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The impact of COVID-19 on oncology professionals – one year on: lessons learned from the ESMO Resilience Task Force survey series

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HIGHLIGHTS

- Risk of distress and burnout amongst oncology professionals continues to worsen since COVID-19 despite improved job performance.
- Female and younger ($\leq$ 40 years old) colleagues continue to be at higher risk of poor well-being and feeling burnout.
- Job demands have increased, with nearly half now feeling overwhelmed with workload.
- Concerns regarding career development/training, job security and international fellowship opportunities remain high.
- A quarter of oncology professionals reported considering changing their career, including leaving the oncology profession.

ABSTRACT

Background

COVID-19 has had a significant impact on the well-being and job performance of oncology professionals globally. The ESMO Resilience Task Force collaboration set out to investigate and monitor well-being since COVID-19 in relation to work, lifestyle and support factors in oncology professionals one year on since the start of the pandemic.

Methods

An online, anonymous survey was conducted in February/March 2021 (Survey III). Key outcome variables included risk of poor well-being or distress (expanded Well-Being Index, eWBI), feeling burnout (single item from eWBI) and job performance since COVID-19. Longitudinal analysis of responses to the series of three surveys since COVID-19 was performed, and responses to job demands and resources questions were interrogated. SPSS V.26.0/V.27.0 and GraphPad Prism V9.0 were used for statistical analyses.

Results

Responses from 1269 participants from 104 countries were analysed in Survey III: 55% (*n* = 699/1269) female, 54% (*n* = 686/1269) >40 years, and 69% (*n* = 852/1230) of white ethnicity. There continues to be an increased risk of poor well-being or distress (*n* = 464/1169, 40%) and feeling burnout (*n* = 660/1169, 57%) compared Survey I (25% and 38% respectively, $P < 0.0001$), despite improved job performance. Compared to the initial period of the pandemic, more participants report feeling overwhelmed with workload (45% vs 29%, $P < 0.0001$). There remain concerns about the negative impact of the pandemic on career development/training (43%), job security (37%) and international fellowship opportunities (76%). Alarmingly, 25%

(*n* = 266/1086) are considering changing their future career with 38% (*n* = 100/266) contemplating leaving the profession.

Conclusion

Oncology professionals continue to face increased job demands. There is now significant concern regarding potential attrition in the oncology workforce. National and international stakeholders must act immediately and work closely with oncology professionals to draw up future-proof recovery plans.

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European Society for Medical Oncology (ESMO)

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Well-being

Burnout

Job performance

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INTRODUCTION

The discovery of the novel coronavirus SARS-CoV-2 in Wuhan, China in late December 2019 and the official declaration of the COVID-19 pandemic in March 2020, has triggered unprecedented changes to health systems worldwide, with cancer services being no exception.[1,2] Globally, oncology services have experienced significant disruption due to staff redeployment, deterioration in working conditions, reduction in oncology clinical trial and research ~~activity~~activities.[3-5] Additional temporising measures such as suspension of 'non-essential' palliative chemotherapy, cancer screening services, and favouring of less intensive treatment regimens have also impacted the nature of our work with potential for longer-term consequences.[6-9]

Since the COVID-19 pandemic, clinicians have been particularly challenged in their ability to provide cancer care to aspired standards with a concomitant diminution in meaningful professional activities.[4,5] All of this whilst also contending with the risk to personal safety at work from COVID-19 infection and associated morbidity.[5] The European Society for Medical Oncology (ESMO) Resilience Task Force launched a unique longitudinal series of global surveys since April 2020 to provide contemporary insights into the daily practice and well-being of oncology professionals during the COVID-19 pandemic. Our findings from Survey I conducted in April/May 2020 and survey II in July/August 2020 indicated that COVID-19 has had a detrimental impact on the lives of oncology professionals with rising rates of distress and burnout, and uncovered significant concerns regarding job security and their future outlook.[4,5] Here, we provide a further update one year on reporting on the key findings from Survey III conducted in February/March 2021.

METHODS

Survey design

Survey III followed on from the series of online global surveys designed by the ESMO Resilience Task Force, in collaboration with the ESMO Young Oncologists Committee, ESMO Women for Oncology Committee, ESMO Leaders Generation Programme Alumni members and the OncoAlert Network, launched at specific time-points during the course of the COVID-19 pandemic. Survey III was hosted on the Qualtrics platform (open from 9 February to 3 March 2021) and was available on the ESMO website, ESMO membership emails, and was promoted through social media. Participation was voluntary and anonymous. Participants who consented to longitudinal evaluation of their responses at different time-points of the survey series were assigned a trackable unique identifier code. The project was approved by the ESMO Executive Board.

Survey measures

Key outcome variables used throughout the survey series including risk of poor well-being or distress (expanded Well-Being Index, eWBI; score $\geq$ 4, at risk)[10,11], feeling burnout (single item from eWBI) and job performance since COVID-19 (JP-CV; score $\geq$ 3.5, favourable) have been previously described in detail.[4,5] In Survey III, we also added relevant questions regarding participants' perception of the COVID-19 situation in their respective country of work including lockdown restrictions and national vaccination programmes. Further questions about participants' personal experience of COVID-19, and their personal and professional future outlook were also included. In total, there were 38 closed response questions with one open text response question at the end of the survey.

Statistical analysis

~~In Survey III, we included data from all participants who consented and responded to key questions placed at the beginning of the survey on their perception of the current status of COVID-19 (trend, lockdown and vaccination) and provided basic demographic details including their country of work, in the final analysis.~~ Key outcome variables: eWBI, burnout and JP-CV were longitudinally compared to results from Surveys I[4] and II[5]. Chi-square analysis was used to compare categorical variables and paired or unpaired *t*-tests were used to analyse continuous variables. We also performed Chi-square test for trend when comparing proportions across time (Survey I vs Survey II vs Survey III, where data available). *P* values were two-tailed and were considered significant if <0.05. A series of cross-sectional between-subject analyses were also carried out in a subgroup of participants who completed all three surveys to examine relationships overtime. Descriptive data were presented as median (interquartile range, IQR) or mean ± standard deviation (SD), and proportions were expressed as a percentage (%). All statistical analyses were performed using SPSS V.26.0 or V.27.0 (IBM Corp., Armonk, NY) and data represented using GraphPad Prism V9.0 (GraphPad Software, San Diego, CA).

RESULTS

Participant demographics

A total of 1432 participants from 104 countries responded to the Survey III invitation. In the final analysis, we included data from all participants who consented and responded to key questions placed at the beginning of the survey on their perception of the current status of COVID-19 (trend, lockdown and vaccination) and provided basic demographic details including their country of work (*n* = 1269 (88.6%)).~~, of whom data provided by *n* = 1269~~

~~(88.6%) participants were included for final analysis as per criteria above.~~ The majority (*n* = 1158/1269, 91.3%) completed the survey to the end. The personal and professional demographic characteristics of Survey III participants are outlined in Table 1 and Supplementary Table S1. Overall, 55.1% (*n* = 699/1269) were female, 54.1% (*n* = 686/1269) over the age of 40 years, and 69.3% (*n* = 852/1230) of white ethnicity. Collectively, participants have a mean of 15 years of experience working in oncology, with Medical Oncology most represented (*n* = 905/1245, 72.7%). Trainees contributed to 22.1% (*n* = 281/1269) of responses. The majority of respondents were ESMO members (*n* = 1073/1238, 86.7%) and were from Europe (*n* = 854/1269, 67.3%) (Supplementary Table S1).

Personal experience with COVID-19

As the COVID-19 pandemic continues, majority of participants have encountered some form of lockdown restrictions in their region of work (Table 2). Almost all participants (*n* = 1250/1269, 98.5%) reported that a national vaccination programme against COVID-19 was underway, if not planned, and two-thirds (*n* = 849/1269, 66.9%) have personally had at least one dose of the vaccine when asked in February/March 2021 (Table 2).

More than a third of participants reported having regular asymptomatic testing for COVID-19 (*n* = 423/1082, 39.1%) (Table 2). A total of 160 participants (14.8%) have tested positive for COVID-19, of whom ten had required hospitalisation. Of those who had tested positive for COVID-19, around a third (*n* = 43/160, 26.9%) neither felt they had been given appropriate time to recover nor felt completely recovered upon their return to work (*n* = 60/160, 37.5%). By February/March 2021, one in five participants disclosed that they have had a work colleague who died of COVID-19 (*n* = 215/1079, 19.9%).

