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The Global impact of COVID-19 on Surgeons and Team members (GlobalCOST) Study

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ABSTRACT

Objectives- To investigate the impact of COVID-19 on the well-being of surgeons and allied health professionals as well as the support provided by their institutions.

Design- This cross-sectional study involved distributing an online survey through medical organisations, social media platforms, and collaborators.

Setting- It included all staff based in an operating theatre environment around the world.

Participants- 1590 complete responses were received from 54 countries between the 15th of July and 15th of December, 2020. The average age of participants was 30–40 years old, 64.9% were male, and 32.5% of a white ethnic background. 79.5% were surgeons with the remainder being nurses, assistants, anaesthetists, operating department practitioners, or classified other.

Main outcome measures- Participants that had experienced any physical illness, changes in mental health, salary or time with family since the start of the pandemic as well as support available based on recommendations by the British Medical Association.

Results- 32.0% reported becoming physically ill. This was more likely in those with reduced access to personal protective equipment (OR 4.62; CI 2.82 to 7.56; p<0.001) and regular breaks (OR 1.56; CI 1.18 to 2.06; p=0.002). Those with a decrease in salary (29.0%) were more likely to have an increase in anxiety (OR 1.50; CI 1.19 to 1.89; p=0.001) and depression (OR 1.84; CI 1.40 to 2.43; p<0.001) and those who spent less time with family (35.2%) were more likely to have an increase in depression (OR 1.74; CI 1.34 to 2.26; p<0.001). Only 36.0% had easy access to occupational health, 44.0% to mental health services, 16.5% to 24/7 rest facilities and 14.2% to 24/7 food and drink facilities. Fewer measures were available in countries with a low Human Development Index.

Conclusions- This work has highlighted a need and strategies to improve conditions for the healthcare workforce, ultimately benefiting patient care.

INTRODUCTION

The COVID-19 outbreak can be traced back to Wuhan, China, where patients initially presented with pneumonia of unknown aetiology that led to a local-scale epidemiological alert on the 31st of December, 2019[1]. Thereafter, the World Health Organization (WHO) declared the outbreak "a public health emergency of international concern" on the 30th of January, 2020, due to an exponential rise in the number of cases as a result of human-to-human transmission[1]. On the 11th of March, 2020, the WHO then classified it as a pandemic[2]. To date, COVID-19 has infected over 167 million people worldwide and been linked to over 3.47 million deaths[3].

While advances have been made in the management and prevention of COVID-19, most notably via the advent and administration of vaccines[4], the impact of the COVID-19 pandemic on healthcare systems has been profound[5]. In particular, there has been a significant effect on surgical practice that is likely to have long-term consequences for patients and healthcare professionals, specifically due to the increasing backlog of elective surgery[6], the negative impact on surgical training[7], and the detrimental effect on overall mental health in both groups[8,9]. The need for psychological support for surgical staff has been noted[9], however, there is a paucity of literature on the impact of the COVID-19 pandemic on surgical team members' overall welfare, especially with regards to domains other than mental health, such as physical, financial, and family well-being.

Some previous studies on this topic have been limited to a single institution[9], a single country[10–12], or a single surgical speciality with a sole focus on surgeons' mental health[12,13]. At present, the largest international study on the impact of workplace factors on the mental health of healthcare workers during the COVID-19 pandemic consists of 54.1% and 34.6% of responses from nurses and doctors, respectively, without a subgroup analysis of surgeons or surgical team members[14]. The British Medical Association (BMA) also found that 45% of doctors were suffering from "depression, anxiety, stress, burnout or other mental health conditions" pertaining to, or exacerbated by, COVID-19 and has therefore published recommendations to develop a long-term strategy to protect the well-being of healthcare staff[15]. This includes the need for adequate Personal Protective Equipment (PPE) along with training on its use as well as support services and facilities.

This study is the largest, international cross-sectional survey that explores the impact of the COVID-19 pandemic on the physical, mental, financial, and family well-being of surgeons and

allied health professionals, including anaesthetists, nurses, assistants, and operating department practitioners. It has also investigated the support available to healthcare professionals as per BMA recommendations to help identify areas for improvement.

METHODS

Study design and participants

This international, cross-sectional study has been reported according to STROBE guidelines. An online anonymous and voluntary survey was created on SurveyGizmo (now known as Alchemer), also translated into Portuguese, and distributed worldwide through medical organisations, social media platforms, and collaborators. Collaborator status was given to any participant who was also able to gain 50 additional responses using a personalised link to the survey through which the number of responses gained could be tracked. Collaborators and the steering committee of this project form the OrthoGlobe Collaborative. Responses were collected over a five-month period, from the 15th of July to the 15th of December, 2020, from healthcare professionals currently in practice and based in an operating theatre environment, namely surgeons and anaesthetists at consultant, trust grade or trainee level, assistants, nurses, and operating department practitioners. Ethics approval was not required for this study according to the Integrated Research Application System for the Health Research Authority. It had been approved and endorsed by the Royal College of Surgeons England COVID Research Group.

Variables and outcomes

The survey consisted of three main sections: demographics, well-being, and support. The first, demographics, included questions on age, gender, ethnicity (with options presented in line with the United Kingdom's Office for National Statistics)[16], marital status, role, grade, and country. The second section included questions about physical, mental, financial, and family well-being since the start of the pandemic. Participants were asked if they had experienced any physical illness with or without COVID related symptoms and all the questions on the Generalised Anxiety Disorder Assessment (GAD-7) and Patient Health Questionnaire (PHQ-9) to generate scores for anxiety and depression, respectively[17,18]. For this group of questions on anxiety and depression, participants were asked to answer for a time two weeks before the start of the pandemic and after. They were also asked if they had experienced a

decrease in salary and time spent with family. The final section on support included questions based on recommendations by the BMA on improving the mental health and well-being of the medical workforce[15,19], specifically the availability and accessibility of PPE training on its use, a well-being guardian, occupational and mental/pastoral health services, support from managers and colleagues, sick leave regular breaks, and 24 hours/seven days a week (24/7) rest and food facilities.

Study size and statistical methods

Assuming that an average of 29.6% of healthcare workers had anxiety and 29.7% had depression[20], the study would require a minimum sample size of 321 to estimate the expected proportion with 5% absolute precision and 95% confidence. The IBM Statistical Package for the Social Sciences (SPSS) version 26 for windows (IBM Corp) was used to perform Pearson χ^2 tests to compare the majority of variables, which were categorical[21]. The only continuous variables were scores for anxiety and depression. The difference between scores for a time period before and after the start of the pandemic were used to categorise the responses into "increased" or "decreased/no change". Ethnicities were further grouped into "white" and "other" and countries were categorised into four according to their Human Development Index (HDI): very high, high, middle, and low as described by the United Nations[22]. Multivariable regression models were used to explore the relationships between variables while accounting for potential confounders. Model coefficients are presented as odds ratios (OR) with 95% confidence intervals (CI). 724 of 2314 responses had failed to provide key or outcome data so were not included in the final analysis (Figure 1). A small number of participants selected "prefer not to answer" where this was available. This has been included as a separate category in the analyses.

Public and Patient Involvement: There was no public or patient involvement in this study.

RESULTS

Participants

1590 complete responses came from 54 countries from the 15th of July to the 15th of December 2020. The average age of participants was between 30 and 40 years old. 1032 (64.9%) were male and 516 (32.5%) of a white ethnic background. 1141 (71.8%) were married or in a

relationship. 1265 (79.5%) were surgeons at consultant, trainee, or trust grade level, 98 (6.2%) nurses, 86 (5.4%) assistants, 66 (4.2%) anaesthetists at consultant, trainee, or trust grade level, 27 (1.7%) operating department practitioners, and 48 (3.0%) classified as other. The latter included perfusionists, radiographers, managerial, and administrative staff. Of the surgeons and anaesthetists combined, 680 (51.1%) were consultants, 588 (44.2%) trainees, and 63 (4.7%) trust grade doctors. 720 (45.3%) participants came from a very high HDI country, 405 (25.5%) a high HDI country, 337 (21.2%) a middle HDI country, and 128 (8.1%) a low HDI country.

Main results

Figure 2 shows the proportion of participants who had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and a decrease in time spent with family. At the time the questionnaire was being answered, 746 (46.9%) had a score greater than 5 indicating mild to severe anxiety, based on the Generalised Anxiety Disorder Assessment (GAD-7). 716 (45.0%) had a score greater than 5 indicating mild to severe depression, based on the Patient Health Questionnaire (PHQ-9). Between a time two weeks before the start of the pandemic and after, there was a significant increase in mean scores for anxiety (2.24 [CI= 2.01–2.46]) ($p<0.0001$) and depression (4.22 [CI= 3.98–4.46]).

Pearson χ^2 tests (shown in Table 1 of the Appendix) indicate a significant difference in physical illness across age groups ($p=0.013$), ethnicities ($p<0.001$), and occupations ($p=0.010$). Anxiety scores differ across ethnicities ($p<0.001$) and depression scores across age groups, ($p=0.007$), gender ($p<0.001$), ethnicities ($p<0.001$), marital status ($p<0.001$), and occupations ($p=0.003$). The difference in the number of participants with a decrease in salary is significant across age, gender, ethnicity, marital status, and occupational groups (all $p<0.001$) as is a decrease in time spent with family across age, marital status, and occupational groups (all $p<0.001$).

Figure 3 shows the proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities.

Pearson χ^2 tests (shown in Table 2 of the Appendix) indicate a significant difference in physical illness and access to PPE, training in its use, occupational health and mental health services,

support from managers and colleagues, sick leave when needed, regular breaks (all p<0.001), and 24/7 food facilities (p=0.049). The presence of an increase in anxiety differs significantly with access to PPE (p=0.002), a well-being guardian (p<0.001), occupational health (p<0.001), mental health services (p=0.018), support from managers (p<0.001), support from colleagues (p=0.02), and regular breaks (p=0.021). The presence of an increase in depression differs significantly with access to PPE (p<0.001), a well-being guardian (p=0.021), occupational health (p=0.004), support from managers and colleagues (p=0.021), sick leave if needed (p=0.011), and regular breaks (p<0.001). There was a significant difference in the availability of all support measures across country HDI groups, all with p-values of less than 0.050.

Multivariable analyses

The results of multivariable analyses to determine risk factors for physical illness, mental illness and decrease in salary and time with family are shown in Table 1. Physical illness with COVID related symptoms was significantly more likely in those with reduced access to PPE, regular breaks and time with family. Physical illness without COVID related symptoms was more likely in trust grade doctors compared to consultants and those with reduced access to PPE.

