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## COVID-19

## The global level of harm among surgical professionals during the COVID-19 pandemic: A multinational cross-sectional cohort study



Mohamed Abouelazayem, MSc, MRCS<sup>a,b</sup>, Yirupaiahgari K.S. Viswanath, MS, FRCS<sup>c,\*</sup>, Ali Haider Bangash, BSc<sup>d</sup>, Johnn Henry Herrera Kok, MD<sup>e</sup>, Chandra Cheruvu, MS, FRCS<sup>f</sup>, Chetan Parmar, MS, DNB, FRCS<sup>g</sup>, Semra Demirli Atici, MD<sup>h</sup>, Wah Yang, MD<sup>i</sup>, Michail Galanis, MD<sup>j</sup>, Francesco Di Maggio, FRCS<sup>k</sup>, Arda Isik, MD<sup>l</sup>, Samik Kumar Bandyopadhyay, MRCS, MS, FNBMNMA<sup>m</sup>

<sup>a</sup> Department of Surgery, St George's University Hospitals NHS Foundation Trust, London, UK

<sup>b</sup> Department of Surgery, National Cancer Institute, Cairo University, Egypt

<sup>c</sup> Department of Surgery, The James Cook University Hospital, Middlesbrough, UK

<sup>d</sup> STMU Shifa College of Medicine, Islamabad, Pakistan

<sup>e</sup> Department of General and Digestive Surgery, Complejo Asistencial Universitario de León, Spain

<sup>f</sup> Department of Surgery, University Hospital North Midlands, Stoke-on-Trent, UK

<sup>g</sup> Department of Surgery, Whittington Health NHS Trust, London, UK

<sup>h</sup> Department of Surgery, University of Health Sciences Tepecik Training and Research Hospital, Izmir, Turkey

<sup>i</sup> Department of Metabolic and Bariatric Surgery, The First Affiliated Hospital of Jinan University, Guangzhou, China

<sup>j</sup> Department of Surgery, University Hospital Bielefeld, Germany

<sup>k</sup> Department of Surgery, Barking Havering and Redbridge University Hospital NHS Trust, Romford, UK

<sup>l</sup> Department of Surgery, Istanbul Medeniyet University, Turkey

<sup>m</sup> Department of Surgery, Shrewsbury and Telford Hospital NHS Trust, Shrewsbury, UK

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## ABSTRACT

**Background:** Health care workers, including surgical professionals, experienced psychological burnout and physical harm during the coronavirus 2019 pandemic. This global survey investigated the coronavirus 2019 pandemic impact on psychological and physical health.

**Methods:** We conducted a global cross-sectional survey between February 18, 2021 and March 13, 2021. The primary outcome was to assess the psychological burnout, fulfillment, and self-reported physical level of harm. A validated Stanford Professional Fulfillment Index score with a self-reported physical level of harm was employed. We used a practical overall composite level of harm score to calculate the level of harm gradient 1–4, combining psychological burnout with self-reported physical level of harm score.

**Results:** A total of 545 participants from 66 countries participated. The final analysis included 520 (95.4%) surgical professionals barring medical students. Most of the participants (81.3%) were professionally unfulfilled. The psychological burnout was evident in 57.7% and was significantly common in those <50 years ( $P = .002$ ) and those working in the public sector ( $P = .005$ ). Approximately 41.7% of respondents showed changes in the physical health with self-remedy and no impact on work, whereas 14.9% reported changes to their physical health with <2 weeks off work, and 10.1% reported changes in physical health requiring >2 weeks off work. Severe harm (level of harm 4) was detected in 10.6%, whereas moderate harm (level of harm 3) affected 40.2% of the participants. Low and no harm (level of harm 2 and level of harm 1) represented 27.5% and 21.7%, respectively.

**Conclusion:** Our study showed that high levels of psychological burnout, professional unfulfillment, work exhaustion, and severe level of harm was more frequent in younger professionals working in the public sector. The findings correlated with a high level of harm in surgical professionals impacting surgical services.