Ongoing changes in professional role and delivery of care

Work routine has yet to return to pre-COVID-19 situation for over half of participants (*n* = 578/1269, 52.3%). In Survey III, around a fifth of participants (*n* = 238/1107, 21.5%) were either partially or fully redeployed. Participants continued to report several changes to their professional roles and duties as detailed in Supplementary Table S2, with nearly half (*n* = 354/756, 46.8%) reporting an increase in overall hours of work. As expected, there remained an increased use of remote or virtual meetings and consultations (>80%). Of concern, over half of participants have reported a decrease in clinical trial activity (*n* = 392/648, 60.5%) and general research activity (*n* = 366/664, 55.1%). About two-thirds of participants (*n* = 708/1108, 63.9%) were worried that COVID-19 would have a negative impact on the quality of cancer research at their institution.

Well-being, burnout and resilience throughout the pandemic

Compared to Surveys I[4] and II[5], there were now significantly more participants who were at risk of poor well-being or distress (*n* = 464/1169, 39.7%) and feeling burnout (*n* = 660/1169, 56.5%) (Chi-square test for trend, $P < 0.0001$) (Figure 1a-b). These trends were confirmed in a longitudinal subgroup of *n* = 127 participants from 47 countries (50.0% female, 39.4% $\leq$ 40 years old and 69.3% of white ethnicity) who had completed all three surveys, in whom there was a progressive increase in the proportion of those at risk of poor well-being (20.5% vs 28.9% vs 31.6%, $P = 0.0516$) and feeling burnout (34.4% vs 47.9% vs 56.4%, $P = 0.0006$) (Supplementary Figure S1a-b). These observations are despite the perception of improved job performance, where JP-CV plateaued at around 50% since the Survey II time-point (Figure 1c and Supplementary Figure S1c). Of note, there appears to be sustained levels of

psychological resilience amongst participants throughout the pandemic (Supplementary Figure S2).

As gender and age were found to be significant predictors of risk of poor well-being in Survey I[4], we assessed whether this disparity persisted over the course of the COVID-19 pandemic. Female colleagues continued to be at higher risk of poor well-being [Odds Ratio (OR) 1.643 (95% CI 1.298-2.091), $P < 0.0001$] and feeling burnout [OR 1.859 (95% CI 1.469-2.342), $P < 0.0001$] (Figure 2). Similarly, younger ($\leq$ 40 years old) colleagues were also at continued risk of poor well-being [OR 1.987 (95% CI 1.562-2.519), $P < 0.0001$] and feeling burnout [OR 1.444 (95% CI 1.144-1.825), $P = 0.002$] (Figure 2).

Factors contributing to perception of increased job demands

We analysed responses to questions associated with job demands over the different time-points studied in this survey series to identify reasons which may have potentially contributed to worsening distress and burnout (Figure 3a). Chi-square test for trend was performed to compare responses to Survey I vs Survey II vs Survey III. Alarmingly, we observed that in general there has been a progressive increase in job demands, with considerable increases in the proportion of participants who have reported an increase in the perception of feeling overwhelmed with workload (29.1% vs 35.6% vs 45.2%, $P < 0.0001$) and overall working hours (16.7% vs 38.4% vs 46.8%, $P < 0.0001$) (Figure 3a). Moreover, more participants were now also burdened with increased COVID-19 inpatient work (13.6% vs 40.3% vs 58.1%, $P < 0.0001$) and COVID-19-related research (15.6% vs 58.7% vs 64.5%, $P < 0.0001$). Whilst the majority have continued to work in pleasant physical conditions, their concern for personal safety at

work due to COVID-19 has remained persistently high (78.3% vs 72.5% vs 63.0%, $P < 0.0001$) (Figure 3a).

Almost half (n = 527/1169, 45.1%) were reporting having inadequate time for personal and/or family life compared to 34.6% (n = 526/1520) and 43.0% (n = 405/942) in Surveys I[4] and II[5], respectively (Figure 3a). Moreover, the majority of participants in Survey III reported that they had not been able to take time off for annual leave or holidays (n = 650/1084, 60.0%), and/or study leave (n = 863/1084, 79.6%) (Figure 3a).

Personal and professional job resources currently available

In addition, we also interrogated several domains in terms of personal and professional resources and coping strategies available to participants which could potentially alleviate job demands (Figure 3b). Here, the main areas of concern were regarding job security and participants' support systems (Figure 3b). In particular, participants were concerned that the pandemic would have a negative impact on their personal job security (n = 386/1057, 36.5%). Only over a third of participants (n = 346/1023, 33.8%) were not concerned that the COVID-19 pandemic would have a negative impact on their personal career development/training, and very few were not concerned about international fellowship opportunities (n = 116/973, 11.9%) (Figure 3b).

Participants were questioned about their support systems, access to well-being support services, and the coping strategies they had been using to help themselves during the pandemic (details summarised in Figure 3b, and Supplementary Table S3). There has been a gradual decline in the proportion of participants who felt well-supported by the management

at their workplace since Survey I, with now less than half (*n* = 476/1058, 45.0%) feeling well-supported (Figure 3b). Similarly, their perception of support from global and/or national societies/groups and governments had declined over time (56.8% vs 50.7% vs 41.7%, *P* < 0.0001) (Figure 3b). Overall, in Survey III, 59.5% (*n* = 635/1068) reported having adequate resources to do their jobs (Figure 3b). There has also been a decrease in the proportion of participants who felt valued by their work organisation (59.7% vs 53.7% vs 50.8%, *P* < 0.0001) and the public (75.1% vs 63.9% vs 57.0%, *P* < 0.0001) (Supplementary Table S3). Whilst access to well-being support services was only perceived as available for less than half of participants (*n* = 472/1077, 43.8%), this represented a reassuring increase compared to pre-pandemic level (*n* = 210/1076, 19.5%) (*P* < 0.0001) (Supplementary Table S3).

Potential risk of workforce attrition

Finally, in Survey III, concerns with regards to attrition in the oncology workforce were flagged. A quarter of participants (*n* = 266/1086, 24.5%) disclosed that they had considered changing their future career, with 37.6% (*n* = 100/266) thinking of leaving the oncology profession and 27.8% (*n* = 74/266) considering moving to work in industry.

DISCUSSION

Survey III draws on the lived experiences of 1269 oncology professionals from 104 countries to shed light on the ongoing deterioration in well-being in oncology and raise the significant threat of workforce attrition. A year on since the COVID-19 pandemic, there is marked increase in risk of poor wellbeing/distress (40% versus 25%) and burnout (57% versus 38%) compared to Survey I (April/May 2020).[4] Job demands have continued to increase, meanwhile

there appears to be a perceived decline in clinical trial activity and research, career development opportunities, and available resources and support. Almost half of survey participants now feel overwhelmed with their workload.

Female and younger ($\leq$ 40 years) colleagues continue to be at higher risk of poor well-being and burnout, two demographic groups noted to be particularly vulnerable in our previous surveys[4,5] and in the published literature[12,13]. There is evidence that the pandemic has had an unequal impact on gender with female clinicians shouldering the greater burden of domestic responsibilities which may be exacerbating the pressure of growing professional demands.[14,15] In Survey II, we previously highlighted concerns raised regarding career development, training and job security disproportionately impacting trainee and early-career oncologists.[5] Survey III broadens these concerns to that of a more widespread impending crisis in workforce retention. Alarmingly, one in four participants are considering changing their future career direction, of whom 38% are contemplating leaving the oncology profession altogether and 28% deliberating moving to a role within industry. This is on a background of perceived declining support from employers and national/global bodies.

Although our findings are compelling this study has its limitations. Survey III had a substantial number of participants but this still only constitutes approximately 5% of the ESMO membership base. Participants were mainly medical oncologists, more established in their careers with the majority based in Europe. Thus, these findings may not necessarily be representative of the needs of the global oncology workforce particularly those in more resource-constrained healthcare systems. Findings from the 2003 SARS experience suggests that those with the most direct contact with patients including nurses, administrative staff

and ancillary workers had the highest level of stress.[16] These occupational groups are not well-represented in our survey series. Attrition in the oncology nursing workforce in particular has already impacted significantly on cancer treatment delivery.[2] Nurses are also predominantly female and are the largest health care professional group providing frontline care, both of which are risk factors for burnout.[2,12]

Our study methodology involved optional online surveys which are associated with the risk of participant self-selection bias. However, on balance, this remains the optimal methodology for accessing a wider audience within the constraints and work pressures of oncology professionals working on the frontline during the COVID-19 pandemic. Our survey provides indicators of distress in participants but does not provide a definitive understanding of their mental health. As the WBI has been cross-validated with an increased risk of suicide, depression and anxiety there may be even graver psychological consequences associated with our study findings.[10,17] Importantly, the impact of additional factors such as prolonged separation from loved ones should also not be underestimated.