		Physical illness								Mental illness								Decrease in salary				Decrease in time spent with family			
		COVID symptoms				No COVID symptoms				Increase in anxiety				Increase in depression											
		p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper
Age	<30 years old																								
	30 - 40 years old	0·235	1·23	0·88	1·72	0·379	0·84	0·57	1·23	0·774	0·96	0·74	1·25	0·241	1·19	0·89	1·60	0·041*	0·73	0·55	0·99	0·583	1·08	0·82	1·14
	41- 50 years old	0·604	0·90	0·60	1·35	0·115	0·69	0·43	1·09	0·094	0·77	0·57	1·05	0·944	1·01	0·72	1·42	0·528	0·90	0·64	1·26	0·823	0·96	0·70	1·33
	51- 60 years old	0·363	0·79	0·48	1·31	0·222	0·71	0·41	1·23	0·736	1·06	0·74	1·53	0·717	1·08	0·72	1·62	0·201	0·77	0·51	1·15	0·651	1·09	0·75	1·60
	Above 60 years old	0·449	0·72	0·31	1·68	0·116	0·37	0·11	1·28	0·557	1·21	0·64	2·28	0·487	1·30	0·62	2·74	0·354	1·37	0·70	2·68	0·729	1·12	0·58	2·18
Sex	Male																								
	Female	0·821	1·03	0·78	1·37	0·589	0·91	0·66	1·27	0·447	1·09	0·88	1·35	0·217	1·17	0·91	1·49	0·129	0·89	0·69	1·13	0·173	1·17	0·93	1·47
	Prefer not to answer	0·764	1·25	0·29	5·40	..	..	..	..	0·377	1·90	0·46	7·85	0·543	0·63	0·14	2·77	0·748	1·27	0·29	5·47	0·217	2·38	0·60	9·39
Ethnicity	White																								
	Other	0·081	1·31	0·97	1·78	0·162	1·29	0·90	1·83	0·000*	0·67	0·53	0·84	0·012	0·72	0·56	0·93	0·112	1·11	0·95	1·57	0·002*	0·69	0·55	0·88
Marital Status	Single/Divorced/Widowed/Other																								
	Married/In a relationship	0·270	0·84	0·62	1·14	0·917	0·98	0·68	1·41	0·471	0·92	0·72	1·16	0·000*	0·72	0·44	0·79	0·533	1·09	0·82	1·45	0·005*	0·70	0·55	0·90
Role	Consultant																								
	Trainee	0·59	1·10	0·79	1·53	0·91	0·98	0·65	1·46	0·32	0·88	0·68	1·13	0·08	1·30	0·97	1·74	0·000*	0·28	0·21	0·37	0·000*	2·80	2·16	3·63
	Trust Grade Doctor	0·20	1·58	0·78	3·18	0·010*	2·48	1·24	4·94	0·98	1·01	0·59	1·72	0·001*	3·16	1·57	6·74	0·001*	0·33	0·18	0·62	0·46	1·25	0·69	2·25
	Nurse	0·67	1·14	0·63	2·06	0·10	1·68	0·91	3·10	0·96	1·01	0·65	1·57	0·78	1·07	0·66	1·75	0·000*	0·24	0·14	0·432	0·002*	2·05	1·32	3·21
	Surgical Assistant	0·75	1·10	0·60	2·02	0·37	1·36	0·70	2·68	0·67	1·11	0·69	1·77	0·06	1·72	0·98	3·05	0·011*	0·52	0·31	0·86	0·07	1·58	0·97	2·57
	Operating Department Practitioner	0·93	0·95	0·30	2·97	0·31	1·73	0·60	5·00	0·08	0·48	0·21	1·10	0·22	1·90	0·68	5·33	0·007*	0·18	0·05	0·62	0·06	2·13	0·96	4·71
	Other	0·80	0·89	0·35	2·26	0·06	2·11	0·97	4·62	0·35	1·35	0·73	2·50	0·53	1·24	0·63	2·47	0·000*	0·18	0·08	0·44	0·10	1·69	0·91	3·14
Access to:																									
PPE	Always																								
	Sometimes	0·008*	1·53	1·11	2·09	0·165	1·29	0·90	1·84	0·003*	1·41	1·12	1·78	0·000*	1·62	1·26	2·09								
	Never	0·000*	4·61	2·82	7·56	0·000*	3·45	1·92	6·22	0·113	1·40	0·92	2·11	0·228	1·33	0·84	2·12								
	Prefer not to answer	..	..	..	..	0·577	0·70	0·21	2·42	0·083	0·46	0·19	1·11	0·040*	0·42	0·18	0·96								
Training on PPE use	Yes																								
	No	0·236	0·83	0·61	1·13	0·254	0·81	0·56	1·17	0·924	0·99	0·78	1·25	0·275	0·86	0·66	1·12								
	Prefer not to answer	0·528	1·39	0·50	3·83	0·055	2·45	0·98	6·13	0·758	1·12	0·54	2·31	0·613	1·25	0·53	2·93								
Regular breaks	Yes																								
	No	0·002*	1·56	1·18	2·06	0·340	1·17	0·85	1·62	0·205	1·15	0·93	1·43	0·139	1·21	0·94	1·54								
24/7 rest facilities	Yes																								
	No	0·952	0·99	0·67	1·45	0·076	1·56	0·96	2·56	0·355	1·15	0·85	1·55	0·972	1·01	0·72	1·41								
24/7 food facilities	Yes																								
	No	0·590	1·12	0·73	1·72	0·315	0·78	0·48	1·26	0·742	0·95	0·69	1·30	0·615	0·91	0·63	1·31								
Decrease in salary	No																								
	Yes	0·615	0·92	0·68	1·26	0·142	0·76	0·52	1·10	0·001*	1·50	1·19	1·89	0·000*	1·84	1·40	2·43								
Decrease in time with family	No																								
	Yes	0·040*	1·34	1·01	1·78	0·089	1·33	0·96	1·84	0·74	1·22	0·98	1·53	0·000*	1·74	1·34	2·25								

Table 1: Multivariable analyses to determine risk factors for physical illness, mental illness and decrease in salary and time with family, p-values <0.05 flagged with a *, OR= odds ratio, Lower= lower limit of 95% confidence interval, Upper= upper limit of 95% confidence interval

An increase in anxiety score was less likely in the other ethnicity group and more likely with a decrease in salary. An increase in depression score was less likely if married or in a relationship and more likely if a trust grade doctor rather than a consultant, experiencing a decrease in salary, or less time with family. The 30–40 age group was less likely to experience a decrease in salary as was any role or occupation other than a consultant. The other ethnicity group and those married or in a relationship were less likely to have a decrease in time spent with family. Trainees and nurses were more likely than consultants to experience a decrease in time with family.

Multivariable analyses looking into the effect of country HDI on access to supportive measures are shown in figure 4 (and Table 3 of the Appendix). Participants from a country with a low Human Development Index were significantly less likely to have access to PPE (OR 18.30; CI 7.46–44.87; p<0.001), occupational health (OR 4.997; CI 2.55–9.81; p<0.001), mental health services (OR 3.36; CI 1.82–6.20; p<0.001), and 24/7 food facilities but more likely to have support from managers (OR 0.29; CI 0.13–0.63; p=0.002) and access to sick leave when needed (OR 0.38; CI 0.17–0.88; p=0.023) compared to a very high HDI country.

DISCUSSION

Overall, 1590 complete responses from surgical team members across 54 countries were obtained and the following domains were analysed: physical health, including illness related and unrelated to COVID-19; mental health as per validated anxiety (GAD-7) and depression (PHQ-9) scores; financial and family well-being; and access to PPE along with training in its use, support in the form of access to a well-being guardian, occupational health, mental health/pastoral services, support from managers and colleagues, sick leave, regular breaks, as well as facilities for rest and food.

Almost a third of respondents had become physically ill since the start of the pandemic, of which over half were due to COVID-19 symptoms. Physical illness was more likely in those with reduced access to PPE and regular breaks, which is in keeping with the well-documented risk factors for developing a coronavirus infection[23]. There are a range of consequences when healthcare workers become physically ill, especially if they require sick leave as this can have a knock-on effect on the remaining staff, who will have to work short-staffed or have to work unplanned shifts[24]. In the context of surgical teams, this can also have a subsequent impact on planned operations and service provision.

Validated scoring systems were used to show that 45% were suffering from mild to severe depression and 47% with mild to severe anxiety. The scores were significantly higher than a self-reported time two weeks before the start of the pandemic. The prevalence of mild-severe depression and anxiety in this study are similar to the upper limits of 8.9-50.4% and 14.5-44.6% respectively reported in a recently published review on the impact of COVID-19 on the mental health of healthcare workers, formed of 24 studies of which the majority were also based on validated scoring systems[20].

An increase in anxiety score was less likely in the other ethnicity group, an unexpected result in the light of a known higher death rate from COVID-19 amongst other ethnic groups but one that may be influenced by the fact that this group was less likely to have experienced a decrease in time spent with family[25]. An increase in depression score was less likely if married or in a relationship and more likely in those who spent less time with family, consistent with the literature as widely recognised protective factors [11]. An increase in depression score was more likely if the participant was a trust grade doctor rather than a consultant. This could be due to the fact that more junior doctors were likely to experience redeployment and a change of clinical duties which has now been linked to an increased risk of depression[14], as well as a decrease in time spent with family.

Understandably, those with a decrease in salary were more likely to have an increase in anxiety and depression scores, likely due to the added financial burden and impact on their personal lives. The 30–40 age group was less likely to experience a decrease in salary as was any role or occupation other than a consultant as consultants, generally of an older age group, were likely to work less due to the suspension of non-urgent elective surgeries and private practice[6].

An analysis of supportive measures has highlighted an association between HDI and the availability of resources. However, where support from managers and access to sick leave when needed was more likely in lower HDI countries, this may be accounted for by contextual factors, such as understaffing and guilt from taking time off work, that were not considered in this study[26]. Another limitation is the fact that the great majority of participants were surgeons. The idea to distribute the survey to staff in an operating theatre environment to balance covering a range of cadres with feasibility and ease may have contributed to this. Most of the collaborators collecting responses were also surgeons who may have been inclined to distribute surveys to their own colleagues. Despite this, the study forms a large, international,

multi-speciality, multi-disciplinary, cross-sectional assessment of the overall well-being of surgical team members and the support available to them.

Improving staff well-being is invaluable. Medication errors alone cost the UK National Health Service (NHS) more than £98 million per year in addition to avoidable patient mortality[27]. Surgical errors can cost the general population in the United States upwards of $569 million per year[28]. Medical errors and poor safety outcomes overall are extensively reported to be strongly related to worker health, burnout and low quality of life[29]. Hence, it would be in the interest of public health to implement measures that improve well-being for healthcare professionals, who can then provide better patient care.

CONCLUSION

In conclusion, this international cross-sectional study has established the negative impact of COVID-19 on the holistic well-being of surgical team members. It is the first to assess the availability of and access to supportive measures at institutions on a global scale. This can form the basis of quality improvement projects at the local level to raise the overall standards of working conditions for healthcare professionals, which will inevitably have a positive effect on the care of patients.

ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study reports the impact of COVID-19 on the physical, mental, financial, and family well-being of surgeons and allied health professionals including anaesthetists, nurses, assistants, and operating department practitioners on a global scale
- It also reports on the support provided by institutions in accordance with established recommendations, highlighting differences amongst countries with a high and low Human Development Index
- Previously published studies on the subject have been limited to a single institution, a single country, or a single surgical speciality with an exclusive focus on surgeons and mental health
- The main limitation of this study was that the majority of participants were surgeons. This can be explained by the fact that most of the collaborators collecting responses were also surgeons who may have been inclined to distribute surveys to their own colleagues

OTHER

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Data sharing: All data collected for this study, excluding participant names and contact details, will be made available with the study protocol on https://orthoglobe.org/Projects with the publication

Author statement: All authors have made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

Drafting the work or revising it critically for important intellectual content; AND

Final approval of the version to be published; AND

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

The following authors specifically have verified the underlying data: ZJ, AS, AN, MAI.

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FIGURE LEGENDS

Figure 1: Flow chart illustrating response recruitment

Figure 2: The proportion of participants (%) that had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and time spent with family

Figure 3: The proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities

Figure 4: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures. Marker represents odds ratio and bars the 95% confidence interval, *=$p<0.05$ (statistically significant)

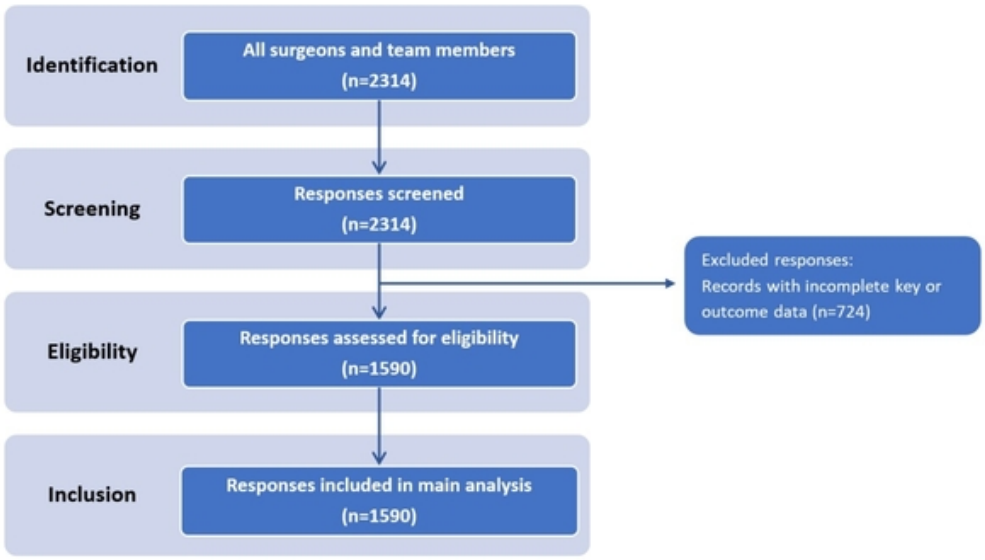

Figure 1: Flow chart illustrating response recruitment

49x28mm (300 x 300 DPI)