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M. Abouelazayem and Y.K.S. Viswanath contributed equally to this research article.

\* Reprint requests: Yirupaiahgari K.S Viswanath, MS, FRCS, South Tees Hospitals NHS Foundation Trust, James Cook University Hospital, Marton Road, Middlesbrough, Cleveland TS43BW, UK.

E-mail address: [keyhole1234@gmail.com](mailto:keyhole1234@gmail.com) (Y.K.S. Viswanath);

Twitter: [@YKSViswanath](https://twitter.com/YKSViswanath)

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## Introduction

Surgical professionals are prone to physical and psychological harm and occupational burnout in the course of their routine job.<sup>1</sup> This may be due to long working hours in high-intensity environments. News of mortality among surgeons due to COVID-19, lack of protective equipment, transfer to other hospital areas, and cessation of surgical services have further impacted surgeons during the pandemic.<sup>2</sup> However, the extent of the psychological and physical harm among surgical professionals due to the pandemic is unclear.

Occupational burnout is a condition that results from unmanaged and chronic stress related to work. It is characterized by physical and emotional exhaustion, withdrawal from work, and decreased efficacy.<sup>3</sup> Other associated components include decreased judgment, a feeling of ineffectiveness, and depersonalization with colleagues and patients. The consequences of these can be severe for both the professionals and the patients. If the COVID-19 pandemic is resulting in more occupational harm, it would be useful to understand it so that appropriate safeguards can be developed.

In this study, we hypothesized that the surgical workforce has sustained significant psychological and physical harm during the pandemic all over the globe. We aimed to assess the psychological and the physical repercussions of the pandemic on surgical professionals globally using standardized tools.

## Methods

### Ethics

We conducted a global survey of surgical professionals. We used the NHS Health Research Authority online decision tool<sup>4</sup> to detect the need for ethical approval. The decision was that this survey does not need NHS REC (research ethics committee) approval. The data were anonymized, and standard data safeguards were followed.

### Setting

A steering committee of 12 international surgical faculty was formed from TUGS<sup>5</sup> (The Upper Gastrointestinal Surgeons). This committee examined published validated scores covering medical or surgical professionals' burnout. A few validated psychological scores such as GAD-7 (Generalized Anxiety Disorder 7),<sup>6</sup> Beck Anxiety Inventory (BAI),<sup>7</sup> and SPFI (Stanford Professional Fulfillment Index)<sup>8</sup> were considered. Finally, SPFI, a 16-item validated questionnaire that includes burnout (work exhaustion and interpersonal disengagement) and professional fulfillment, was adopted. The score also assesses the innate reward such as happiness, self-control, and satisfaction that an individual draws from work.

We defined a surgical professional as one who performed, assisted, or obtained training in surgery during the pandemic. Because the SPFI does not measure physical harm, we added 1 question to the survey to assess this component and named it Self-Reported Physical Level of Harm (SRPLH).

We developed a composite score by combining the outcome of psychological burnout from SPFI and the SRPLH to reach the Overall Composite Level of Harm Score (OCLHS). The OCLHS has 4 levels of harm (LH) ranging from 1 (LH 1, no harm) to 4 (LH 4, severe harm).

### Survey design

The final survey was only available in the English language and consisted of 3 parts: demographic questions, the SPFI questionnaire, and the self-reported physical level of harm (SRPLH)

question. Demographic questions included age, gender, country of practice, professional role, the scope of practice (public or private hospital setups), subspecialty, on-call duties, and redeployment outside the everyday workplace.

SPFI consists of 16 items: 6 measure professional fulfillment and 10 cover work exhaustion and interpersonal disengagement for burnout. Response options are on a 5-point Likert scale (0–4), from “not at all true” to “completely true” for professional fulfillment items and “not at all” to “extremely” for work exhaustion and interpersonal disengagement items. The SPFI and SRPLH questions are presented in [Appendix S1](#) (a and b), and the OCLHS interpretation is shown in [Appendix E1c](#).