Although the findings of the ESMO Resilience Taskforce Survey series are cause for concern, there are also reasons of optimism. Survey III highlights a significant increase in available well-being support services compared to pre-pandemic levels. Our data has allowed us to infer longitudinal trends but it does not provide us with an indication of future trends particularly given the dramatic changes in the global landscape that have ensued since Survey III was undertaken with many regions experiencing greater social freedoms. These are likely to be providing psychological relief and improvements in personal circumstances although the prevailing sense of professional uncertainty with the spectre of rising case numbers remains.

There is already some early evidence though of resilience in health services with oncology departments experiencing a return back to normal or higher clinical activity than before the pandemic.

The COVID-19 pandemic has also provided an opportunity for positive transformation. There are a number of adaptations to service delivery that should perhaps continue post-pandemic. For instance, the beneficial impact on equitable access to clinical trials by facilitating greater access to telehealth encounters has been notable particularly for patients based in non-metropolitan settings who often face greater travel time and financial toxicity to access novel therapies.[18] Remote site visits, greater use of electronic signatures and virtual meetings have also improved efficiency in clinical trial delivery which has been beneficial for all stakeholders. For example, in Singapore, the pharmacy drug courier service has allowed a substantial number of patient prescriptions to be sent directly to their homes, improving overall quality of care.[19] Virtual outpatient patient visits conducted by Clinical Pharmacy Specialists in New York City optimised treatment delivery and patient safety whilst reducing in-person visits.[20]

Although our survey participants have highlighted ongoing challenges with accessing professional development opportunities, international initiatives such as the introduction of virtual oncology fellowships and dedicated educational webinars have been examples of positive responses.[21] The increased access to virtual oncology conferences and virtual mentorship programmes have also proven popular.[22] In the long-term, these initiatives may increase the ability of more staff to participate in professional development activities while balancing other commitments and mitigating financial cost.

A focus group study of American oncologists during the pandemic identified that many participants were strongly considering working part-time or taking early retirement.[23] Although this may seem concerning from a workforce planning viewpoint similar to our study, these career decisions were triggered by COVID-19-related work changes providing opportunity for self-care and reprioritisation of work-life balance. This examination of personal and professional values should be encouraged as essential for healthy careers and workplaces. It also highlights the importance of workplace arrangements that promote flexibility and work-life balance. Despite Melbourne being the city worst affected by the COVID-19 pandemic in Australasia, modifications to practice in response to the pandemic was well-received by radiation oncologists with the vast majority of staff (majority of whom were female) reporting satisfaction with their work arrangements, particularly those with children.[24] The ability to work from home has been reported as a positive experience associated with reduced burnout if adequate information technology and childcare support is available.[25] This suggests that judicious changes to standard workplace practice as a result of COVID-19 restrictions has the potential to improve workplace flexibility and quality.

The ESMO Resilience Taskforce survey series highlights the pivotal importance of ameliorating the distress of cancer professionals with a critical focus on prioritising workforce retention. National and international stakeholders must act together as we recover from the COVID-19 crisis to promote the well-being of oncology professionals. Further detailed analyses, including multivariate analyses on factors influencing outcomes of interest and interrogation of qualitative data collected from the survey series, are underway. The ESMO Resilience Task Force will shortly be releasing a position paper with some key recommendations. Ultimately, a healthy oncology workforce is a matter of urgency. It is essential for supporting the well-

being of our patients and their loved ones, many of whom know that their time together is limited.

Contributors

K.H.J.L., K.M., K.K., K.P., C.O., M.O.C., E.É., J.B.A.G.H., C.H. and S.B. conceived and designed the study. K.H.J.L. and E.T. analysed the data. All co-authors were involved in data interpretation. K.H.J.L. produced the manuscript tables and figures. K.H.J.L., K.M., E.T. and S.B. wrote the first draft of the paper. All co-authors contributed to reviewing and editing drafts of the paper. K.H.J.L. and S.B. were involved in the final reviewing and editing of the paper and approving the manuscript.

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TABLE CAPTIONS

Table 1 Participant demographics for Survey III (*n* = 1269). See also Supplementary Table S1 for further details of countries/regions represented.

Table 2 Personal experience of COVID-19 as reported by participants in Survey III (*n* = 1269), reflecting the period from February to March 2021.

FIGURE CAPTIONS

Figure 1 Comparison of key outcome variables across three survey timepoints since the outbreak of the COVID-19 pandemic (Survey I: April-May 2020, Survey II: July-August 2020, and Survey III: February-March 2021): (a) risk of poor well-being/distress, (b) burnout, and (c) job performance since COVID-19 (JP-CV). Groups were compared using Chi-square analyses. **P* < 0.05, ***P* < 0.01, ****P* < 0.001, *****P* < 0.0001; ns, not significant; S I, Survey I; S II, Survey II; S III, Survey III; CI, confidence interval; eWBI, expanded Well-Being Index. See also Supplementary Figures S1 and S2.

Figure 2 Subgroup comparisons of key outcome variables (risk of poor well-being/distress and burnout) analysed by (a) age and (b) gender, respectively, of participants in Survey III. Groups were compared using Chi-square analyses. **P* < 0.05, ***P* < 0.01, ****P* < 0.001, *****P* < 0.0001; ns, not significant; OR, Odds Ratio; CI, confidence interval; eWBI, expanded Well-Being Index.

Figure 3 Heatmaps of factors which may be contributing to worsening distress and feeling burnout since COVID-19: (a) various factors related to job demands, and (b) personal and professional resources available to participants. Proportions (percentage, %) are displayed as colours ranging from blue to red (with red denoting cause for concern i.e. increased job demands for (a) and decreased job resources in (b)), as shown in the key. Groups were compared using Chi-square test for trend (Survey I vs Survey II vs Survey III, where available). $P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$, $^{****}P < 0.0001$; ns, not significant; n/a, not applicable. See also Supplementary Table S3.

SUPPLEMENTARY DATA

Table S1 Proportion (percentage, %) of participants from each global region, respectively, in all three surveys (supplementary data to Table 1). Collectively, views reported by participants from 124 countries have been analysed across the three surveys.

Table S2 Summary of changes in professional duties since the COVID-19 outbreak reported by participants in Survey III (n = 1269).

Table S3 Personal and work-related well-being resources and support services used by participants in Survey III (supplementary data to Figure 3).

Figure S1 Longitudinal comparison of key outcome variables across three survey timepoints since the outbreak of the COVID-19 pandemic in the subgroup of

participants who answered to all three surveys (*n* = 127): (a) risk of poor well-being/distress, (b) burnout, and (c) job performance since COVID-19 (JP-CV). Groups were compared using Chi-square analyses. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, ****$P < 0.0001$; ns, not significant; S I, Survey I; S II, Survey II; S III, Survey III; CI, confidence interval.

Figure S2 Self-reported levels of psychological resilience since the outbreak of the COVID-19 pandemic (Survey I: April-May 2020, Survey II: July-August 2020 and Survey III: February-March 2021) (supplementary data to Figure 1). (a) Baseline self-reported psychological resilience amongst participants as measured by the single-item bipolar measure for employee psychological resilience (SIMER); scale 1 to 9 – low to high psychological resilience. (b) Baseline self-reported psychological resilience amongst the subgroup of participants who answered to all three surveys (*n* = 127).

The impact of COVID-19 on oncology professionals – one year on: lessons learned from the ESMO Resilience Task Force survey series

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HIGHLIGHTS

- Risk of distress and burnout amongst oncology professionals continues to worsen since COVID-19 despite improved job performance.
- Female and younger ($\leq$ 40 years old) colleagues continue to be at higher risk of poor well-being and feeling burnout.
- Job demands have increased, with nearly half now feeling overwhelmed with workload.
- Concerns regarding career development/training, job security and international fellowship opportunities remain high.
- A quarter of oncology professionals reported considering changing their career, including leaving the oncology profession.

ABSTRACT

Background

COVID-19 has had a significant impact on the well-being and job performance of oncology professionals globally. The ESMO Resilience Task Force collaboration set out to investigate and monitor well-being since COVID-19 in relation to work, lifestyle and support factors in oncology professionals one year on since the start of the pandemic.

Methods

An online, anonymous survey was conducted in February/March 2021 (Survey III). Key outcome variables included risk of poor well-being or distress (expanded Well-Being Index, eWBI), feeling burnout (single item from eWBI) and job performance since COVID-19. Longitudinal analysis of responses to the series of three surveys since COVID-19 was performed, and responses to job demands and resources questions were interrogated. SPSS V.26.0/V.27.0 and GraphPad Prism V9.0 were used for statistical analyses.