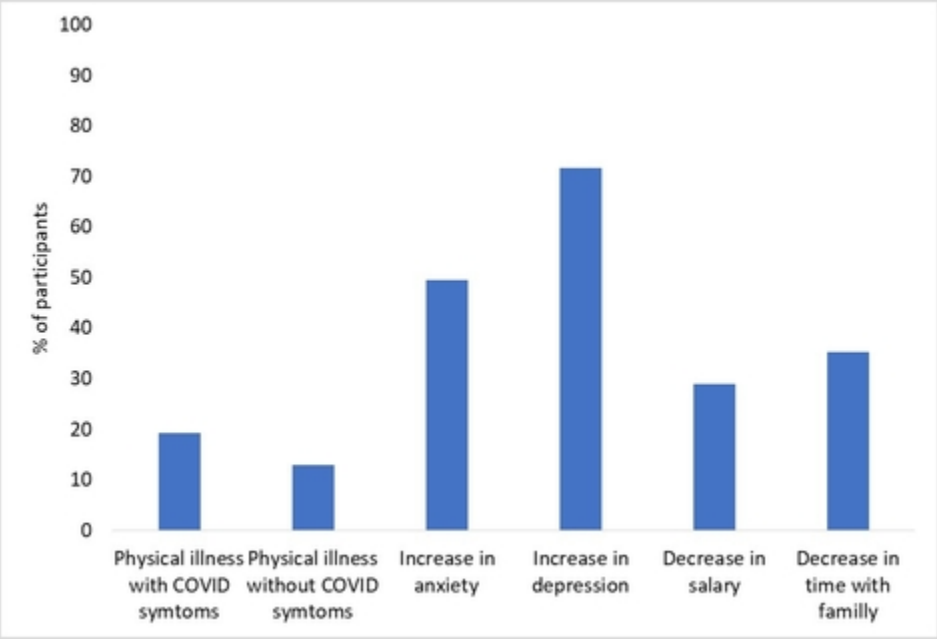

Figure 2: The proportion of participants (%) that had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and time spent with family

39x27mm (300 x 300 DPI)

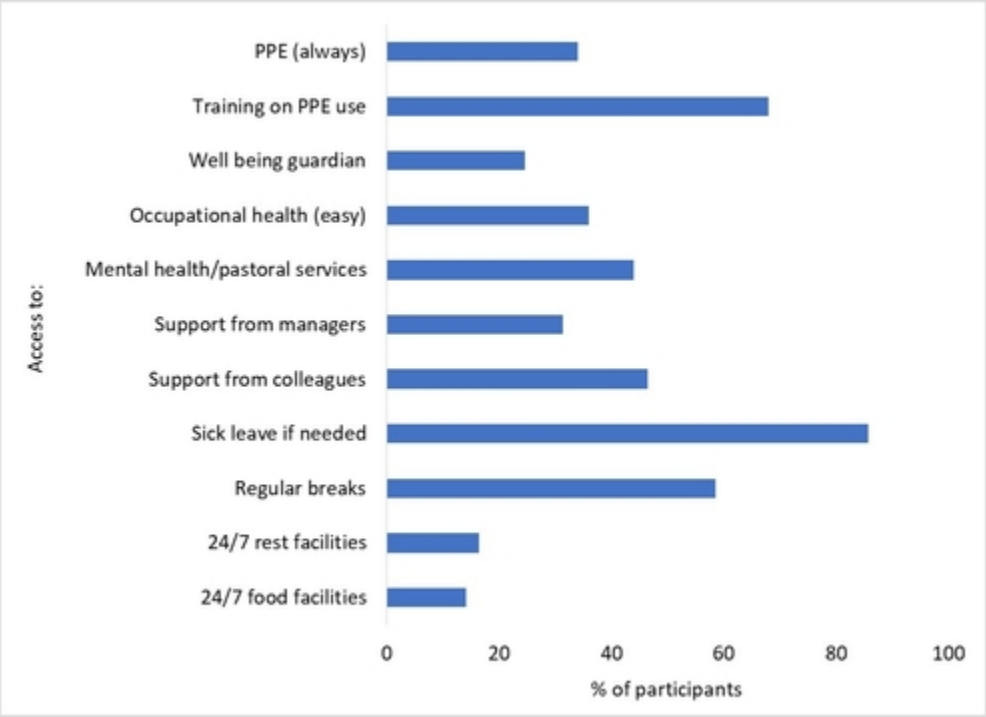

Figure 3: The proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities

41x30mm (300 x 300 DPI)

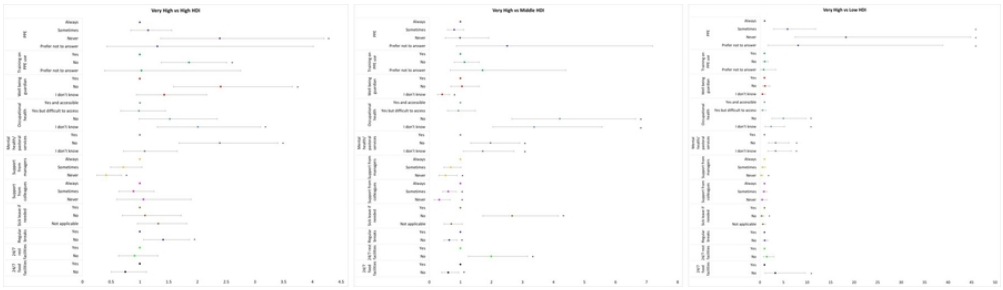

Figure 4: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures. Marker represents odds ratio and bars the 95% confidence interval, *=p<0.05 (statistically significant)

76x21mm (300 x 300 DPI)

Appendix

Table 1

		Physical illness								Increase in anxiety				Increase in depression				Decrease in salary				Decrease in time spent with family			
		COVID symptoms		No COVID symptoms		No		Prefer not to answer		Yes		No		Yes		No		Yes		No		Yes		No	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Age	<30 years old	99	32·5	56	27·5	244	23·0	7	35·0	202	25·7	204	25·4	313	27·5	93	20·6		18·7	320	28·3	199	35·6	207	20·0
	30 - 40 years old	117	38·4	85	41·7	416	39·2	9	45·0	309	39·3	318	39·6	455	40·0	172	38·1		36·0	461	40·8	216	38·6	411	39·9
	41- 50 years old	60	19·7	39	19·1	221	20·8	4	20·0	150	19·1	174	21·6	219	19·2	105	23·2		24·9	209	18·5	90	16·1	234	22·7
	51- 60 years old	26	8·5	20	9·8	141	13·3	0	0·0	97	12·3	90	11·2	122	10·7	65	14·4		15·2	117	10·4	43	7·7	144	14·0
	Above 60 years old	3	1·0	4	2·0	39	3·7	0	0·0	28	3·6	18	2·2	29	2·5	17	3·8		5·2	22	1·9	11	2·0	35	3·4
p values									0·013*				0·386				0·007*				0·001*				<0·001*
Sex	Male	199	65·2	124	60·8	695	65·5	14	70·0	491	62·5	541	67·0	699	61·4	333	73·7		72·7	697	61·7	350	62·6	682	66·1
	Female	103	33·8	79	38·7	361	34·0	6	30·0	291	37·0	258	32·1	434	38·1	115	25·4		26·7	426	37·7	205	36·7	344	33·4
	Prefer not to answer	3	1·0	1	0·5	5	0·5	0	0·0	4	0·5	5	0·6	5	0·4	4	0·9		0·7	6	0·5	4	0·7	5	0·5
p values									0·782				0·116				<0·001*				<0·001*				0·335
Ethnicity	Arab	39	12·8	37	18·1	126	11·9	3	15·0	111	14·1	94	11·7	173	15·2	32	7·1		13·0	145	12·8	61	10·9	144	14·0
	Asian	96	31·5	55	27·0	389	36·7	11	55·0	239	30·4	312	38·8	358	31·5	193	42·7		38·0	376	33·3	183	32·7	368	35·7
	Black/African/Caribbean	41	13·4	22	10·8	69	6·5	2	10·0	56	7·1	78	9·7	70	6·2	64	14·2		3·9	116	10·3	50	8·9	84	8·1
	Mixed/Multiple	40	13·1	30	14·7	96	9·0	1	5·0	80	10·2	87	10·8	134	11·1	33	7·3		12·6	109	9·7	61	10·0	106	10·0
	White	83	27·2	59	28·9	371	35·0	3	15·0	289	36·8	227	28·2	389	34·2	127	28·1		30·8	374	33·1	200	35·8	316	30·6
	Any other	6	2·0	1	0·5	10	0·9	0	0·0	11	1·4	6	0·7	14	1·2	3	0·7		1·7	9	0·8	4	0·7	13	1·3
p values									0·001*				0·001*				0·001*				<0·001*				0·162
Marital Status	Married/In a relationship	203	66·6	144	70·6	782	73·7	12	60·0	557	70·9	584	72·6	779	68·5	362	80·1		78·3	780	69·1	352	63·0	789	76·5
	Single/Divorced/Widowed/Other	102	33·4	60	29·4	279	26·3	8	40·0	229	29·1	220	27·4	359	31·5	90	19·9		21·7	349	30·9	207	37·0	242	23·5
p values									0·056				0·433				<0·001*				<0·001*				<0·001*
Occupation	Consultant	112	36·7	72	35·3	492	46·4	4	20·0	344	43·8	336	41·8	452	39·8	228	50·4		64·0	385	34·1	161	28·8	519	50·3
	Trainee	135	44·3	72	35·3	370	34·9	11	55·0	279	35·5	309	38·4	441	38·8	147	32·5		22.8	483	42·8	281	50·3	307	29·8
	Trust Grade Doctor	13	4·3	14	6·9	36	3·4	0	0·0	29	3·7	34	4·2	52	4·6	11	2·2		2·8	50	4·4	17	3·0	46	4·5
	Nurse	18	5·9	17	8·3	61	5·7	2	10·0	51	6·5	47	5·8	69	6·1	29	6·4		3·3	83	7·4	40	7·2	58	5·6
	Surgical Assistant	17	5·6	13	6·4	54	5·1	2	10·0	46	5·9	40	5·0	68	6·0	18	4·0		5·2	62	5·5	30	5·4	56	5·4
	Operating Department Practitioner	4	1·3	5	2·5	18	1·7	0	0·0	10	1·3	17	2·1	22	1·9	5	1·1		0·7	24	2·1	12	2·1	15	1·5
	Other	6	2·0	11	5·4	30	2·8	1	5·0	27	3·4	21	2·6	34	3·0	14	3·1		1·3	42	3·7	18	3·2	30	2·9
p values									0·010*				0·548				0·003*				<0·001*				<0·001*

Table 1: The association between demographic characteristics and physical illness with and without COVID related symptoms, change in anxiety levels, depression, salary, and time with family. Pearson χ^2 tests have been used to derive p-values, statistically significant differences with a p-value of <0.05 have been flagged with *.