### Study propagation

This cross-sectional survey was kept open for a total of 24 days (Feb 18 to Mar 13, 2021) and was conducted using SurveyMonkey.<sup>9</sup> An e-mail was sent out to all members of the TUGS Global Community inviting them to participate in the survey. The study was advertised, and the link to the survey was shared on the official accounts of TUGS on Twitter, Facebook, LinkedIn, and WhatsApp groups. The steering committee aided the dissemination by sharing the study invitation on their social media accounts and networks.

### Statistics

All scores were calculated by averaging each item score of all responses; the weighted average was then estimated for each of the 16 queries, followed by further analysis. The psychological burnout (PB), as a dichotomized variable, was calculated for each respondent using Microsoft Excel. The recommended cut-off points of 1.33 and 3.0 was adopted to calculate PB and professional fulfillment.

The obtained final data, excluding medical students, were analyzed using the Statistical Package for the Social Sciences (SPSS) (v. 26). Descriptive characteristics were presented as ratios and percentages. The  $\chi^2$  test was employed with a 2-sided *P*-value <.05 regarded as significant.

## Results

### Demographics of surgical professionals

The study included 545 surgical professionals (including students on surgical placements) from 66 countries in 14 surgical specialties. General surgery represented 82.9% of the sample ([Figure 1, A and B](#)). The male-to-female ratio was approximately 4:1, with males being 79.5% ( $n = 433$ ). Consultants represented 54.7% ( $n = 298$ ) of the group, whereas trainees accounted for 38% ( $n = 207$ ) and allied health care professionals and students represented 7.4% ( $n = 40$ ) of the participants. Junior surgical staff ( $n = 222$ ) were considered any staff below the level of consultant or equivalent, excluding medical students.

Most of the participants (88.7%,  $n = 483$ ) were <50 years old. More than half of the respondents were based in the public sector (63.4%,  $n = 346$ ), and the majority (86.2%,  $n = 470$ ) participated in on-call emergency duties.

Nearly all (92.3%,  $n = 503$ ) of those who responded to the survey were working in a hospital admitting COVID patients, and about half of them (45.7%,  $n = 249$ ) were redeployed into areas outside their usual scope of practice. Approximately 42.2% ( $n = 230$ ) had to self-isolate at some time without being infected by COVID-19. Demographics of the participants are presented in [Table 1](#). The students ( $n = 25$ ) were excluded from the analysis hereafter, leaving 520 participants for further analysis. PB was calculated in a