Results

Responses from 1269 participants from 104 countries were analysed in Survey III: 55% (*n* = 699/1269) female, 54% (*n* = 686/1269) >40 years, and 69% (*n* = 852/1230) of white ethnicity. There continues to be an increased risk of poor well-being or distress (*n* = 464/1169, 40%) and feeling burnout (*n* = 660/1169, 57%) compared Survey I (25% and 38% respectively, $P < 0.0001$), despite improved job performance. Compared to the initial period of the pandemic, more participants report feeling overwhelmed with workload (45% vs 29%, $P < 0.0001$). There remain concerns about the negative impact of the pandemic on career development/training (43%), job security (37%) and international fellowship opportunities (76%). Alarmingly, 25%

(*n* = 266/1086) are considering changing their future career with 38% (*n* = 100/266) contemplating leaving the profession.

Conclusion

Oncology professionals continue to face increased job demands. There is now significant concern regarding potential attrition in the oncology workforce. National and international stakeholders must act immediately and work closely with oncology professionals to draw up future-proof recovery plans.

Funding

European Society for Medical Oncology (ESMO)

KEYWORDS

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INTRODUCTION

The discovery of the novel coronavirus SARS-CoV-2 in Wuhan, China in late December 2019 and the official declaration of the COVID-19 pandemic in March 2020, has triggered unprecedented changes to health systems worldwide, with cancer services being no exception.[1,2] Globally, oncology services have experienced significant disruption due to staff redeployment, deterioration in working conditions, reduction in oncology clinical trial and research activities.[3-5] Additional temporising measures such as suspension of 'non-essential' palliative chemotherapy, cancer screening services, and favouring of less intensive treatment regimens have also impacted the nature of our work with potential for longer-term consequences.[6-9]

Since the COVID-19 pandemic, clinicians have been particularly challenged in their ability to provide cancer care to aspired standards with a concomitant diminution in meaningful professional activities.[4,5] All of this whilst also contending with the risk to personal safety at work from COVID-19 infection and associated morbidity.[5] The European Society for Medical Oncology (ESMO) Resilience Task Force launched a unique longitudinal series of global surveys since April 2020 to provide contemporary insights into the daily practice and well-being of oncology professionals during the COVID-19 pandemic. Our findings from Survey I conducted in April/May 2020 and survey II in July/August 2020 indicated that COVID-19 has had a detrimental impact on the lives of oncology professionals with rising rates of distress and burnout, and uncovered significant concerns regarding job security and their future outlook.[4,5] Here, we provide a further update one year on reporting on the key findings from Survey III conducted in February/March 2021.

METHODS

Survey design

Survey III followed on from the series of online global surveys designed by the ESMO Resilience Task Force, in collaboration with the ESMO Young Oncologists Committee, ESMO Women for Oncology Committee, ESMO Leaders Generation Programme Alumni members and the OncoAlert Network, launched at specific time-points during the course of the COVID-19 pandemic. Survey III was hosted on the Qualtrics platform (open from 9 February to 3 March 2021) and was available on the ESMO website, ESMO membership emails, and was promoted through social media. Participation was voluntary and anonymous. Participants who consented to longitudinal evaluation of their responses at different time-points of the survey series were assigned a trackable unique identifier code. The project was approved by the ESMO Executive Board.

Survey measures

Key outcome variables used throughout the survey series including risk of poor well-being or distress (expanded Well-Being Index, eWBI; score $\geq$ 4, at risk)[10,11], feeling burnout (single item from eWBI) and job performance since COVID-19 (JP-CV; score $\geq$ 3.5, favourable) have been previously described in detail.[4,5] In Survey III, we also added relevant questions regarding participants' perception of the COVID-19 situation in their respective country of work including lockdown restrictions and national vaccination programmes. Further questions about participants' personal experience of COVID-19, and their personal and professional future outlook were also included. In total, there were 38 closed response questions with one open text response question at the end of the survey.

Statistical analysis

Key outcome variables: eWBI, burnout and JP-CV were longitudinally compared to results from Surveys I[4] and II[5]. Chi-square analysis was used to compare categorical variables and paired or unpaired *t*-tests were used to analyse continuous variables. We also performed Chi-square test for trend when comparing proportions across time (Survey I vs Survey II vs Survey III, where data available). *P* values were two-tailed and were considered significant if <0.05. A series of cross-sectional between-subject analyses were also carried out in a subgroup of participants who completed all three surveys to examine relationships overtime. Descriptive data were presented as median (interquartile range, IQR) or mean ± standard deviation (SD), and proportions were expressed as a percentage (%). All statistical analyses were performed using SPSS V.26.0 or V.27.0 (IBM Corp., Armonk, NY) and data represented using GraphPad Prism V9.0 (GraphPad Software, San Diego, CA).

RESULTS

Participant demographics

A total of 1432 participants from 104 countries responded to the Survey III invitation. In the final analysis, we included data from all participants who consented and responded to key questions placed at the beginning of the survey on their perception of the current status of COVID-19 (trend, lockdown and vaccination) and provided basic demographic details including their country of work (*n* = 1269 (88.6%)). The majority (*n* = 1158/1269, 91.3%) completed the survey to the end. The personal and professional demographic characteristics of Survey III participants are outlined in Table 1 and Supplementary Table S1. Overall, 55.1% (*n* = 699/1269) were female, 54.1% (*n* = 686/1269) over the age of 40 years, and 69.3% (*n* = 852/1230) of white ethnicity. Collectively, participants have a mean of 15 years of experience

working in oncology, with Medical Oncology most represented (*n* = 905/1245, 72.7%). Trainees contributed to 22.1% (*n* = 281/1269) of responses. The majority of respondents were ESMO members (*n* = 1073/1238, 86.7%) and were from Europe (*n* = 854/1269, 67.3%) (Supplementary Table S1).

Personal experience with COVID-19

As the COVID-19 pandemic continues, majority of participants have encountered some form of lockdown restrictions in their region of work (Table 2). Almost all participants (*n* = 1250/1269, 98.5%) reported that a national vaccination programme against COVID-19 was underway, if not planned, and two-thirds (*n* = 849/1269, 66.9%) have personally had at least one dose of the vaccine when asked in February/March 2021 (Table 2).

More than a third of participants reported having regular asymptomatic testing for COVID-19 (*n* = 423/1082, 39.1%) (Table 2). A total of 160 participants (14.8%) have tested positive for COVID-19, of whom ten had required hospitalisation. Of those who had tested positive for COVID-19, around a third (*n* = 43/160, 26.9%) neither felt they had been given appropriate time to recover nor felt completely recovered upon their return to work (*n* = 60/160, 37.5%). By February/March 2021, one in five participants disclosed that they have had a work colleague who died of COVID-19 (*n* = 215/1079, 19.9%).

Ongoing changes in professional role and delivery of care

Work routine has yet to return to pre-COVID-19 situation for over half of participants (*n* = 578/1269, 52.3%). In Survey III, around a fifth of participants (*n* = 238/1107, 21.5%) were either partially or fully redeployed. Participants continued to report several changes to their

professional roles and duties as detailed in Supplementary Table S2, with nearly half (*n* = 354/756, 46.8%) reporting an increase in overall hours of work. As expected, there remained an increased use of remote or virtual meetings and consultations (>80%). Of concern, over half of participants have reported a decrease in clinical trial activity (*n* = 392/648, 60.5%) and general research activity (*n* = 366/664, 55.1%). About two-thirds of participants (*n* = 708/1108, 63.9%) were worried that COVID-19 would have a negative impact on the quality of cancer research at their institution.

Well-being, burnout and resilience throughout the pandemic

Compared to Surveys I[4] and II[5], there were now significantly more participants who were at risk of poor well-being or distress (*n* = 464/1169, 39.7%) and feeling burnout (*n* = 660/1169, 56.5%) (Chi-square test for trend, $P < 0.0001$) (Figure 1a-b). These trends were confirmed in a longitudinal subgroup of *n* = 127 participants from 47 countries (50.0% female, 39.4% $\leq$ 40 years old and 69.3% of white ethnicity) who had completed all three surveys, in whom there was a progressive increase in the proportion of those at risk of poor well-being (20.5% vs 28.9% vs 31.6%, $P = 0.0516$) and feeling burnout (34.4% vs 47.9% vs 56.4%, $P = 0.0006$) (Supplementary Figure S1a-b). These observations are despite the perception of improved job performance, where JP-CV plateaued at around 50% since the Survey II time-point (Figure 1c and Supplementary Figure S1c). Of note, there appears to be sustained levels of psychological resilience amongst participants throughout the pandemic (Supplementary Figure S2).

