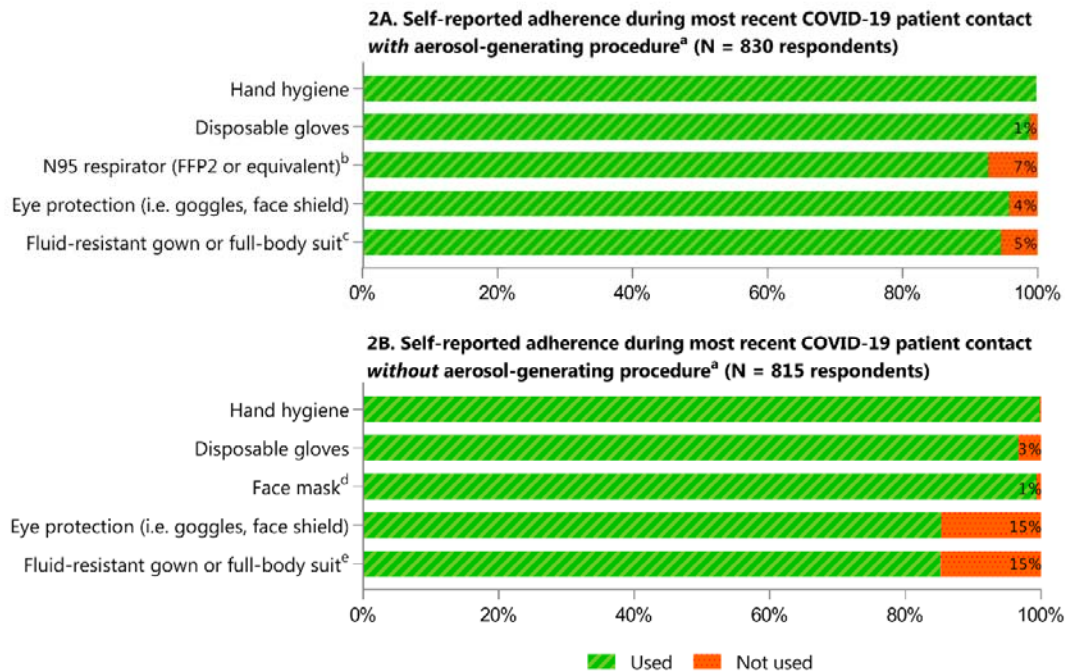
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Figure 1. Perceptions of hospital healthcare workers on recommended IPC procedures, perceived skills, intentions and environmental resources.



HCWs, health care workers; IPC, infection prevention and control; PPE; personal protective equipment
NB. Individual statements were abbreviated for readability of this figure (see Appendix A for all complete statements used in the surveys).

Figure 2. Self-reported adherence to recommended IPC procedures^a used during most recent clinical contact with COVID-19 case.



^a Recommended infection prevention and control (IPC) procedures during direct medical care with suspected or confirmed COVID-19 patients according to WHO interim guidance document (6 April 2020)[36] on the rational use of personal protective equipment (PPE) at the time of data collection: (A) contacts with aerosol-generating procedures (e.g. tracheal intubation, non-invasive ventilation, cardiopulmonary resuscitation): gloves, N95 mask or equivalent, eye protection (i.e. goggles or face shield), and fluid-resistant long-sleeved gown. (B) Contacts without aerosol-generating procedure: gown, gloves, medical mask and eye protection (goggles or face shield). Hand hygiene was part of recommendations during all contacts.

^b Of those respondents (n=60) that did not use an N95 respirator, 58 (97%) used another type of face mask, such as surgical mask (categorized in figure as 'no').

^c Of those respondents (n=44) that did not use either a fluid-resistant gown or full-body suit, 26 (59%) used a disposable plastic apron (categorized in figure as 'no').

^d Of those respondents use either a gown or full-body suit (n=120), 68 (57%) used a disposable plastic apron.

^e Of those HCWs that used a face mask (n=802), 69% used an N95 mask (n=557) and 31% (n=245) used another type of mask, such as a surgical mask.