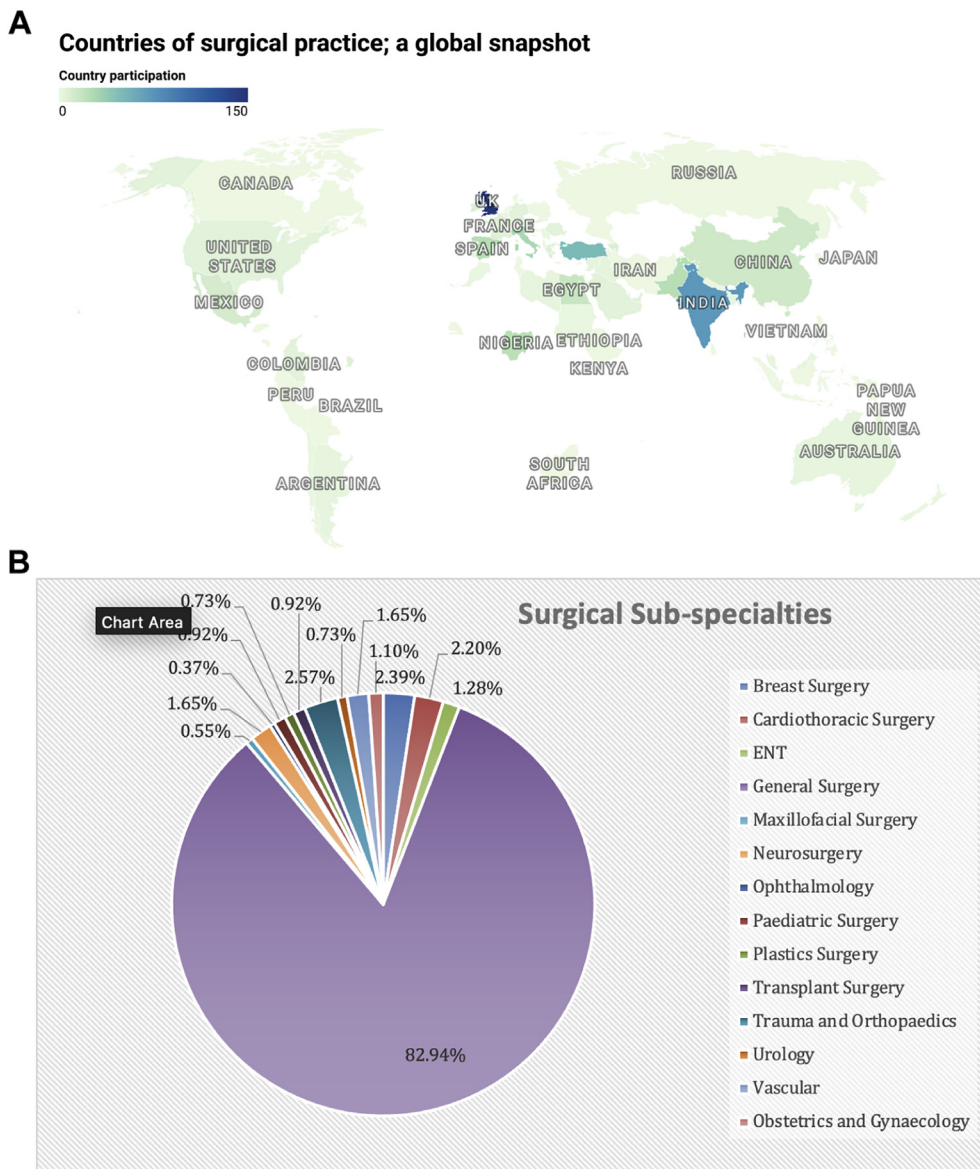


Figure 1. (A) Surgical professionals' country of origin. (B) Surgical subspecialties.

dichotomized fashion followed by “level of harm” determination as per the methodology mentioned earlier.

2 weeks ( $P < .001$ ). PU was significantly associated with PB ( $P < .001$ ) and the scope of practice ( $P = .002$ ).

*Professional unfulfillment (PU)*

*Work exhaustion (WE)*

Approximately 81.3% ( $n = 423$ ) of surgical professionals showed professional unfulfillment. Of those who were professionally fulfilled, 72% ( $n = 70$ ) were consultants ( $P < .001$ ), and 78% ( $n = 76$ ) were <50 years old ( $P = .001$ ). Approximately 73.5% of those less than 50 years old ( $n = 382$ ) exhibited professional unfulfillment ( $P = .001$ ). As much as 85.4% ( $n = 281$ ) of those who reported working in the public sector only were professionally unfulfilled against 77.8% ( $n = 91$ ) of those who reported working in both the public and private sector and 68.9% ( $n = 51$ ) of those who reported working in the private sector only ( $P = .002$ ).

In total, 69.6% of the surgical professional respondents ( $n = 362$ ) reported work exhaustion. Only 8% of those surgical professionals who experienced WE ( $n = 29$ ) were more than 50 years of age ( $P < .001$ ). A total of 63.9% of those who did not experience WE ( $n = 101$ ) were consultants ( $P = .04$ ). As much as 63.9% of those who were calculated not to be experiencing WE ( $n = 101$ ) reported not being deployed outside their scope of work during the COVID-19 pandemic ( $P = .001$ ). An overwhelming 89.2% of those with WE ( $n = 323$ ) suffered professional unfulfillment ( $P > .001$ ), whereas 87.3% of those without WE ( $n = 138$ ) were calculated to be comfortable with interpersonal engagement ( $P > .001$ ). A 60.8% of those who did not experience WE ( $n = 96$ ) reported no physical level of harm ( $P < .001$ ). The scope of practice did not exhibit a statistically significant relation with WE ( $P = .12$ ).