As gender and age were found to be significant predictors of risk of poor well-being in Survey I[4], we assessed whether this disparity persisted over the course of the COVID-19 pandemic.

Female colleagues continued to be at higher risk of poor well-being [Odds Ratio (OR) 1.643 (95% CI 1.298-2.091), $P < 0.0001$] and feeling burnout [OR 1.859 (95% CI 1.469-2.342), $P < 0.0001$] (Figure 2). Similarly, younger ($\leq$ 40 years old) colleagues were also at continued risk of poor well-being [OR 1.987 (95% CI 1.562-2.519), $P < 0.0001$] and feeling burnout [OR 1.444 (95% CI 1.144-1.825), $P = 0.002$] (Figure 2).

Factors contributing to perception of increased job demands

We analysed responses to questions associated with job demands over the different time-points studied in this survey series to identify reasons which may have potentially contributed to worsening distress and burnout (Figure 3a). Chi-square test for trend was performed to compare responses to Survey I vs Survey II vs Survey III. Alarmingly, we observed that in general there has been a progressive increase in job demands, with considerable increases in the proportion of participants who have reported an increase in the perception of feeling overwhelmed with workload (29.1% vs 35.6% vs 45.2%, $P < 0.0001$) and overall working hours (16.7% vs 38.4% vs 46.8%, $P < 0.0001$) (Figure 3a). Moreover, more participants were now also burdened with increased COVID-19 inpatient work (13.6% vs 40.3% vs 58.1%, $P < 0.0001$) and COVID-19-related research (15.6% vs 58.7% vs 64.5%, $P < 0.0001$). Whilst the majority have continued to work in pleasant physical conditions, their concern for personal safety at work due to COVID-19 has remained persistently high (78.3% vs 72.5% vs 63.0%, $P < 0.0001$) (Figure 3a).

Almost half (n = 527/1169, 45.1%) were reporting having inadequate time for personal and/or family life compared to 34.6% (n = 526/1520) and 43.0% (n = 405/942) in Surveys I[4] and II[5], respectively (Figure 3a). Moreover, the majority of participants in Survey III reported that they

had not been able to take time off for annual leave or holidays (*n* = 650/1084, 60.0%), and/or study leave (*n* = 863/1084, 79.6%) (Figure 3a).

Personal and professional job resources currently available

In addition, we also interrogated several domains in terms of personal and professional resources and coping strategies available to participants which could potentially alleviate job demands (Figure 3b). Here, the main areas of concern were regarding job security and participants' support systems (Figure 3b). In particular, participants were concerned that the pandemic would have a negative impact on their personal job security (*n* = 386/1057, 36.5%). Only over a third of participants (*n* = 346/1023, 33.8%) were not concerned that the COVID-19 pandemic would have a negative impact on their personal career development/training, and very few were not concerned about international fellowship opportunities (*n* = 116/973, 11.9%) (Figure 3b).

Participants were questioned about their support systems, access to well-being support services, and the coping strategies they had been using to help themselves during the pandemic (details summarised in Figure 3b, and Supplementary Table S3). There has been a gradual decline in the proportion of participants who felt well-supported by the management at their workplace since Survey I, with now less than half (*n* = 476/1058, 45.0%) feeling well-supported (Figure 3b). Similarly, their perception of support from global and/or national societies/groups and governments had declined over time (56.8% vs 50.7% vs 41.7%, $P < 0.0001$) (Figure 3b). Overall, in Survey III, 59.5% (*n* = 635/1068) reported having adequate resources to do their jobs (Figure 3b). There has also been a decrease in the proportion of participants who felt valued by their work organisation (59.7% vs 53.7% vs 50.8%, $P < 0.0001$)

and the public (75.1% vs 63.9% vs 57.0%, $P < 0.0001$) (Supplementary Table S3). Whilst access to well-being support services was only perceived as available for less than half of participants (n = 472/1077, 43.8%), this represented a reassuring increase compared to pre-pandemic level (n = 210/1076, 19.5%) ($P < 0.0001$) (Supplementary Table S3).

Potential risk of workforce attrition

Finally, in Survey III, concerns with regards to attrition in the oncology workforce were flagged. A quarter of participants (n = 266/1086, 24.5%) disclosed that they had considered changing their future career, with 37.6% (n = 100/266) thinking of leaving the oncology profession and 27.8% (n = 74/266) considering moving to work in industry.

DISCUSSION

Survey III draws on the lived experiences of 1269 oncology professionals from 104 countries to shed light on the ongoing deterioration in well-being in oncology and raise the significant threat of workforce attrition. A year on since the COVID-19 pandemic, there is marked increase in risk of poor wellbeing/distress (40% versus 25%) and burnout (57% versus 38%) compared to Survey I (April/May 2020).[4] Job demands have continued to increase, meanwhile there appears to be a perceived decline in clinical trial activity and research, career development opportunities, and available resources and support. Almost half of survey participants now feel overwhelmed with their workload.

Female and younger ($\leq$ 40 years) colleagues continue to be at higher risk of poor well-being and burnout, two demographic groups noted to be particularly vulnerable in our previous

surveys[4,5] and in the published literature[12,13]. There is evidence that the pandemic has had an unequal impact on gender with female clinicians shouldering the greater burden of domestic responsibilities which may be exacerbating the pressure of growing professional demands.[14,15] In Survey II, we previously highlighted concerns raised regarding career development, training and job security disproportionately impacting trainee and early-career oncologists.[5] Survey III broadens these concerns to that of a more widespread impending crisis in workforce retention. Alarmingly, one in four participants are considering changing their future career direction, of whom 38% are contemplating leaving the oncology profession altogether and 28% deliberating moving to a role within industry. This is on a background of perceived declining support from employers and national/global bodies.

Although our findings are compelling this study has its limitations. Survey III had a substantial number of participants but this still only constitutes approximately 5% of the ESMO membership base. Participants were mainly medical oncologists, more established in their careers with the majority based in Europe. Thus, these findings may not necessarily be representative of the needs of the global oncology workforce particularly those in more resource-constrained healthcare systems. Findings from the 2003 SARS experience suggests that those with the most direct contact with patients including nurses, administrative staff and ancillary workers had the highest level of stress.[16] These occupational groups are not well-represented in our survey series. Attrition in the oncology nursing workforce in particular has already impacted significantly on cancer treatment delivery.[2] Nurses are also predominantly female and are the largest health care professional group providing frontline care, both of which are risk factors for burnout.[2,12]

Our study methodology involved optional online surveys which are associated with the risk of participant self-selection bias. However, on balance, this remains the optimal methodology for accessing a wider audience within the constraints and work pressures of oncology professionals working on the frontline during the COVID-19 pandemic. Our survey provides indicators of distress in participants but does not provide a definitive understanding of their mental health. As the WBI has been cross-validated with an increased risk of suicide, depression and anxiety there may be even graver psychological consequences associated with our study findings.[10,17] Importantly, the impact of additional factors such as prolonged separation from loved ones should also not be underestimated.

Although the findings of the ESMO Resilience Taskforce Survey series are cause for concern, there are also reasons of optimism. Survey III highlights a significant increase in available well-being support services compared to pre-pandemic levels. Our data has allowed us to infer longitudinal trends but it does not provide us with an indication of future trends particularly given the dramatic changes in the global landscape that have ensued since Survey III was undertaken with many regions experiencing greater social freedoms. These are likely to be providing psychological relief and improvements in personal circumstances although the prevailing sense of professional uncertainty with the spectre of rising case numbers remains. There is already some early evidence though of resilience in health services with oncology departments experiencing a return back to normal or higher clinical activity than before the pandemic.

The COVID-19 pandemic has also provided an opportunity for positive transformation. There are a number of adaptations to service delivery that should perhaps continue post-pandemic.

For instance, the beneficial impact on equitable access to clinical trials by facilitating greater access to telehealth encounters has been notable particularly for patients based in non-metropolitan settings who often face greater travel time and financial toxicity to access novel therapies.[18] Remote site visits, greater use of electronic signatures and virtual meetings have also improved efficiency in clinical trial delivery which has been beneficial for all stakeholders. For example, in Singapore, the pharmacy drug courier service has allowed a substantial number of patient prescriptions to be sent directly to their homes, improving overall quality of care.[19] Virtual outpatient patient visits conducted by Clinical Pharmacy Specialists in New York City optimised treatment delivery and patient safety whilst reducing in-person visits.[20]

Although our survey participants have highlighted ongoing challenges with accessing professional development opportunities, international initiatives such as the introduction of virtual oncology fellowships and dedicated educational webinars have been examples of positive responses.[21] The increased access to virtual oncology conferences and virtual mentorship programmes have also proven popular.[22] In the long-term, these initiatives may increase the ability of more staff to participate in professional development activities while balancing other commitments and mitigating financial cost.