Table 2

		Physical illness								Increase in anxiety				Increase in depression				Country Human Development Index (HDI)							
Access to:		COVID symptoms		No COVID symptoms		No		Prefer not to answer		Yes		No		Yes		No		Very high		High		Middle		Low	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPE	Always	74	24·3	60	29·4	405	38·2	4	20·0	242	30·8	301	37·4	355	31·2	188	41·6	279	38·8	113	27·9	141	41·8	10	7·8
	Sometimes	182	59·7	115	56·4	583	54·9	13	65·0	472	60·1	421	52·4	678	59·6	215	47·6	402	55·8	238	58·8	163	48·4	90	70·3
	Never	49	16·1	25	12·3	50	4·7	1	5·0	64	8·1	61	7·6	91	8·0	34	7·5	31	4·3	47	11·6	22	6·5	25	19·5
	Prefer not to answer	0	0·0	4	2·0	23	2·2	2	10·0	8	1·0	21	2·6	14	1·2	15	3·3	8	1·1	7	1·7	11	3·3	3	2·3
p values									<0·001*				0·002*				<0·001*								<0·001*
Training on PPE use	Yes	206	67·5	141	69·1	725	69·3	9	45·0	529	67·3	552	68·7	775	68·0	306	67·7	555	77·1	219	54·1	228	67·7	79	61·7
	No	93	30·5	54	26·5	320	30·2	7	35·0	240	30·5	234	29·1	337	29·6	137	30·3	153	21·3	178	44·0	97	28·8	46	35·9
	Prefer not to answer	6	2·0	9	4·4	16	1·5	4	20·0	17	2·2	18	2·2	26	2·6	9	2·0	12	1·3	8	2·0	12	3·6	3	2·3
p values									<0·001*				0·823				0·911								<0·001*
Well being guardian	Yes	71	23·3	50	24·5	267	25·2	3	15·0	154	19·6	237	29·5	262	23·0	129	28·5	218	30·0	55	13·6	95	28·2	23	18·0
	No	151	49·5	82	40·2	437	41·2	6	30·0	355	45·2	321	39·9	506	44·5	170	37·6	213	29·6	220	54·3	168	49·9	75	58·6
	I don't know	83	27·2	72	35·3	357	33·6	11	55·0	277	35·2	246	30·6	370	32·5	153	33·8	289	40·1	130	32·1	74	22·0	30	23·4
p values									0·051				<0·001*				0·021*								<0·001*
Occupational health	Yes and accessible	89	29·2	70	34·3	408	38·5	6	30·0	232	29·5	341	42·4	385	33·8	188	41·6	341	47·4	108	26·7	99	29·4	25	19·5
	Yes but difficult to access	70	23·0	49	24·0	199	18·8	2	10·0	180	22·9	140	17·4	251	22·1	69	15·3	179	24·9	91	22·5	39	11·6	11	8·6
	No	113	37·0	52	25·5	265	25·0	5	25·0	218	27·7	217	27·0	316	27·8	119	26·3	97	13·5	125	30·6	141	41·8	72	56·3
	I don't know	33	10·8	33	16·2	189	17·8	7	35·0	156	19·8	106	13·2	186	16·3	76	16·8	103	14·3	81	20·0	58	17·2	20	15·6
p values									<0·001*				<0·001*				0·004*								<0·001*
Mental health/pastoral services	Yes	120	39·3	80	39·2	495	46·7	8	40·0	324	41·2	379	47·1	487	42·8	216	47·8	423	58·8	130	32·1	126	37·4	24	18·8
	No	143	46·9	92	45·1	388	36·6	2	10·0	336	42·7	289	39·9	466	40·9	159	35·8	176	24·4	216	53·3	156	46·3	77	60·2
	I don't know	42	13·9	32	15·7	178	16·8	10	50·0	126	16·0	136	16·9	185	16·3	77	17·0	121	16·8	59	14·6	55	16·3	27	21·1
p values									<0·001*				0·018*				0·096								<0·001*
Support from managers	Always	69	22·6	52	25·5	372	35·1	6	30·0	204	26·0	295	36·7	317	27·9	182	40·3	226	31·4	110	27·2	129	38·8	34	26·6
	Sometimes	156	51·1	103	50·5	494	46·6	10	50·0	401	51·0	362	45·0	570	50·1	193	42·7	349	48·5	201	49·6	145	43·0	68	53·1
	Never	80	26·2	49	24·0	195	18·4	4	20·0	181	23·0	147	18·3	251	22·1	77	17·0	145	20·0	94	23·2	63	18·7	26	20·3
p values									<0·001*				<0·001*				<0·001*								0·042*
Support from colleagues	Always	116	38·0	78	38·2	538	50·7	7	35·0	338	43·0	401	49·9	488	42·9	251	55·5	334	46·4	163	40·1	192	57·0	50	39·1
	Sometimes	161	52·8	112	54·9	449	42·3	9	45·0	387	49·2	344	42·8	560	49·2	171	37·8	334	46·4	197	48·6	129	38·3	71	55·5
	Never	28	9·2	14	6·9	74	7·0	4	20·0	61	7·8	59	7·3	90	7·9	30	6·6	52	7·2	45	11·1	16	4·7	7	5·5
p values									<0·001*				0·021*				<0·001*								<0·001*
Sick leave if needed	Yes	212	69·5	141	69·1	708	66·7	11	55·0	517	65·8	555	69·0	752	66·1	320	70·8	501	69·6	246	60·0	227	67·4	98	76·6
	No	59	19·3	26	12·7	91	8·6	3	15·0	83	10·6	96	11·9	145	12·7	34	7·5	58	8·1	50	12·2	63	18·3	8	6·3
	Not applicable	34	11·1	37	18·1	262	24·7	6	30·0	186	23·7	153	19·0	241	21·2	98	21·7	161	22·4	109	26·9	47	13·9	22	17·2
p values									<0·001*				0·071				0·011*								<0·001*
Regular breaks	Yes	144	47·8	115	56·4	660	62·2	11	55·0	437	55·6	493	61·3	633	55º6	297	65·7	434	60·3	194	47·9	230	68·3	72	56·3
	No	161	52·8	89	43·6	401	37·8	9	45·0	349	44·4	311	38·7	505	44·4	155	34·3	286	39·7	211	52·1	107	31·8	56	43·8
p values									<0·001*				0·021*				<0·001*								<0·001*
24/7 rest facilities	Yes	51	16·7	25	12·3	183	17·2	4	20·0	122	15·5	141	17·5	188	16·5	75	16·6	131	18·2	80	19·8	40	11·9	12	9·4
	No	254	83·3	179	87·7	878	82·8	16	80·0	664	84·5	663	82·5	950	83·5	377	83·4	589	81·8	325	80·2	297	88·1	116	90·6
p values									0·351				0·279				0·972								0·002*
24/7 food facilities	Yes	38	12·5	29	14·2	152	14·3	7	35·0	110	14·0	116	14·4	163	14·3	63	13·9	107	14·9	63	15·6	52	15·4	4	3·1
	No	267	87·5	175	85·8	909	85·7	13	65·0	676	86·0	688	85·6	975	85·7	389	86·1	613	85·1	342	84·4	285	84·6	124	96·9
p values									0·049*				0·805				0·843								0·003*

Table 2: The association between institutional support measures and physical illness, change in anxiety levels, depression, and country Human Development Index (HDI). Pearson χ^2 tests have been used to derive p-values, statistically significant differences with a p-value of <0.05 have been flagged with *.

Table 3

		High HDI				Middle HDI				Low HDI			
Access to:		p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper
PPE	Always												
	Sometimes	0·389	1·14	0·84	1·55	0·179	0·80	0·58	1·11	0·000*	5·87	2·91	11·84
	Never	0·002*	2·39	1·36	4·20	0·982	0·99	0·51	1·92	0·000*	18·30	7·46	44·87
	Prefer not to answer	0·645	1·30	0·42	4·02	0·087	2·51	0·87	7·20	0·009*	8·10	1·69	38·92
Training on PPE use	Yes												
	No	0·000*	1·85	1·37	2·51	0·481	1·13	0·80	1·61	0·785	1·07	0·67	1·70
	Prefer not to answer	0·957	1·03	0·38	2·75	0·261	1·72	0·67	4·41	0·786	0·82	0·20	3·38
Well being guardian	Yes												
	No	0·000*	2·41	1·58	3·65	0·814	1·05	0·69	1·60	0·769	1·10	0·57	2·11
	I don't know	0·096	1·42	0·94	2·16	0·000*	0·41	0·26	0·65	0·114	0·56	0·27	1·15
Occupational health	Yes and accessible												
	Yes but difficult to access	0·918	0·98	0·67	1·44	0·767	0·93	0·58	1·49	0·198	0·59	0·26	1·32
	No	0·059	1·52	0·98	2·34	0·000*	4·21	2·66	6·65	0·000*	5·00	2·55	9·81
	I don’t know	0·002*	2·01	1·30	3·10	0·000*	3·38	2·05	5·57	0·029*	2·39	1·09	5·23
Mental health/pastoral services	Yes												
	No	0·000*	2·39	1·68	3·40	0·001*	1·97	1·33	2·92	0·000*	3·36	1·82	6·20
	I don't know	0·707	1·08	0·71	1·65	0·020*	1·73	1·09	2·73	0·001*	3·34	1·68	6·65
Support from managers	Always												
	Sometimes	0·076	0·71	0·49	1·04	0·061	0·69	0·47	1·02	0·152	0·65	0·36	1·17
	Never	0·001*	0·41	0·25	0·68	0·017*	0·53	0·31	0·89	0·002*	0·29	0·13	0·63
Support from colleagues	Always												
	Sometimes	0·488	0·89	0·63	1·24	0·007*	0·61	0·42	0·87	0·601	0·87	0·52	1·46
	Never	0·838	1·06	0·60	1·89	0·002*	0·32	0·16	0·67	0·212	0·52	0·18	1·46
Sick leave if needed	Yes												
	No	0·705	1·09	0·69	1·72	0·000*	2·67	1·72	4·15	0·023*	0·38	0·17	0·88
	Not applicable	0·090	1·32	0·96	1·82	0·095	0·71	0·48	1·06	0·154	0·67	0·38	1·16
Regular breaks	Yes												
	No	0·018*	1·41	1·06	1·86	0·007*	0·64	0·47	0·89	0·787	1·06	0·68	1·65
24/7 rest facilities	Yes												
	No	0·610	0·91	0·63	1·31	0·003*	2·00	1·26	3·16	0·268	1·48	0·74	2·99
24/7 food facilities	Yes												
	No	0·149	0·75	0·50	1·11	0·028*	0·61	0·39	0·95	0·033*	3·27	1·10	9·68

Table 3: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures, the reference values are for very high HDI countries, statistically significant differences with a p-value of <0.05 have been flagged with *, OR= odds ratio, Lower= lower limit of 95% confidence interval, Upper= upper limit of 95% confidence interval

Global impact of COVID19 on Surgeons and Team members (Global COST) study

Message for participants

As the COVID-19 pandemic wreaked havoc over the globe, it forced us to consider alternative approaches to undertake our practice.

We aim to investigate the impact of COVID19 on surgeons and allied health professionals worldwide, of all specialities; on their career, family and home life as well as overall well-being- mentally, physically (including access to PPE) and financially.

The procedure involves filling an online survey that will take approximately 10 minutes. Your participation in this research study is voluntary. You may choose not to participate. Your details will be kept confidential. All data will be stored in a password protected electronic format.

If you have any questions about the research study, please contact Dr Mohamed A. Imam (Email: M.Imam@UEA.ac.uk).

Staring the survey indicates
• you have read the above information
• you voluntarily agree to participate
• you are a surgeon (consultant or trainee), surgical assistant, anaesthetist (consultant or trainee), operating department practitioner or scrub/theatre nurse, currently in practice.

Objectives

To collect data on the following aspects of health amongst surgeons and allied health care professionals during the COVID 19 pandemic across the world:

- Information and training on COVID19 as a disease, personal protective equipment, managing (potential) COVID positive patients
- Physical health (COVID and non-COVID related illness during this time) and access to PPE and testing
- Mental health as per validated anxiety (GAD-7) and depression (PHQ-9) scores
- Financial and family well being
- Access to support in the form of occupational health, mental health and pastoral services as well as facilities for rest and food as outlined by British Medical Association Guidelines

Unique Points

To our knowledge, no other study is collecting data on all these dimensions of health simultaneously, using all parts of the validated mental health scoring systems outlined above, for the surgical health workforce on a global scale, as well as looking at available support resources within institutions.

Inclusion Criteria

The survey can be completed by all surgeons, surgical assistants, anaesthetists, operating department practitioners or scrub/theatre nurses within all surgical specialities currently in practice.

Study Period

The survey will be disseminated through a number of platforms including national surgical societies and trainee societies to reach as many people as possible globally over a period of 3 months.

Approvals

The study has been endorsed by the Royal College of Surgeons COVID Research Group.

Analysis

Data will be analysed through Microsoft Excel Software by members of the Global COST steering committee, led by Mr M Imam.

Presentation

We aim to present this work at relevant national/international conferences- virtually if not physically- and publish this in a peer-reviewed journal with open access. This is with the intent that this information can be taken forwards to improve the working environment for staff at all healthcare institutions.

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3-4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4-5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	5
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5
		(*e*) Describe any sensitivity analyses	5

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4-6 Fig1
		(b) Give reasons for non-participation at each stage	5
		(c) Consider use of a flow diagram	Fig 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	5-6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	-
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	-
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-
		Cross-sectional study—Report numbers of outcome events or summary measures	6-9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-9
		(*b*) Report category boundaries when continuous variables were categorized	6-9
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	6-9
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	6-9
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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The Global impact of COVID-19 on Surgeons and Team members (GlobalCOST): A Cross-Sectional Study

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The Global impact of COVID-19 on Surgeons and Team members (GlobalCOST): A Cross-Sectional Study

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The Global impact of COVID-19 on Surgeons and Team members (GlobalCOST): A Cross-Sectional Study

ABSTRACT

Objectives- To investigate the impact of COVID-19 on the well-being of surgeons and allied health professionals as well as the support provided by their institutions.