Redeployment outside the scope of work exhibited a statistically insignificant relationship with PU ( $P = .3$ ). Professionals suffering from professional unfulfillment were more likely to report changes to their physical health and necessitate time off work for more than

**Table 1**  
Basic demographics, roles, and specialties

Variable	No. (%)
Sex	
Male	433 (79.45)
Female	112 (20.55)
Age	
<35	208 (38.17)
35–50	275 (50.46)
>50	62 (11.38)
Role	
Consultant/equivalent	298 (54.6)
Senior trainee/equivalent	170 (31.2)
Junior trainee/equivalent	37 (6.8)
Allied health professional	15 (2.75)
Student	25 (4.6)
Scope of practice	
Public sector	346 (63.49)
Private sector	76 (13.94)
Both	123 (22.57)
Subspecialty	
General/upper GI/lower GI surgery	452 (82.94)
Trauma and orthopedics	14 (2.57)
Breast surgery	13 (2.39)
Cardiothoracic surgery	12 (2.2)
Others	54 (9.9%)

GI, gastrointestinal.

### Interpersonal disengagement (ID)

Nearly 63% of the respondents ( $n = 327$ ) were comfortable with interpersonal engagement. A total of 92.2% of those who experienced ID ( $n = 178$ ) were <50 years old ( $P = .02$ ). Only 9.3% of those who experienced ID ( $n = 18$ ) reported practicing in the private sector ( $P = .04$ ). A total of 58.4% of those who did not experience ID ( $n = 191$ ) reported no deployment outside their scope of work during the COVID-19 pandemic ( $P = .002$ ). Approximately 92.7% of those who suffered from ID ( $n = 179$ ) were professionally unfulfilled ( $P < .001$ ), and 89.6% ( $n = 173$ ) of them reported WE ( $P < .001$ ). Only 6.4% of those who did not suffer from ID ( $n = 21$ ) reported a change in their physical health requiring time off more than 2 weeks ( $P < .001$ ).

### Psychological burnout (PB)

Approximately 58% of the surgical professionals ( $n = 300$ ) experienced PB. Approximately 63% of those not experiencing PB ( $n = 140$ ) were consultants ( $P = .02$ ). In total, 44% of surgical professionals experiencing PB ( $n = 132$ ) reported a change in their physical health requiring self-remedy. However, this did not impact their surgical work ( $P < .001$ ) (Table II).

### The self-reported physical level of harm (SRPLH)

No changes to physical health were reported by 33.4% of the participants, whereas 41.7% showed changes in physical health with self-remedy and no impact on work. Professionals who reported changes to their physical health with <2 weeks off work represented 14.9%, whereas 10.1% reported changes in physical health requiring >2 weeks off work. SRPLH was not associated with the professional role ( $P = .174$ ) or gender ( $P = .18$ ). Professional fulfillment ( $P < .001$ ) was significantly related to the SRPLH. In contrast, on-call duties ( $P = .27$ ) and scope of practice ( $P = .47$ ) exhibited a statistically insignificant relationship with SRPLH.

### Overall Composite Level of Harm Score (OCLHS)

Severe harm (LH4) was detected in 10.6%, whereas moderate harm (LH3) affected 40.2% of the participants. Low harm and no harm levels (LH2 and LH1) represented 27.5% and 21.7%, respectively.

OCLHS was not related to the professional role ( $P = .09$ ), gender ( $P = .13$ ), scope of practice ( $P = .68$ ), or on-call duties ( $P = .21$ ). In total, 95% ( $n = 53$ ) of professionals showing the highest OCLHS were less than 50 years old ( $P < .001$ ). An 89% of professionals showing the highest OCLHS ( $n = 49$ ) were calculated to be experiencing professional unfulfillment ( $P < .001$ ) (Table III).