A focus group study of American oncologists during the pandemic identified that many participants were strongly considering working part-time or taking early retirement.[23] Although this may seem concerning from a workforce planning viewpoint similar to our study, these career decisions were triggered by COVID-19-related work changes providing opportunity for self-care and reprioritisation of work-life balance. This examination of personal and professional values should be encouraged as essential for healthy careers and

workplaces. It also highlights the importance of workplace arrangements that promote flexibility and work-life balance. Despite Melbourne being the city worst affected by the COVID-19 pandemic in Australasia, modifications to practice in response to the pandemic was well-received by radiation oncologists with the vast majority of staff (majority of whom were female) reporting satisfaction with their work arrangements, particularly those with children.[24] The ability to work from home has been reported as a positive experience associated with reduced burnout if adequate information technology and childcare support is available.[25] This suggests that judicious changes to standard workplace practice as a result of COVID-19 restrictions has the potential to improve workplace flexibility and quality.

The ESMO Resilience Taskforce survey series highlights the pivotal importance of ameliorating the distress of cancer professionals with a critical focus on prioritising workforce retention. National and international stakeholders must act together as we recover from the COVID-19 crisis to promote the well-being of oncology professionals. Further detailed analyses, including multivariate analyses on factors influencing outcomes of interest and interrogation of qualitative data collected from the survey series, are underway. The ESMO Resilience Task Force will shortly be releasing a position paper with some key recommendations. Ultimately, a healthy oncology workforce is a matter of urgency. It is essential for supporting the well-being of our patients and their loved ones, many of whom know that their time together is limited.

Contributors

K.H.J.L., K.M., K.K., K.P., C.O., M.O.C., E.É., J.B.A.G.H., C.H. and S.B. conceived and designed the study. K.H.J.L. and E.T. analysed the data. All co-authors were involved in data interpretation. K.H.J.L. produced the manuscript tables and figures. K.H.J.L., K.M., E.T. and S.B. wrote the first draft of the paper. All co-authors contributed to reviewing and editing drafts of the paper. K.H.J.L. and S.B. were involved in the final reviewing and editing of the paper and approving the manuscript.

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TABLE CAPTIONS

Table 1 Participant demographics for Survey III (*n* = 1269). See also Supplementary Table S1 for further details of countries/regions represented.

Table 2 Personal experience of COVID-19 as reported by participants in Survey III (*n* = 1269), reflecting the period from February to March 2021.

FIGURE CAPTIONS

Figure 1 Comparison of key outcome variables across three survey timepoints since the outbreak of the COVID-19 pandemic (Survey I: April-May 2020, Survey II: July-August 2020, and Survey III: February-March 2021): (a) risk of poor well-being/distress, (b) burnout, and (c) job performance since COVID-19 (JP-CV). Groups were compared using Chi-square analyses. **P* < 0.05, ***P* < 0.01, ****P* < 0.001, *****P* < 0.0001; ns, not significant; S I, Survey I; S II, Survey II; S III, Survey III; CI, confidence interval; eWBI, expanded Well-Being Index. See also Supplementary Figures S1 and S2.

Figure 2 Subgroup comparisons of key outcome variables (risk of poor well-being/distress and burnout) analysed by (a) age and (b) gender, respectively, of participants in Survey III. Groups were compared using Chi-square analyses. **P* < 0.05, ***P* < 0.01, ****P* < 0.001, *****P* < 0.0001; ns, not significant; OR, Odds Ratio; CI, confidence interval; eWBI, expanded Well-Being Index.

Figure 3 Heatmaps of factors which may be contributing to worsening distress and feeling burnout since COVID-19: (a) various factors related to job demands, and (b) personal and professional resources available to participants. Proportions (percentage, %) are displayed as colours ranging from blue to red (with red denoting cause for concern i.e. increased job demands for (a) and decreased job resources in (b)), as shown in the key. Groups were compared using Chi-square test for trend (Survey I vs Survey II vs Survey III, where available). $P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$, $^{****}P < 0.0001$; ns, not significant; n/a, not applicable. See also Supplementary Table S3.

SUPPLEMENTARY DATA

Table S1 Proportion (percentage, %) of participants from each global region, respectively, in all three surveys (supplementary data to Table 1). Collectively, views reported by participants from 124 countries have been analysed across the three surveys.

Table S2 Summary of changes in professional duties since the COVID-19 outbreak reported by participants in Survey III (n = 1269).

Table S3 Personal and work-related well-being resources and support services used by participants in Survey III (supplementary data to Figure 3).

Figure S1 Longitudinal comparison of key outcome variables across three survey timepoints since the outbreak of the COVID-19 pandemic in the subgroup of

participants who answered to all three surveys (*n* = 127): (a) risk of poor well-being/distress, (b) burnout, and (c) job performance since COVID-19 (JP-CV). Groups were compared using Chi-square analyses. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, ****$P < 0.0001$; ns, not significant; S I, Survey I; S II, Survey II; S III, Survey III; CI, confidence interval.

Figure S2 Self-reported levels of psychological resilience since the outbreak of the COVID-19 pandemic (Survey I: April-May 2020, Survey II: July-August 2020 and Survey III: February-March 2021) (supplementary data to Figure 1). (a) Baseline self-reported psychological resilience amongst participants as measured by the single-item bipolar measure for employee psychological resilience (SIMER); scale 1 to 9 – low to high psychological resilience. (b) Baseline self-reported psychological resilience amongst the subgroup of participants who answered to all three surveys (*n* = 127).

Table 1

	Number, *n* (%)
Age (years), *n* = 1269	
≤40	583 (45.9%)
>40	686 (54.1%)
Gender, *n* = 1269	
Female	699 (55.1%)
Male	566 (44.6%)
Prefer not to say	4 (0.3%)
Ethnicity, *n* = 1230	
White	852 (69.3%)
Asian (East/Southeast)	156 (12.7%)
Asian (South)	63 (5.1%)
Hispanic	59 (4.8%)
Arab	32 (2.6%)
Mixed	17 (1.4%)
Black	16 (1.3%)
Other	17 (1.4%)
Prefer not to say	18 (1.5%)
Lives alone, *n* = 1232	
Yes	187 (15.2%)
No	1045 (84.8%)
Have children/dependents, *n* = 1232	
Yes	738 (59.9%)
No	494 (40.1%)
Region[a], *n* = 1269	
Europe[b]	
Southwestern Europe	264 (20.8%)
Central Europe	220 (17.3%)
Northern Europe and British Isles	175 (13.8%)
Southeastern Europe	87 (6.9%)
Western Europe	78 (6.1%)
Eastern Europe	30 (2.4%)
Asia	223 (17.6%)
North America	78 (6.1%)
South America	56 (4.4%)
Africa	43 (3.4%)
Oceania	15 (1.2%)
Primary place of work, *n* = 1238	
General hospital	628 (50.7%)
Cancer centre	460 (37.2%)
Private outpatient clinic	21 (1.7%)
Pharmaceutical/technology company	44 (3.6%)

Healthcare organisation	21 (1.7%)
Other	64 (5.2%)
Specialty[c], *n* = 1245	
Medical oncology	905 (72.7%)
Radiation/Clinical oncology	177 (14.2%)
Haemato-oncology	130 (10.4%)
Palliative care	75 (6.0%)
Surgical oncology	44 (3.5%)
Laboratory-based researcher/scientist	38 (3.1%)
Nursing	11 (0.9%)
Other	81 (6.5%)
Trainee, *n* = 1269	
Yes	281 (22.1%)
No	988 (77.9%)
ESMO member, *n* = 1238	
Yes	1073 (86.7%)
No	165 (13.3%)

[a]Countries most represented in Survey III were United Kingdom (*n* = 112), Germany (*n* = 99), Spain (*n* = 98), Italy (*n* = 85), Portugal (*n* = 81) and India (*n* = 78). See Supplementary Table S1 for complete list of countries/regions, and the corresponding number of participants per country.

[b]**Southwestern Europe** – Italy, Portugal, Spain; **Central Europe** – Austria, Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, Slovenia, Switzerland; **Northern Europe and the British Isles** – Denmark, Finland, Norway, Republic of Ireland, Sweden, United Kingdom; **Southeastern Europe** – Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Greece, Israel, Kosovo, Montenegro, North Macedonia, Serbia, Turkey; **Western Europe** – Belgium, France, Luxembourg, The Netherlands; and **Eastern Europe** – Belarus, Estonia, Georgia, Latvia, Lithuania, Moldova, Russian Federation, Ukraine).