Table 2. WHO-5 Emotional Well-Being index per subgroup. 420

	Mean ($\pm$ SD)	P value
Gender		
Male	59.6 (19.3)	<.001
Female	54.5 (19.0)	
Job role		
Junior nurse	54.0 (18.2)	.04
Senior nurse	57.5 (19.3)	
Junior medical doctor	54.8 (17.8)	
Senior medical doctor	56.9 (19.8)	
Junior allied health professional	57.5 (17.2)	
Senior allied health professional	51.0 (21.2)	
Other	55.7 (19.8)	
Region^a		
Eastern Europe	52.7 (19.9)	<.001
Southern Europe	53.4 (19.5)	
Northern Europe	56.0 (18.8)	
Western Europe	62.1 (17.8)	
COVID-19 direct patient care		
HCWs with COVID-19 patient care	56.0 (19.5)	NS
HCWs without COVID-19 patient care	57.0 (18.7)	

COVID-19, coronavirus disease 2019; HCW, health care worker; NS, not significant; SD, standard deviation; WHO, World Health Organization

^a Sub division of Europe adapted from the United Nations; for the current study, Cyprus, Israel and Turkey were categorized as Southern Europe [35].

Table 3. Ordered logistic regression for the effect of perceived skills, self-reported environmental context, social influences and institutional trust on a positive sense of control over getting infected with COVID-19.

	aOR	95% CI	P value
Having received general training for IPC procedures for communicable diseases	0.98	0.90 1.06	NS
Having received sufficient training in IPC practices for COVID-19	1.11	1.02 1.20	.01
Feeling confident in ability to correctly use PPE	1.08	1.00 1.17	.045
Index of PPE availability	1.05	0.96 1.15	NS
Feeling encouraged and supported by senior medical/nurse staff to apply recommended IPC measures	1.03	0.96 1.11	NS
Trust that health facility is competent, honest and acts in best interest of its staff	1.34	1.24 1.45	<.0001

aOR, adjusted odds ratio; COVID-19, coronavirus disease 2019; CI, confidence interval; IPC, infection prevention and control; PPE, personal protective equipment; NS, not significant

This model was adjusted for age, gender, living situation, European region and providing direct care for COVID-19 patients.

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ADDITIONAL FILES

Additional file 1 – Survey tools (.docx)

Additional file 2 – Supplementary tables and figures (.docx)

eTable 1. Country of work of responding hospital healthcare workers.

eTable 2. Response bias assessment round 1.

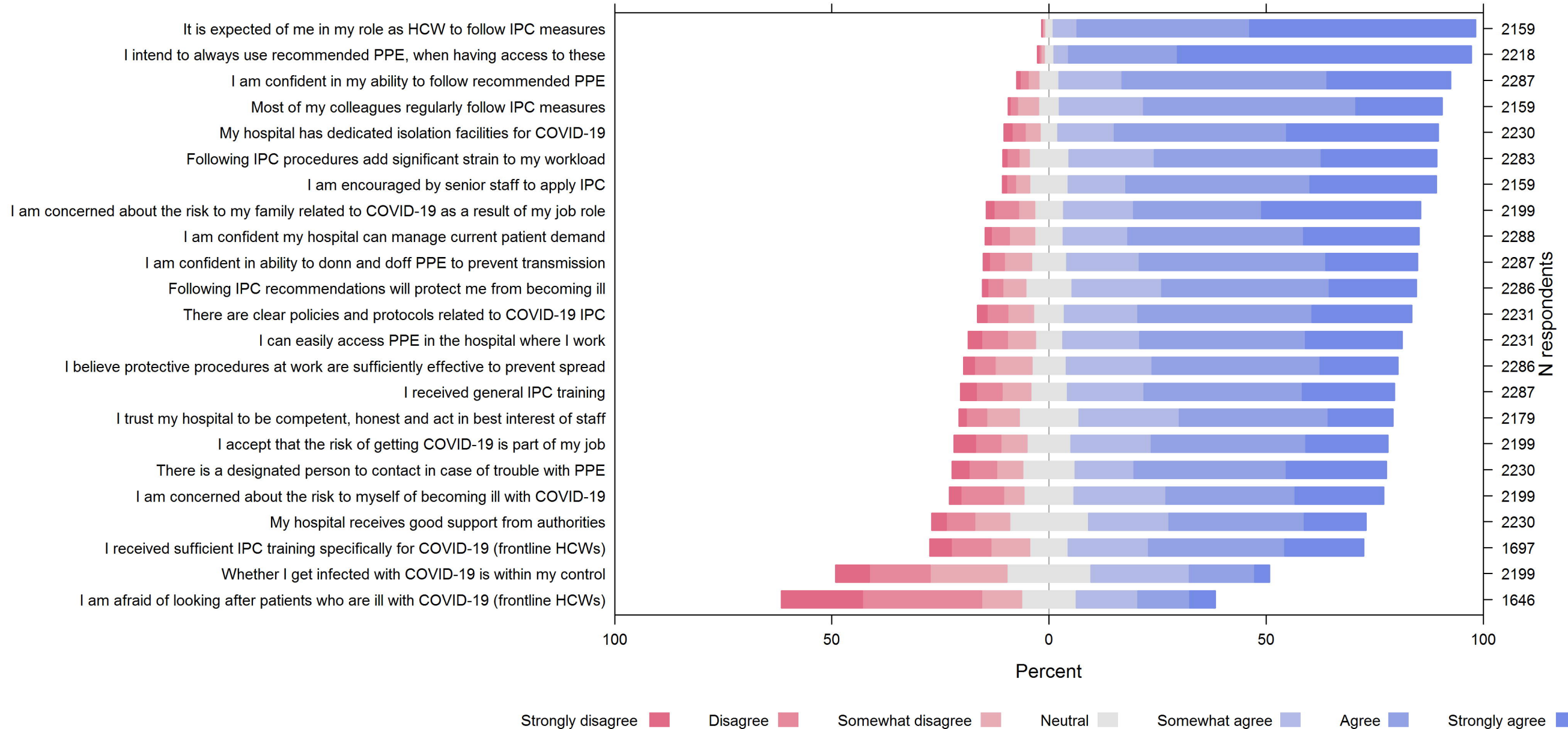
eFigure 1. Self-reported availability of personal protective equipment during most