Design- This cross-sectional study involved distributing an online survey through medical organisations, social media platforms, and collaborators.

Setting- It included all staff based in an operating theatre environment around the world.

Participants- 1590 complete responses were received from 54 countries between the 15th of July and 15th of December, 2020. The average age of participants was 30–40 years old, 64.9% were male, and 32.5% of a white ethnic background. 79.5% were surgeons with the remainder being nurses, assistants, anaesthetists, operating department practitioners, or classified other.

Main outcome measures- Participants that had experienced any physical illness, changes in mental health, salary or time with family since the start of the pandemic as well as support available based on recommendations by the British Medical Association.

Results- 32.0% reported becoming physically ill. This was more likely in those with reduced access to personal protective equipment (OR 4.62; CI 2.82 to 7.56; p<0.001) and regular breaks (OR 1.56; CI 1.18 to 2.06; p=0.002). Those with a decrease in salary (29.0%) were more likely to have an increase in anxiety (OR 1.50; CI 1.19 to 1.89; p=0.001) and depression (OR 1.84; CI 1.40 to 2.43; p<0.001) and those who spent less time with family (35.2%) were more likely to have an increase in depression (OR 1.74; CI 1.34 to 2.26; p<0.001). Only 36.0% had easy access to occupational health, 44.0% to mental health services, 16.5% to 24/7 rest facilities and 14.2% to 24/7 food and drink facilities. Fewer measures were available in countries with a low Human Development Index.

Conclusions- This work has highlighted a need and strategies to improve conditions for the healthcare workforce, ultimately benefiting patient care.

ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY

- An online anonymous survey was distributed worldwide through medical organisations, social media platforms, and collaborators
- The survey included questions about participant demographics, physical, mental, financial and family well-being, as well as support from their institutions
- Questions on mental health were based on validated scoring systems and those on support were based on published recommendations
- The main limitations of the study were that responses were only collected from healthcare professionals in an operating theatre environment and that many collaborators themselves were surgeons

INTRODUCTION

The COVID-19 outbreak can be traced back to Wuhan, China, where patients initially presented with pneumonia of unknown aetiology that led to a local-scale epidemiological alert on the 31st of December, 2019[1]. Thereafter, the World Health Organization (WHO) declared the outbreak "a public health emergency of international concern" on the 30th of January, 2020, due to an exponential rise in the number of cases as a result of human-to-human transmission[1]. On the 11th of March, 2020, the WHO then classified it as a pandemic[2]. To date, COVID-19 has infected over 167 million people worldwide and been linked to over 3.47 million deaths[3].

While advances have been made in the management and prevention of COVID-19, most notably via the advent and administration of vaccines[4], the impact of the COVID-19 pandemic on healthcare systems has been profound[5]. In particular, there has been a significant effect on surgical practice that is likely to have long-term consequences for patients and healthcare professionals, specifically due to the increasing backlog of elective surgery[6], the negative impact on surgical training[7], and the detrimental effect on overall mental health in both groups[8,9]. The need for psychological support for surgical staff has been noted[9], however, there is a paucity of literature on the impact of the COVID-19 pandemic on surgical team members' overall welfare, especially with regards to domains other than mental health, such as physical, financial, and family well-being.

Some previous studies on this topic have been limited to a single institution[9], a single country[10–12], or a single surgical speciality with a sole focus on surgeons' mental

health[12,13]. At present, the largest international study on the impact of workplace factors on the mental health of healthcare workers during the COVID-19 pandemic consists of 54.1% and 34.6% of responses from nurses and doctors, respectively, without a subgroup analysis of surgeons or surgical team members[14]. The British Medical Association (BMA) also found that 45% of doctors were suffering from "depression, anxiety, stress, burnout or other mental health conditions" pertaining to, or exacerbated by, COVID-19 and has therefore published recommendations to develop a long-term strategy to protect the well-being of healthcare staff[15]. This includes the need for adequate Personal Protective Equipment (PPE) along with training on its use as well as support services and facilities.

This study is the largest, international cross-sectional survey that explores the impact of the COVID-19 pandemic on the physical, mental, financial, and family well-being of surgeons and allied health professionals, including anaesthetists, nurses, assistants, and operating department practitioners. It has also investigated the support available to healthcare professionals as per BMA recommendations to help identify areas for improvement.

METHODS

Study design and participants

This international, cross-sectional study has been reported according to STROBE guidelines. An online anonymous and voluntary survey was created on SurveyGizmo (now known as Alchemer) and distributed worldwide through medical organisations including the royal colleges of surgeons and other allied health professionals in various countries, social media platforms, and collaborators. Collaborator status was given to any participant who was also able to gain 50 additional responses using a personalised link to the survey through which the number of responses gained could be tracked. Collaborators and the steering committee of this project form the OrthoGlobe Collaborative. One collaborator in Brazil was able to translate the form into Portuguese to increase the response rate from this region. Responses were collected over a five-month period, from the 15th of July to the 15th of December, 2020, from healthcare professionals currently in practice and based in an operating theatre environment, namely surgeons and anaesthetists at consultant, trust grade or trainee level, assistants, nurses, and operating department practitioners. Ethics approval was not required for this study according to the Integrated Research Application System for the Health Research Authority. It had been approved and endorsed by the Royal College of Surgeons England COVID Research Group.

Variables and outcomes

The survey consisted of three main sections: demographics, well-being, and support. The first, demographics, included questions on age, gender, ethnicity (with options presented in line with the United Kingdom (UK)'s Office for National Statistics)[16], marital status, role, grade, and country. The options for grade were headed with UK-centric terms but each covers its counterparts from other countries. Consultants are synonymous with attendings, trainees with residents and interns and trust grade doctors with all other doctors that fall outside of the previously mentioned titles. The second section included questions about physical, mental, financial, and family well-being since the start of the pandemic. Participants were asked if they had experienced any physical illness with or without COVID related symptoms and all the questions on the Generalised Anxiety Disorder Assessment (GAD-7) and Patient Health Questionnaire (PHQ-9) to generate scores for anxiety and depression, respectively[17,18]. For this group of questions on anxiety and depression, participants were asked to answer for a time two weeks before the start of the pandemic and after. They were also asked if they had experienced a decrease in salary and time spent with family between the time just before the start of the pandemic and now, the time at which this questionnaire was being filled out. The final section on support included questions based on recommendations by the BMA on improving the mental health and well-being of the medical workforce[15,19], specifically the availability and accessibility of PPE training on its use, a well-being guardian, occupational and mental/pastoral health services, support from managers and colleagues, sick leave regular breaks, and 24 hours/seven days a week (24/7) rest and food facilities.

Study size and statistical methods

Assuming that an average of 29.6% of healthcare workers had anxiety and 29.7% had depression[20], the study would require a minimum sample size of 321 to estimate the expected proportion with 5% absolute precision and 95% confidence. The IBM Statistical Package for the Social Sciences (SPSS) version 26 for windows (IBM Corp) was used to perform Pearson χ^2 tests to compare the majority of variables, which were categorical[21]. The only continuous variables were scores for anxiety and depression. The difference between scores for a time period before and after the start of the pandemic were used to categorise the responses into "increased" or "decreased/no change". Ethnicities were further grouped into "white" and

"other" and countries were categorised into four according to their Human Development Index (HDI): very high, high, middle, and low as described by the United Nations[22]. Multivariable regression models were used to explore the relationships between variables while accounting for potential confounders. Model coefficients are presented as odds ratios (OR) with 95% confidence intervals (CI). 724 of 2314 responses had failed to provide key or outcome data so were not included in the final analysis (Figure 1). A small number of participants selected "prefer not to answer" where this was available. This has been included as a separate category in the analyses.

Public and Patient Involvement: There was no public or patient involvement in this study.

RESULTS

Participants

1590 complete responses came from 54 countries from the 15th of July to the 15th of December 2020. The average age of participants was between 30 and 40 years old. 1032 (64.9%) were male and 516 (32.5%) of a white ethnic background. 1141 (71.8%) were married or in a relationship. 1265 (79.5%) were surgeons at consultant, trainee, or trust grade level, 98 (6.2%) nurses, 86 (5.4%) assistants, 66 (4.2%) anaesthetists at consultant, trainee, or trust grade level, 27 (1.7%) operating department practitioners, and 48 (3.0%) classified as other. The latter included perfusionists, radiographers, managerial, and administrative staff. Of the surgeons and anaesthetists combined, 680 (51.1%) were consultants, 588 (44.2%) trainees, and 63 (4.7%) trust grade doctors. 720 (45.3%) participants came from a very high HDI country, 405 (25.5%) a high HDI country, 337 (21.2%) a middle HDI country, and 128 (8.1%) a low HDI country.

Main results

Demographics and well-being

Figure 2 shows the proportion of participants who had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and a decrease in time spent with family. At the time the questionnaire was being answered, 746 (46.9%) had a score greater than 5 indicating mild to severe anxiety, based on the Generalised Anxiety Disorder Assessment (GAD-7). 716 (45.0%) had a score greater than 5 indicating mild to severe depression, based on the Patient Health Questionnaire (PHQ-9).

Between a time two weeks before the start of the pandemic and after, there was a significant increase in mean scores for anxiety (2.24 [CI= 2.01–2.46]) ($p<0.0001$) and depression (4.22 [CI= 3.98–4.46]).

Pearson χ^2 tests (shown in Table 1 of the Appendix) indicate a significant difference in physical illness across age groups ($p=0.013$), ethnicities ($p<0.001$), and occupations ($p=0.010$). Anxiety scores differ across ethnicities ($p<0.001$) and depression scores across age groups, ($p=0.007$), gender ($p<0.001$), ethnicities ($p<0.001$), marital status ($p<0.001$), and occupations ($p=0.003$). The difference in the number of participants with a decrease in salary is significant across age, gender, ethnicity, marital status, and occupational groups (all $p<0.001$) as is a decrease in time spent with family across age, marital status, and occupational groups (all $p<0.001$).

Support measures and well-being

Figure 3 shows the proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities.

Pearson χ^2 tests (shown in Table 2 of the Appendix) indicate a significant difference in physical illness and access to PPE, training in its use, occupational health and mental health services, support from managers and colleagues, sick leave when needed, regular breaks (all $p<0.001$), and 24/7 food facilities ($p=0.049$). The presence of an increase in anxiety differs significantly with access to PPE ($p=0.002$), a well-being guardian ($p<0.001$), occupational health ($p<0.001$), mental health services ($p=0.018$), support from managers ($p<0.001$), support from colleagues ($p=0.02$), and regular breaks ($p=0.021$). The presence of an increase in depression differs significantly with access to PPE ($p<0.001$), a well-being guardian ($p=0.021$), occupational health ($p=0.004$), support from managers and colleagues ($p=0.021$), sick leave if needed ($p=0.011$), and regular breaks ($p<0.001$). There was a significant difference in the availability of all support measures across country HDI groups, all with p-values of less than 0.050.

Multivariable analyses

The results of multivariable analyses to determine risk factors for physical illness, mental illness and decrease in salary and time with family are shown in Table 1. Multivariable analyses looking into the effect of country HDI on access to supportive measures are shown in figure 4 (and Table 3 of the Appendix).