[c]Note that some participants have selected 2 or more specialties within their job role (to encompass differences in the scope of practice between countries/regions), and proportion of representation is summarised as such. Overall, participants have reported a mean of 15.1 ± 10.5 years of experience in the field of oncology.

Table 2

	Number, *n* (%)
Perception of COVID-19 death rate in region of work	
Increasing	536 (42.2%)
No change	176 (13.9%)
Decreasing	533 (42.0%)
Free of COVID-19	24 (1.9%)
Current restrictions in region of work	
Full lockdown	280 (22.1%)
Partial lockdown	718 (56.6%)
End of lockdown	157 (12.4%)
No lockdown imposed so far	114 (9.0%)
Current status of COVID-19 vaccination programme in country of work	
National programme has started	1112 (87.6%)
National programme planned but has not started yet	138 (10.9%)
No plans for a national programme so far	19 (1.5%)
Personally received vaccination against COVID-19	
Yes, 2 doses	554 (43.7%)
Yes, 1 dose	295 (23.2%)
No	408 (32.2%)
Prefer not to say	12 (0.9%)
Regular asymptomatic testing for COVID-19, *n* = 1082	
Yes	423 (39.1%)
No	659 (60.9%)
Have had to undergo isolation/take sick leave due to COVID-19 symptoms, *n* = 1080	
Yes	263 (24.4%)
No	817 (75.6%)
Tested positive for COVID-19, *n* = 1081	
Yes	160 (14.8%)
No	921 (85.2%)
Required hospitalisation for COVID-19, *n* = 160	
Yes	10 (6.3%)
No	150 (93.8%)
Feel given appropriate time to recover (if had symptomatic COVID-19), *n* = 160	
Yes	117 (73.1%)
No	43 (26.9%)
Feel completely recovered upon return to work, *n* = 160	
Yes	100 (62.5%)
No	60 (37.5%)

Had colleague who has died from COVID-19, *n* = 1079	
Yes	215 (19.9%)
No	841 (77.9%)
Prefer not to say	23 (2.1%)

Figure 1

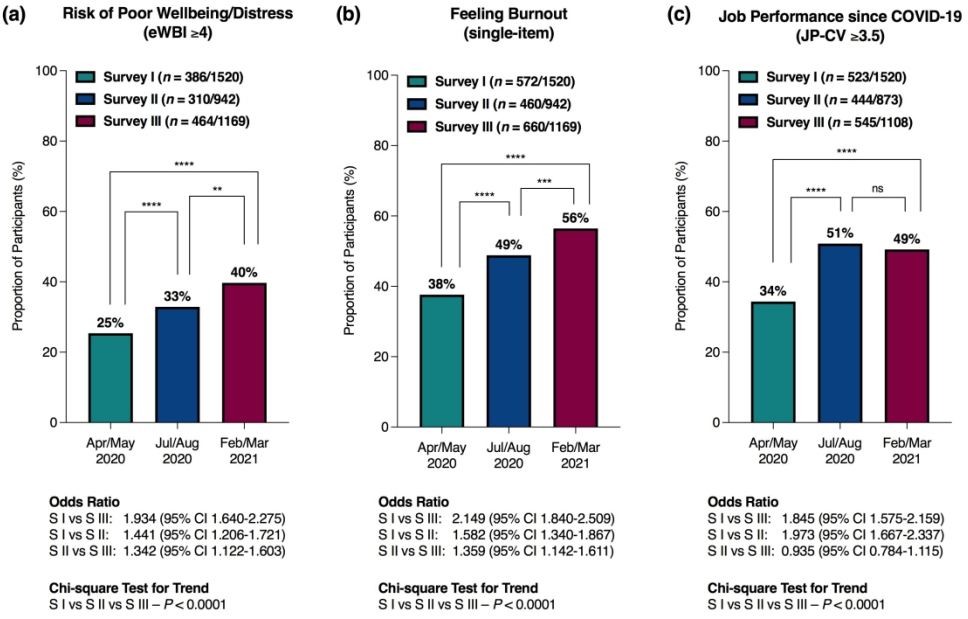

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Figure 2

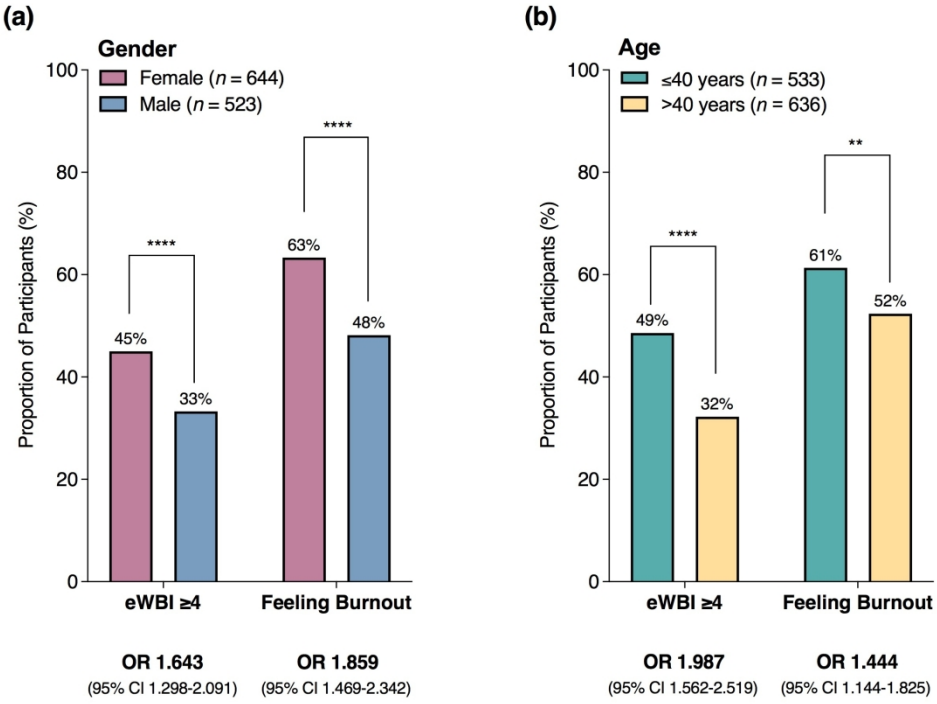

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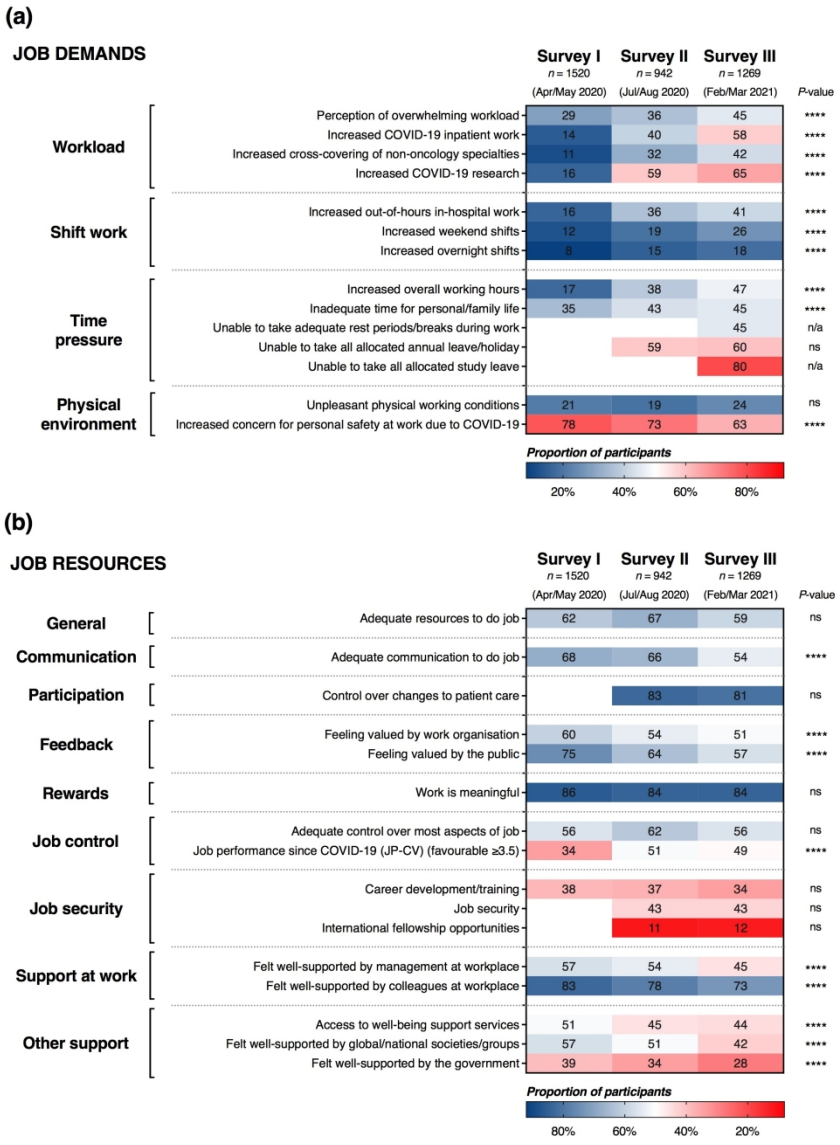
Figure 3