### Discussion

This study is one of the most extensive global studies assessing the impact of the pandemic on surgeon burnout and physical health across all surgical specialties. Most of the respondents (81.3%) reported professional unfulfillment. Approximately 69.6% reported work exhaustion, and 58% reported psychological burnout.

A recent study<sup>10</sup> from Singapore showed that about 51% of surgeons in one general hospital reported professional fulfillment. This difference can be explained by the fact that our study was conducted later in the pandemic and by the global reach of our research, which included countries of different economic levels and health care systems.

Studies have also reported PB among surgeons before the pandemic. A large study<sup>11</sup> in 2009 surveyed 7,905 surgeons and reported burnout in 40% of the participants. Another study<sup>12</sup> compared burnout in surgical oncologists to other surgical specialties and reported burnout rates at 36.1% and 39.8%, respectively. In our research, PB was evident in 57.7% of the surgical professionals. We believe a higher percentage in our study was due to the pandemic. This is almost twice compared to a burnout rate of 29.5% reported by Dobson et al,<sup>13</sup> using the SPFL. At the same time, it is worth noting that this was a study among Australian health care workers and included specialties other than surgery.

Another global survey by Tan et al<sup>14</sup> investigated the effect of the pandemic on the psychological health of surgeons and reported depression, anxiety, and stress in 32.8%, 30.8%, and 25.9%, respectively, in the study population ( $n = 3391$ ). However, they used the Depression Anxiety Stress Scale–21 (DASS-21) and the Impact of Event Scale–Revised (IES-R) scores. The apparent increase in burnout rates seen in our study compared to the prepandemic levels is quite concerning, and the pandemic is not over yet.

Several studies have reported that female surgeons are more prone to burnout in the form of stress, anxiety, or depression during the COVID-19 pandemic. Tan et al<sup>14</sup> mentioned that females are 1.4 times more prone to depression than males, whereas Mavroudis et al<sup>15</sup> reported statistically significant higher stress levels among female surgeons regardless of parental status. Our study showed no difference in burnout between male and female surgeons. Our study shows that junior doctors were more affected by the pandemic. This may be due to the pandemic's impact on training and because they were more likely to have been redeployed.

### Strengths and limitations

This is the most extensive study examining the effect of the pandemic on the mental and physical health of surgeons using

**Table II**  
Analysis on PB

Variable	Descriptive*	Significance (P value) <sup>†</sup>
Sex	<ul style="list-style-type: none"> <li>Female: 64/300, (41/220)</li> <li>Male: 236/300, (179/220)</li> </ul>	.44 <sup>‡</sup>
Age	<ul style="list-style-type: none"> <li>Less than or equal to 50 years: 276/300, (182/220)</li> <li>More than 50 years: 24/300, (38/220)</li> </ul>	.002 <sup>†</sup>
Professional role	<ul style="list-style-type: none"> <li>Consultant/equivalent: 158/300, (140/220)</li> <li>Junior surgical staff: 141/300, (78/220)</li> </ul>	.02
Scope of practice	<ul style="list-style-type: none"> <li>Public sector (NHS, government or equivalent): 202/300, (127/220)</li> <li>Private sector: 30/300, (44/220)</li> <li>Both: 68/300, (49/220)</li> </ul>	.005
On-call duties	<ul style="list-style-type: none"> <li>No on-call duties: 27/300, (26/220)</li> <li>On-call duties: 272/300, (194/220)</li> </ul>	.40
Professional fulfillment	<ul style="list-style-type: none"> <li>Feeling professionally fulfilled: 27/300, (70/220)</li> <li>Feeling professionally unfulfilled: 273/300, (150/220)</li> </ul>	<.001 <sup>‡</sup>
Impact of the pandemic on physical health	<ul style="list-style-type: none"> <li>No changes to physical health: 59/300, (113/220)</li> <li>Changes to physical health requiring self remedy but without impacting either clinical or surgical work: 132/300, (84/220)</li> <li>Changes to physical health necessitating time off less than 2 weeks with an impact on clinical or surgical work: 65/300, (12/220)</li> <li>Changes to physical health necessitating time off more than 2 weeks with an impact on clinical or surgical work: 44/300, (11/220)</li> </ul>	<.001

PB, psychological burnout.