		Physical illness								Mental illness								Decrease in salary				Decrease in time spent with family			
		COVID symptoms				No COVID symptoms				Increase in anxiety				Increase in depression											
		p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper
Age	<30 years old																								
	30 - 40 years old	0·235	1·23	0·88	1·72	0·379	0·84	0·57	1·23	0·774	0·96	0·74	1·25	0·241	1·19	0·89	1·60	0·041*	0·73	0·55	0·99	0·583	1·08	0·82	1·14
	41- 50 years old	0·604	0·90	0·60	1·35	0·115	0·69	0·43	1·09	0·094	0·77	0·57	1·05	0·944	1·01	0·72	1·42	0·528	0·90	0·64	1·26	0·823	0·96	0·70	1·33
	51- 60 years old	0·363	0·79	0·48	1·31	0·222	0·71	0·41	1·23	0·736	1·06	0·74	1·53	0·717	1·08	0·72	1·62	0·201	0·77	0·51	1·15	0·651	1·09	0·75	1·60
	Above 60 years old	0·449	0·72	0·31	1·68	0·116	0·37	0·11	1·28	0·557	1·21	0·64	2·28	0·487	1·30	0·62	2·74	0·354	1·37	0·70	2·68	0·729	1·12	0·58	2·18
Sex	Male																								
	Female	0·821	1·03	0·78	1·37	0·589	0·91	0·66	1·27	0·447	1·09	0·88	1·35	0·217	1·17	0·91	1·49	0·229	0·89	0·69	1·13	0·173	1·17	0·93	1·47
	Prefer not to answer	0·764	1·25	0·29	5·40	..	..	..	..	0·377	1·90	0·46	7·85	0·543	0·63	0·14	2·77	0·748	1·27	0·29	5·47	0·217	2·38	0·60	9·39
Ethnicity	White																								
	Other	0·081	1·31	0·97	1·78	0·162	1·29	0·90	1·83	0·000*	0·67	0·53	0·84	0·012	0·72	0·56	0·93	0·112	1·11	0·95	1·57	0·002*	0·69	0·55	0·88
Marital Status	Single/Divorced/Widowed/Other																								
	Married/In a relationship	0·270	0·84	0·62	1·14	0·917	0·98	0·68	1·41	0·471	0·92	0·72	1·16	0·000*	0·72	0·44	0·79	0·533	1·09	0·82	1·45	0·005*	0·70	0·55	0·90
Role	Consultant																								
	Trainee	0·59	1·10	0·79	1·53	0·91	0·98	0·65	1·46	0·32	0·88	0·68	1·13	0·08	1·30	0·97	1·74	0·000*	0·28	0·21	0·37	0·000*	2·80	2·16	3·63
	Trust Grade Doctor	0·20	1·58	0·78	3·18	0·010*	2·48	1·24	4·94	0·98	1·01	0·59	1·72	0·001*	3·16	1·57	6·74	0·001*	0·33	0·18	0·62	0·46	1·25	0·69	2·25
	Nurse	0·67	1·14	0·63	2·06	0·10	1·68	0·91	3·10	0·96	1·01	0·65	1·57	0·78	1·07	0·66	1·75	0·000*	0·24	0·14	0·432	0·002*	2·05	1·32	3·21
	Surgical Assistant	0·75	1·10	0·60	2·02	0·37	1·36	0·70	2·68	0·67	1·11	0·69	1·77	0·06	1·72	0·98	3·05	0·011*	0·52	0·31	0·86	0·07	1·58	0·97	2·57
	Operating Department Practitioner	0·93	0·95	0·30	2·97	0·31	1·73	0·60	5·00	0·08	0·48	0·21	1·10	0·22	1·90	0·68	5·33	0·007*	0·18	0·05	0·62	0·06	2·13	0·96	4·71
	Other	0·80	0·89	0·35	2·26	0·06	2·11	0·97	4·62	0·35	1·35	0·73	2·50	0·53	1·24	0·63	2·47	0·000*	0·18	0·08	0·44	0·10	1·69	0·91	3·14
Access to:																									
PPE	Always																								
	Sometimes	0·008*	1·53	1·11	2·09	0·165	1·29	0·90	1·84	0·003*	1·41	1·12	1·78	0·000*	1·62	1·26	2·09								
	Never	0·000*	4·61	2·82	7·56	0·000*	3·45	1·92	6·22	0·113	1·40	0·92	2·11	0·228	1·33	0·84	2·12								
	Prefer not to answer	..	..	..	..	0·577	0·70	0·21	2·42	0·083	0·46	0·19	1·11	0·040*	0·42	0·18	0·96								
Training on PPE use	Yes																								
	No	0·236	0·83	0·61	1·13	0·254	0·81	0·56	1·17	0·924	0·99	0·78	1·25	0·275	0·86	0·66	1·12								
	Prefer not to answer	0·528	1·39	0·50	3·83	0·055	2·45	0·98	6·13	0·758	1·12	0·54	2·31	0·613	1·25	0·53	2·93								
Regular breaks	Yes																								
	No	0·002*	1·56	1·18	2·06	0·340	1·17	0·85	1·62	0·205	1·15	0·93	1·43	0·139	1·21	0·94	1·54								
24/7 rest facilities	Yes																								
	No	0·952	0·99	0·67	1·45	0·076	1·56	0·96	2·56	0·355	1·15	0·85	1·55	0·972	1·01	0·72	1·41								
24/7 food facilities	Yes																								
	No	0·590	1·12	0·73	1·72	0·315	0·78	0·48	1·26	0·742	0·95	0·69	1·30	0·615	0·91	0·63	1·31								
Decrease in salary	No																								
	Yes	0·615	0·92	0·68	1·26	0·142	0·76	0·52	1·10	0·001*	1·50	1·19	1·89	0·000*	1·84	1·40	2·43								
Decrease in time with family	No																								
	Yes	0·040*	1·34	1·01	1·78	0·089	1·33	0·96	1·84	0·74	1·22	0·98	1·53	0·000*	1·74	1·34	2·25								

Table 1: Multivariable analyses to determine risk factors for physical illness, mental illness and decrease in salary and time with family, p-values <0.05 flagged with a *, OR= odds ratio, Lower= lower limit of 95% confidence interval, Upper= upper limit of 95% confidence interval

Physical illness

Physical illness with COVID related symptoms was significantly more likely, according to the OR, in those with reduced access to PPE, regular breaks and time with family. Physical illness without COVID related symptoms was more likely in trust grade doctors compared to consultants and those with reduced access to PPE.

Mental illness

An increase in anxiety score was less likely in the other ethnicity group and more likely with a decrease in salary. An increase in depression score was less likely if married or in a relationship and more likely if a trust grade doctor rather than a consultant, experiencing a decrease in salary, or less time with family.

Salary and time with family

The 30–40 age group was less likely to experience a decrease in salary as was any role or occupation other than a consultant. The other ethnicity group and those married or in a relationship were less likely to have a decrease in time spent with family. Trainees and nurses were more likely than consultants to experience a decrease in time with family.

Country HDI and support measures

Participants from a country with a low Human Development Index were significantly less likely to have access to PPE (OR 18.30; CI 7.46–44.87; p<0.001), occupational health (OR 4.997; CI 2.55–9.81; p<0.001), mental health services (OR 3.36; CI 1.82–6.20; p<0.001), and 24/7 food facilities but more likely to have support from managers (OR 0.29; CI 0.13–0.63; p=0.002) and access to sick leave when needed (OR 0.38; CI 0.17–0.88; p=0.023) compared to a very high HDI country.

DISCUSSION

Overall, 1590 complete responses from surgical team members across 54 countries were obtained and the following domains were analysed: physical health, including illness related and unrelated to COVID-19; mental health as per validated anxiety (GAD-7) and depression

(PHQ-9) scores; financial and family well-being; and access to PPE along with training in its use, support in the form of access to a well-being guardian, occupational health, mental health/pastoral services, support from managers and colleagues, sick leave, regular breaks, as well as facilities for rest and food.

Almost a third of respondents had become physically ill since the start of the pandemic, of which over half were due to COVID-19 symptoms. Physical illness was more likely in those with reduced access to PPE and regular breaks, which is in keeping with the well-documented risk factors for developing a coronavirus infection[23]. There are a range of consequences when healthcare workers become physically ill, especially if they require sick leave as this can have a knock-on effect on the remaining staff, who will have to work short-staffed or have to work unplanned shifts[24]. In the context of surgical teams, this can also have a subsequent impact on planned operations and service provision.

Validated scoring systems were used to show that 45% were suffering from mild to severe depression and 47% with mild to severe anxiety. The scores were significantly higher than a self-reported time two weeks before the start of the pandemic. The prevalence of mild-severe depression and anxiety in this study are similar to the upper limits of 8.9-50.4% and 14.5-44.6% respectively reported in a recently published review on the impact of COVID-19 on the mental health of healthcare workers, formed of 24 studies of which the majority were also based on validated scoring systems[20].

An increase in anxiety score was less likely in the other ethnicity group, an unexpected result in the light of a known higher death rate from COVID-19 amongst other ethnic groups but one that may be influenced by the fact that this group was less likely to have experienced a decrease in time spent with family[25]. An increase in depression score was less likely if married or in a relationship and more likely in those who spent less time with family, consistent with the literature as widely recognised protective factors[11]. An increase in depression score was more likely if the participant was a trust grade doctor rather than a consultant. This could be due to the fact that more junior doctors were likely to experience redeployment and a change of clinical duties which has now been linked to an increased risk of depression[14], as well as a decrease in time spent with family.

Understandably, those with a decrease in salary were more likely to have an increase in anxiety and depression scores, likely due to the added financial burden and impact on their personal lives. The 30–40 age group was less likely to experience a decrease in salary as was any role

or occupation other than a consultant as consultants, generally of an older age group, were likely to work less due to the suspension of non-urgent elective surgeries and private practice[6]. Other aspects of physical and mental health, such as fatigue, stress and drug consumption, and other potential risk factors, including whether participant's were involved in the care of patients with COVID-19, could have been investigated, however, this would have made the questionnaire considerably longer and a possible hindrance to complete responses.

An analysis of supportive measures has highlighted an association between HDI and the availability of resources. However, where support from managers and access to sick leave when needed was more likely in lower HDI countries, this may be accounted for by contextual factors, such as understaffing and guilt from taking time off work, that were not considered in this study[26]. Recommendations from the BMA were used as a standard on a global scale because there were no other widely accessible guidelines on health workforce support measures for institutions at the time the questionnaire was constructed. Another limitation is the fact that the great majority of participants were surgeons. The idea to distribute the survey to staff in an operating theatre environment to balance covering a range of cadres with feasibility and ease may have contributed to this. Most of the collaborators collecting responses were also surgeons who may have been inclined to distribute surveys to their own colleagues. The response rate could have also been improved by translating the questionnaire into more languages from English than just Portuguese and considering a lack of internet access in certain areas, however, this would have increased the time taken to conduct the study significantly. Despite this, the study forms a large, international, multi-speciality, multi-disciplinary, cross-sectional assessment of the overall well-being of surgical team members and the support available to them.

Improving staff well-being is invaluable. Adverse events, including medical errors, are a leading cause of death and disability worldwide, costing 64 million disability adjusted life years annually, with a major contributor being human factors[27]. . Hence, it would be in the interest of public health to implement measures that improve well-being for healthcare professionals, who can then provide better patient care.

CONCLUSION

In conclusion, this international cross-sectional study has established the negative impact of COVID-19 on the holistic well-being of surgical team members. It is the first to assess the

availability of and access to supportive measures at institutions on a global scale. This can form the basis of quality improvement projects at the local level to raise the overall standards of working conditions for healthcare professionals, which will inevitably have a positive effect on the care of patients.

OTHER

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Competing interests: All authors declare no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Data sharing: All data collected for this study, excluding participant names and contact details, will be made available with the study protocol on https://orthoglobe.org/Projects with the publication

Author statement: ZJ, AN, CHAY, AS and MAI designed and planned the study, ZJ, SR, AS, SL, AN, CFAY, AS, NB, RF, HA, RH, NQ, BS, PAB, AH, AN, AJ, MAI and all OrthoGlobe Collaborators acquired data by distributing the survey and collecting responses, ZJ, SR, AS, SL, AN, NB, RF and MAI analysed and interpreted the data, ZJ, SR and NB wrote up the study and ZJ, SR, AS, SL, AN, CFAY, AS, NB, RF, HA, RH, NQ, BS, PAB, AH, AN, AJ and MAI reviewed and approved the final manuscript.