recent clinical shift.

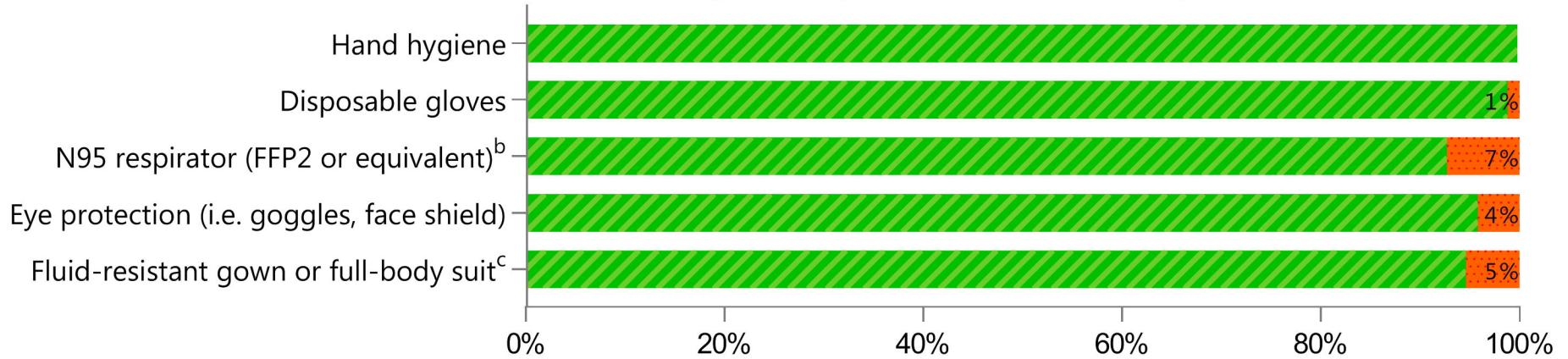
eTable 3. Multivariable linear regression for the effect of gender on WHO-5 emotional

wellbeing index of secondary care healthcare workers.

HCWs' perceptions and experience over the past week.



2A. Self-reported adherence during most recent COVID-19 patient contact *with* aerosol-generating procedure^a (N = 830 respondents)



2B. Self-reported adherence during most recent COVID-19 patient contact *without* aerosol-generating procedure^a (N = 815 respondents)