\* N, (n) = Ratio among those with burnout, (ratio among those with no burnout). Example: Out of 300 surgical professionals calculated to have burnout, 64 were females.

<sup>†</sup> P value indicated is asymptomatic significance (2-sided) for the Pearson  $\chi^2$  test unless stated otherwise.

<sup>‡</sup> P value indicated is exact significance (2-sided) for the Fisher's exact test.

**Table III**  
Analysis on OCLHS

Variable	Descriptive*	Significance (P value) <sup>†</sup>
Sex	<ul style="list-style-type: none"> <li>Female: 17/113, (33/143), (39/209), (16/55)</li> <li>Male: 96/113, (110/143), (170/209), (39/55)</li> </ul>	.13
Age	<ul style="list-style-type: none"> <li>Less than or 50 years: 84/113, (130/143), (192/209), (52/55)</li> <li>More than 50 years: 29/113, (13/143), (17/209), (3/55)</li> </ul>	<.001
Professional role	<ul style="list-style-type: none"> <li>Consultant/Equivalent: 73/113, (76/143), (123/209), (26/55)</li> <li>Junior Surgical Staff: 38/113, (66/143), (86/209), (29/55)</li> </ul>	.09
Scope of practice	<ul style="list-style-type: none"> <li>Public sector (NHS, government or equivalent): 71/113, (91/143), (132/209), (35/55)</li> <li>Private sector: 20/113, (23/143), (25/209), (6/55)</li> <li>Both: 22/113, (29/143), (52/209), (14/55)</li> </ul>	.68
On-call duties	<ul style="list-style-type: none"> <li>No on-call duties: 19/113, (12/143), (17/209), (5/55)</li> <li>On-call duties: 94/113, (131/143), (191/209), (50/55)</li> </ul>	.21
Professional fulfillment	<ul style="list-style-type: none"> <li>Feeling professionally fulfilled: 43/113, (29/143), (19/209), (6/55)</li> <li>Feeling professionally unfulfilled: 70/113, (114/143), (190/209), (49/55)</li> </ul>	<.001

OCLHS, Overall Composite Level of Harm Score.

\* N, (n) = Ratio among those with no harm, (ratio among those with moderate harm), (ratio among those with severe harm).

<sup>†</sup> P value indicated is asymptomatic significance (2-sided) for the Pearson  $\chi^2$  test.

standardized tools. Participation from many countries enables us to obtain a more global picture.

At the same time, this study has several weaknesses that need to be acknowledged. First of all, because of our survey distribution methodology, we cannot determine a response rate. However, we believe we have a representative sample given our sample size. It is, however, possible that those who were experiencing more ill effects of the pandemic were more likely to take part in this study.

Second, given the cross-sectional nature of our survey, we cannot make any deductions about the lasting effect of the pandemic. A further longitudinal qualitative study is required to assess the long-term impact of the pandemic on surgeons' mental health and burnout. Finally, using many statistical tests in this study should be considered exploratory for further, more focused examination.

In conclusion, our study showed high levels of psychological burnout, professional unfulfillment, and work exhaustion, and this was more frequent in younger professionals working in the public sector. The findings correlated with a high level

of harm (LH) in surgical professionals impacting surgical services.

#### Future implications

This study highlights a need to protect the psychological well-being of surgical professionals during the COVID-19 pandemic. Institutions must investigate it more seriously and safeguard the surgeon's well-being globally. More research is needed in this area to better understand the psychological and physical harm caused by the pandemic and to examine mitigating strategies.

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### Conflict of interest/Disclosure

All authors declare that they do not hold any disclosure, including direct or indirect financial or personal relationships, interests, and affiliations relevant to the article's subject matter that has occurred over the last 2 years or that are expected in the foreseeable future.

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### Supplementary materials

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