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FIGURE LEGENDS

Figure 1: Flow chart illustrating response recruitment

Figure 2: The proportion of participants (%) that had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and time spent with family

Figure 3: The proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities

Figure 4: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures. Marker represents odds ratio and bars the 95% confidence interval, *=$p<0.05$ (statistically significant)

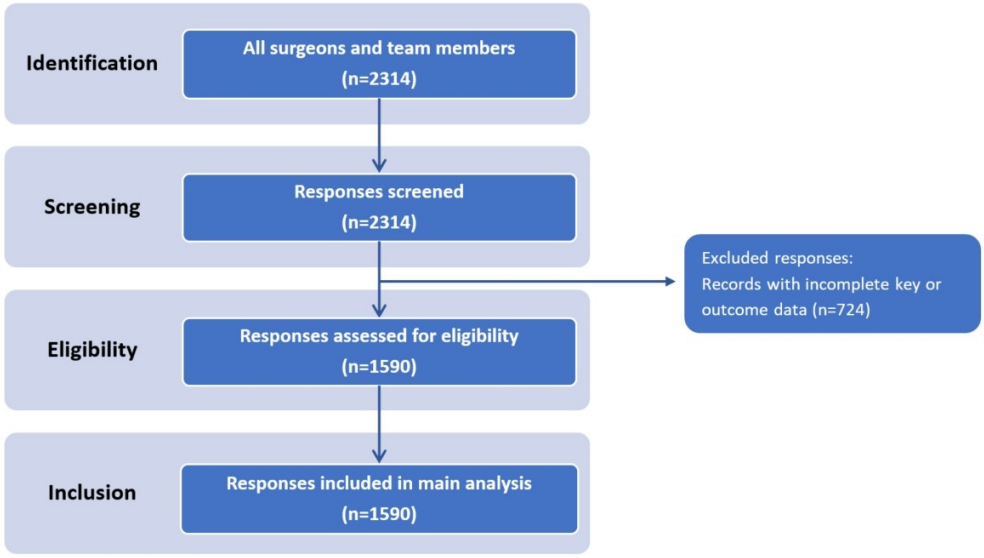

Figure 1: Flow chart illustrating response recruitment

49x28mm (600 x 600 DPI)

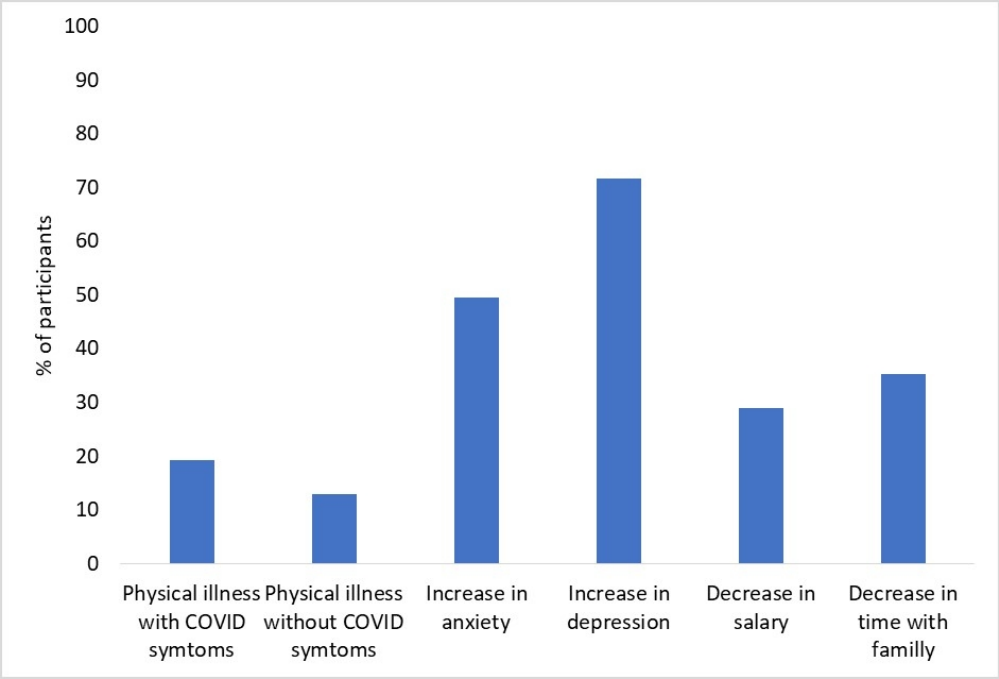

Figure 2: The proportion of participants (%) that had become physically ill with or without COVID related symptoms, an increase in anxiety and depression scores, a decrease in salary, and time spent with family

39x27mm (600 x 600 DPI)

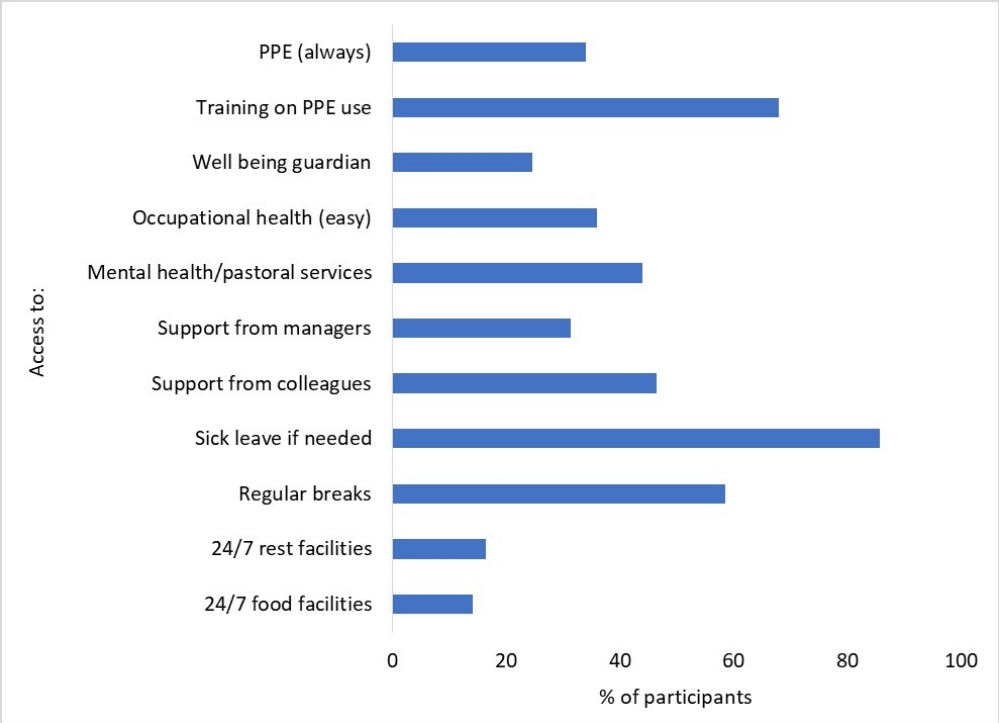

Figure 3: The proportion of participants that had access to different support measures including always having access to PPE, access to training on its use, a well-being guardian, easy access to occupational health, access to mental health/pastoral services, support from managers, support from colleagues, sick leave when needed, regular breaks, 24/7 rest facilities, and 24/7 food and drink facilities

41x30mm (600 x 600 DPI)

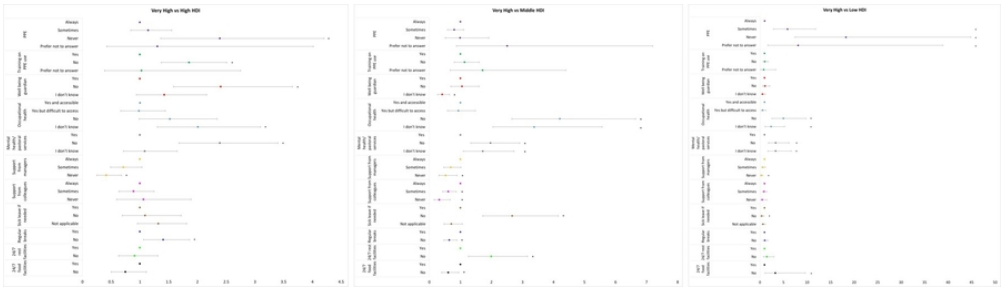

Figure 4: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures. Marker represents odds ratio and bars the 95% confidence interval, *=p<0.05 (statistically significant)

76x21mm (300 x 300 DPI)

Appendix

Table 1

		Physical illness								Increase in anxiety				Increase in depression				Decrease in salary				Decrease in time spent with family			
		COVID symptoms		No COVID symptoms		No		Prefer not to answer		Yes		No		Yes		No		Yes		No		Yes		No	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Age	<30 years old	99	32·5	56	27·5	244	23·0	7	35·0	202	25·7	204	25·4	313	27·5	93	20·6	60	18·7	320	28·3	199	35·6	207	20·0
	30 - 40 years old	117	38·4	85	41·7	416	39·2	9	45·0	309	39·3	318	39·6	455	40·0	172	38·1	116	36·0	461	40·8	216	38·6	411	39·9
	41- 50 years old	60	19·7	39	19·1	221	20·8	4	20·0	150	19·1	174	21·6	219	19·2	105	23·2	80	24·9	209	18·5	90	16·1	234	22·7
	51- 60 years old	26	8·5	20	9·8	141	13·3	0	0·0	97	12·3	90	11·2	122	10·7	65	14·4	49	15·2	117	10·4	43	7·7	144	14·0
	Above 60 years old	3	1·0	4	2·0	39	3·7	0	0·0	28	3·6	18	2·2	29	2·5	17	3·8	17	5·2	22	1·9	11	2·0	35	3·4
p values									0·013*				0·386				0·007*				0·001*				<0·001*
Sex	Male	199	65·2	124	60·8	695	65·5	14	70·0	491	62·5	541	67·0	699	61·4	333	73·7	210	72·7	697	61·7	350	62·6	682	66·1
	Female	103	33·8	79	38·7	361	34·0	6	30·0	291	37·0	258	32·1	434	38·1	115	25·4	77	26·7	426	37·7	205	36·7	344	33·4
	Prefer not to answer	3	1·0	1	0·5	5	0·5	0	0·0	4	0·5	5	0·6	5	0·4	4	0·9	2	0·7	6	0·5	4	0·7	5	0·5
p values									0·782				0·116				<0·001*				<0·001*				0·335
Ethnicity	Arab	39	12·8	37	18·1	126	11·9	3	15·0	111	14·1	94	11·7	173	15·2	32	7·1	37	13·0	145	12·8	61	10·9	144	14·0
	Asian	96	31·5	55	27·0	389	36·7	11	55·0	239	30·4	312	38·8	358	31·5	193	42·7	108	38·0	376	33·3	183	32·7	368	35·7
	Black/African/Caribbean	41	13·4	22	10·8	69	6·5	2	10·0	56	7·1	78	9·7	70	6·2	64	14·2	11	3·9	116	10·3	50	8·9	84	8·1
	Mixed/Multiple	40	13·1	30	14·7	96	9·0	1	5·0	80	10·2	87	10·8	134	11·1	33	7·3	36	12·6	109	9·7	61	10·0	106	10·0
	White	83	27·2	59	28·9	371	35·0	3	15·0	289	36·8	227	28·2	389	34·2	127	28·1	88	30·8	374	33·1	200	35·8	316	30·6
	Any other	6	2·0	1	0·5	10	0·9	0	0·0	11	1·4	6	0·7	14	1·2	3	0·7	5	1·7	9	0·8	4	0·7	13	1·3
p values									0·001*				0·001*				0·001*				<0·001*				0·162
Marital Status	Married/In a relationship	203	66·6	144	70·6	782	73·7	12	60·0	557	70·9	584	72·6	779	68·5	362	80·1	223	78·3	780	69·1	352	63·0	789	76·5
	Single/Divorced/Widowed/Other	102	33·4	60	29·4	279	26·3	8	40·0	229	29·1	220	27·4	359	31·5	90	19·9	62	21·7	349	30·9	207	37·0	242	23·5
p values									0·056				0·433				<0·001*				<0·001*				<0·001*
Occupation	Consultant	112	36·7	72	35·3	492	46·4	4	20·0	344	43·8	336	41·8	452	39·8	228	50·4	183	64·0	385	34·1	161	28·8	519	50·3
	Trainee	135	44·3	72	35·3	370	34·9	11	55·0	279	35·5	309	38·4	441	38·8	147	32·5	65	22.8	483	42·8	281	50·3	307	29·8
	Trust Grade Doctor	13	4·3	14	6·9	36	3·4	0	0·0	29	3·7	34	4·2	52	4·6	11	2·2	8	2·8	50	4·4	17	3·0	46	4·5
	Nurse	18	5·9	17	8·3	61	5·7	2	10·0	51	6·5	47	5·8	69	6·1	29	6·4	15	3·3	83	7·4	40	7·2	58	5·6
	Surgical Assistant	17	5·6	13	6·4	54	5·1	2	10·0	46	5·9	40	5·0	68	6·0	18	4·0	24	5·2	62	5·5	30	5·4	56	5·4
	Operating Department Practitioner	4	1·3	5	2·5	18	1·7	0	0·0	10	1·3	17	2·1	22	1·9	5	1·1	3	0·7	24	2·1	12	2·1	15	1·5
	Other	6	2·0	11	5·4	30	2·8	1	5·0	27	3·4	21	2·6	34	3·0	14	3·1	6	1·3	42	3·7	18	3·2	30	2·9
p values									0·010*				0·548				0·003*				<0·001*				<0·001*

Table 1: The association between demographic characteristics and physical illness with and without COVID related symptoms, change in anxiety levels, depression, salary, and time with family. Pearson χ^2 tests have been used to derive p-values, statistically significant differences with a p value of <0.05 have been flagged with *.

Table 2

		Physical illness								Increase in anxiety				Increase in depression				Country Human Development Index (HDI)							
Access to:		COVID symptoms		No COVID symptoms		No		Prefer not to answer		Yes		No		Yes		No		Very high		High		Middle		Low	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPE	Always	74	24·3	60	29·4	405	38·2	4	20·0	242	30·8	301	37·4	355	31·2	188	41·6	279	38·8	113	27·9	141	41·8	10	7·8
	Sometimes	182	59·7	115	56·4	583	54·9	13	65·0	472	60·1	421	52·4	678	59·6	215	47·6	402	55·8	238	58·8	163	48·4	90	70·3
	Never	49	16·1	25	12·3	50	4·7	1	5·0	64	8·1	61	7·6	91	8·0	34	7·5	31	4·3	47	11·6	22	6·5	25	19·5
	Prefer not to answer	0	0·0	4	2·0	23	2·2	2	10·0	8	1·0	21	2·6	14	1·2	15	3·3	8	1·1	7	1·7	11	3·3	3	2·3
p values									<0·001*				0·002*				<0·001*								<0·001*
Training on PPE use	Yes	206	67·5	141	69·1	725	69·3	9	45·0	529	67·3	552	68·7	775	68·0	306	67·7	555	77·1	219	54·1	228	67·7	79	61·7
	No	93	30·5	54	26·5	320	30·2	7	35·0	240	30·5	234	29·1	337	29·6	137	30·3	153	21·3	178	44·0	97	28·8	46	35·9
	Prefer not to answer	6	2·0	9	4·4	16	1·5	4	20·0	17	2·2	18	2·2	26	2·6	9	2·0	12	1·3	8	2·0	12	3·6	3	2·3
p values									<0·001*				0·823				0·911								<0·001*
Well being guardian	Yes	71	23·3	50	24·5	267	25·2	3	15·0	154	19·6	237	29·5	262	23·0	129	28·5	218	30·0	55	13·6	95	28·2	23	18·0
	No	151	49·5	82	40·2	437	41·2	6	30·0	355	45·2	321	39·9	506	44·5	170	37·6	213	29·6	220	54·3	168	49·9	75	58·6
	I don't know	83	27·2	72	35·3	357	33·6	11	55·0	277	35·2	246	30·6	370	32·5	153	33·8	289	40·1	130	32·1	74	22·0	30	23·4
p values									0·051				<0·001*				0·021*								<0·001*
Occupational health	Yes and accessible	89	29·2	70	34·3	408	38·5	6	30·0	232	29·5	341	42·4	385	33·8	188	41·6	341	47·4	108	26·7	99	29·4	25	19·5
	Yes but difficult to access	70	23·0	49	24·0	199	18·8	2	10·0	180	22·9	140	17·4	251	22·1	69	15·3	179	24·9	91	22·5	39	11·6	11	8·6
	No	113	37·0	52	25·5	265	25·0	5	25·0	218	27·7	217	27·0	316	27·8	119	26·3	97	13·5	125	30·6	141	41·8	72	56·3
	I don't know	33	10·8	33	16·2	189	17·8	7	35·0	156	19·8	106	13·2	186	16·3	76	16·8	103	14·3	81	20·0	58	17·2	20	15·6
p values									<0·001*				<0·001*				0·004*								<0·001*
Mental health/pastoral services	Yes	120	39·3	80	39·2	495	46·7	8	40·0	324	41·2	379	47·1	487	42·8	216	47·8	423	58·8	130	32·1	126	37·4	24	18·8
	No	143	46·9	92	45·1	388	36·6	2	10·0	336	42·7	289	39·9	466	40·9	159	35·8	176	24·4	216	53·3	156	46·3	77	60·2
	I don't know	42	13·9	32	15·7	178	16·8	10	50·0	126	16·0	136	16·9	185	16·3	77	17·0	121	16·8	59	14·6	55	16·3	27	21·1
p values									<0·001*				0·018*				0·096								<0·001*
Support from managers	Always	69	22·6	52	25·5	372	35·1	6	30·0	204	26·0	295	36·7	317	27·9	182	40·3	226	31·4	110	27·2	129	38·8	34	26·6
	Sometimes	156	51·1	103	50·5	494	46·6	10	50·0	401	51·0	362	45·0	570	50·1	193	42·7	349	48·5	201	49·6	145	43·0	68	53·1
	Never	80	26·2	49	24·0	195	18·4	4	20·0	181	23·0	147	18·3	251	22·1	77	17·0	145	20·0	94	23·2	63	18·7	26	20·3
p values									<0·001*				<0·001*				<0·001*								0·042*
Support from colleagues	Always	116	38·0	78	38·2	538	50·7	7	35·0	338	43·0	401	49·9	488	42·9	251	55·5	334	46·4	163	40·1	192	57·0	50	39·1
	Sometimes	161	52·8	112	54·9	449	42·3	9	45·0	387	49·2	344	42·8	560	49·2	171	37·8	334	46·4	197	48·6	129	38·3	71	55·5
	Never	28	9·2	14	6·9	74	7·0	4	20·0	61	7·8	59	7·3	90	7·9	30	6·6	52	7·2	45	11·1	16	4·7	7	5·5
p values									<0·001*				0·021*				<0·001*								<0·001*
Sick leave if needed	Yes	212	69·5	141	69·1	708	66·7	11	55·0	517	65·8	555	69·0	752	66·1	320	70·8	501	69·6	246	60·0	227	67·4	98	76·6
	No	59	19·3	26	12·7	91	8·6	3	15·0	83	10·6	96	11·9	145	12·7	34	7·5	58	8·1	50	12·2	63	18·3	8	6·3
	Not applicable	34	11·1	37	18·1	262	24·7	6	30·0	186	23·7	153	19·0	241	21·2	98	21·7	161	22·4	109	26·9	47	13·9	22	17·2
p values									<0·001*				0·071				0·011*								<0·001*
Regular breaks	Yes	144	47·8	115	56·4	660	62·2	11	55·0	437	55·6	493	61·3	633	55º6	297	65·7	434	60·3	194	47·9	230	68·3	72	56·3
	No	161	52·8	89	43·6	401	37·8	9	45·0	349	44·4	311	38·7	505	44·4	155	34·3	286	39·7	211	52·1	107	31·8	56	43·8
p values									<0·001*				0·021*				<0·001*								<0·001*
24/7 rest facilities	Yes	51	16·7	25	12·3	183	17·2	4	20·0	122	15·5	141	17·5	188	16·5	75	16·6	131	18·2	80	19·8	40	11·9	12	9·4
	No	254	83·3	179	87·7	878	82·8	16	80·0	664	84·5	663	82·5	950	83·5	377	83·4	589	81·8	325	80·2	297	88·1	116	90·6
p values									0·351				0·279				0·972								0·002*
24/7 food facilities	Yes	38	12·5	29	14·2	152	14·3	7	35·0	110	14·0	116	14·4	163	14·3	63	13·9	107	14·9	63	15·6	52	15·4	4	3·1
	No	267	87·5	175	85·8	909	85·7	13	65·0	676	86·0	688	85·6	975	85·7	389	86·1	613	85·1	342	84·4	285	84·6	124	96·9
p values									0·049*				0·805				0·843								0·003*

Table 2: The association between institutional support measures and physical illness, change in anxiety levels, depression, and country Human Development Index (HDI). Pearson χ^2 tests have been used to derive p-values, statistically significant differences with a p-value of <0.05 have been flagged with *.

Table 3

		High HDI				Middle HDI				Low HDI			
Access to:		p values	OR	Lower	Upper	p values	OR	Lower	Upper	p values	OR	Lower	Upper
PPE	Always												
	Sometimes	0·389	1·14	0·84	1·55	0·179	0·80	0·58	1·11	0·000*	5·87	2·91	11·84
	Never	0·002*	2·39	1·36	4·20	0·982	0·99	0·51	1·92	0·000*	18·30	7·46	44·87
	Prefer not to answer	0·645	1·30	0·42	4·02	0·087	2·51	0·87	7·20	0·009*	8·10	1·69	38·92
Training on PPE use	Yes												
	No	0·000*	1·85	1·37	2·51	0·481	1·13	0·80	1·61	0·785	1·07	0·67	1·70
	Prefer not to answer	0·957	1·03	0·38	2·75	0·261	1·72	0·67	4·41	0·786	0·82	0·20	3·38
Well being guardian	Yes												
	No	0·000*	2·41	1·58	3·65	0·814	1·05	0·69	1·60	0·769	1·10	0·57	2·11
	I don't know	0·096	1·42	0·94	2·16	0·000*	0·41	0·26	0·65	0·114	0·56	0·27	1·15
Occupational health	Yes and accessible												
	Yes but difficult to access	0·918	0·98	0·67	1·44	0·767	0·93	0·58	1·49	0·198	0·59	0·26	1·32
	No	0·059	1·52	0·98	2·34	0·000*	4·21	2·66	6·65	0·000*	5·00	2·55	9·81
	I don’t know	0·002*	2·01	1·30	3·10	0·000*	3·38	2·05	5·57	0·029*	2·39	1·09	5·23
Mental health/pastoral services	Yes												
	No	0·000*	2·39	1·68	3·40	0·001*	1·97	1·33	2·92	0·000*	3·36	1·82	6·20
	I don't know	0·707	1·08	0·71	1·65	0·020*	1·73	1·09	2·73	0·001*	3·34	1·68	6·65
Support from managers	Always												
	Sometimes	0·076	0·71	0·49	1·04	0·061	0·69	0·47	1·02	0·152	0·65	0·36	1·17
	Never	0·001*	0·41	0·25	0·68	0·017*	0·53	0·31	0·89	0·002*	0·29	0·13	0·63
Support from colleagues	Always												
	Sometimes	0·488	0·89	0·63	1·24	0·007*	0·61	0·42	0·87	0·601	0·87	0·52	1·46
	Never	0·838	1·06	0·60	1·89	0·002*	0·32	0·16	0·67	0·212	0·52	0·18	1·46
Sick leave if needed	Yes												
	No	0·705	1·09	0·69	1·72	0·000*	2·67	1·72	4·15	0·023*	0·38	0·17	0·88
	Not applicable	0·090	1·32	0·96	1·82	0·095	0·71	0·48	1·06	0·154	0·67	0·38	1·16
Regular breaks	Yes												
	No	0·018*	1·41	1·06	1·86	0·007*	0·64	0·47	0·89	0·787	1·06	0·68	1·65
24/7 rest facilities	Yes												
	No	0·610	0·91	0·63	1·31	0·003*	2·00	1·26	3·16	0·268	1·48	0·74	2·99
24/7 food facilities	Yes												
	No	0·149	0·75	0·50	1·11	0·028*	0·61	0·39	0·95	0·033*	3·27	1·10	9·68

Table 3: Multivariable analyses looking into the effect of country Human Development Index (HDI) on access to supportive measures, the reference values are for very high HDI countries, statistically significant differences with a p-value of <0.05 have been flagged with *, OR= odds ratio, Lower= lower limit of 95% confidence interval, Upper= upper limit of 95% confidence interval

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3-4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4-5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	5
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5
		(*e*) Describe any sensitivity analyses	5

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4-6 Fig1
		(b) Give reasons for non-participation at each stage	5
		(c) Consider use of a flow diagram	Fig 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	5-6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	-
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	-
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-
		Cross-sectional study—Report numbers of outcome events or summary measures	6-9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-9
		(*b*) Report category boundaries when continuous variables were categorized	6-9
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	6-9
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	6-9
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.