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Proportion of participants per region (%)		SURVEY I (% of total)
EUROPE	Central Europe	16.3
	Southwestern Europe	17.8
	Northern Europe and British Isles	16.3
	Southeastern Europe	6.8
	Western Europe	7.2
	Eastern Europe	2.8
ASIA		17.2
NORTH AMERICA		5.2
SOUTH AMERICA		4.5
AFRICA		3.8
OCEANIA		2.2
Prefer not to say		0.1
	Total	**100.0**

Number of countries represented (*n*)	**101**	**100**
Proportion from EUROPE (%)	**67.1**	**57.7**

SURVEY II (% of total)	SURVEY III (% of total)
17.0	17.3
13.0	20.8
9.9	13.8
9.4	6.9
5.2	6.1
3.3	2.4
20.5	17.6
7.9	6.1
7.4	4.4
3.9	3.4
2.4	1.2
0.1	-
100.0	**100.0**

104
67.3

Table S2

Summary of changes in professional duties since the COVID-19 outbreak reported by participants in Survey III (*n* = 1269).

	Number, *n* (%)			
Work routine has returned to pre-COVID-19 situation[b]	*Disagree*	*Neither*	*Agree*	*N/A*[a]
	578 (52%)	195 (18%)	333 (30%)	163
Nature of change in duties[b]				
Scope of clinical work	*Increased*	*No change*	*Decreased*	*N/A*[a]
Direct patient care	238 (33%)	284 (39%)	200 (28%)	547
Remote consultations	622 (89%)	61 (9%)	12 (2%)	574
Inpatient work	245 (36%)	313 (45%)	131 (19%)	580
COVID-19 inpatient work	335 (58%)	182 (32%)	59 (10%)	693
Covering other oncology patients	206 (34%)	320 (53%)	80 (13%)	663
Covering non-oncology specialties	235 (42%)	305 (54%)	25 (4%)	704
Virtual MDT/tumour board meetings	620 (86%)	81 (11%)	24 (3%)	544
Remote meetings	697 (94%)	38 (5%)	10 (1%)	524
Working hours and shift patterns	*Increased*	*No change*	*Decreased*	*N/A*[a]
Overall hours of work	354 (47%)	308 (41%)	94 (12%)	513
Out-of-hours work in hospital	286 (41%)	313 (45%)	100 (14%)	570
Hours working from home	472 (67%)	204 (29%)	27 (4%)	566
Weekend shifts	168 (26%)	423 (65%)	57 (9%)	621
Overnight shifts	106 (18%)	429 (73%)	51 (9%)	683
Clinical trial and research activity	*Increased*	*No change*	*Decreased*	*N/A*[a]
Clinical trial activity	67 (10%)	189 (29%)	392 (60%)	621
Research (non-clinical trials) activity	99 (15%)	199 (30%)	366 (55%)	605
COVID-19 related research	307 (65%)	146 (31%)	17 (4%)	799
Redeployed, *n* = 1107				
Yes		65 (5.9%)		
Partially		173 (15.6%)		
No		869 (78.5%)		

[a]N/A: not applicable, or question not answered by participants.

[b]Proportion (percentage, %) calculated based on the total number of participants who have answered the question as denominator.

Table S3

Personal and work-related well-being resources and support services used by participants in Survey III (supplementary data to Figure 3).

	Number, *n* (%)
Access to well-being support services	
Have access to well-being support services prior to COVID-19, *n* = 1076	210 (19.5%)
Currently have access to well-being support services, *n* = 1077	472 (43.8%)
Have used well-being support services since COVID-19, *n* = 1075	137 (12.7%)
Wellbeing support services used, *n* = 137	
Personal psychiatrist or psychologist	65 (47.5%)
Online or smartphone apps	41 (29.9%)
Psychological support from work	36 (26.3%)
Spiritual or religious support	25 (18.3%)
Telephone support	19 (13.9%)
Psychological support from national organisations	12 (8.8%)
Charities supporting mental health	4 (2.9%)
Other	13 (9.5%)
Feeling well-supported during COVID-19, *n* = 1058	
By friends and/or family	904 (85.4%)
By colleagues at workplace	768 (72.6%)
By management of workplace	476 (45.0%)
By global or national societies	441 (41.7%)
By government	299 (28.3%)
Feeling valued, *n* = 1063	
By the public	606 (57.0%)
By work organisation	540 (50.8%)
Coping strategies used, *n* = 1073	
Change in physical activity (e.g. exercise)	490 (45.7%)
Thinking of positives	489 (45.6%)
Using humour, laughing	365 (34.0%)
Talking to colleagues to get information	326 (30.4%)
Distracting myself	319 (29.7%)
Changing in diet (e.g. types of food, amount)	308 (28.7%)
Talking to colleagues to get emotional support	294 (27.4%)
Strategising and planning steps to take	268 (25.0%)
Using meditation, mindfulness or other relaxation techniques	207 (19.3%)
Avoiding thinking about or not thinking about it	195 (18.2%)
Using religious or spiritual practice(s)	170 (15.8%)
Changes in substance intake (e.g. smoking, alcohol, others)	155 (14.5%)
Other	44 (4.1%)
None	142 (13.2%)

Figure S1

Longitudinal comparison of key outcome variables across three survey timepoints since the outbreak of the COVID-19 pandemic in the subgroup of participants who answered to all three surveys ($n = 127$): (a) risk of poor well-being/distress, (b) burnout, and (c) job performance since COVID-19 (JP-CV). Groups were compared using Chi-square analysis. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, ****$P < 0.0001$; ns, not significant; S I, Survey I; S II, Survey II; S III, Survey III; CI, confidence interval; eWBI, expanded Well-being Index.

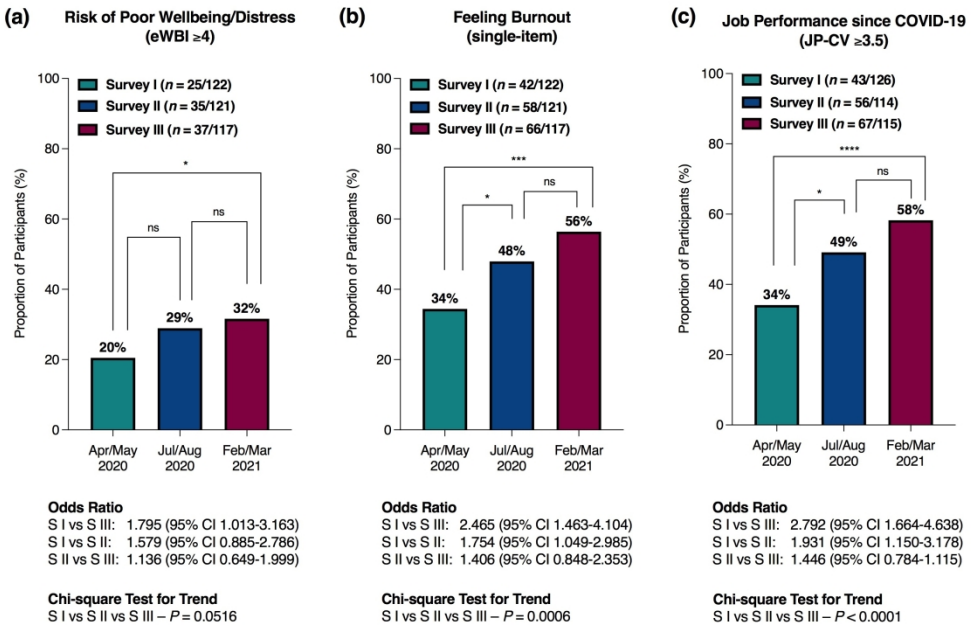

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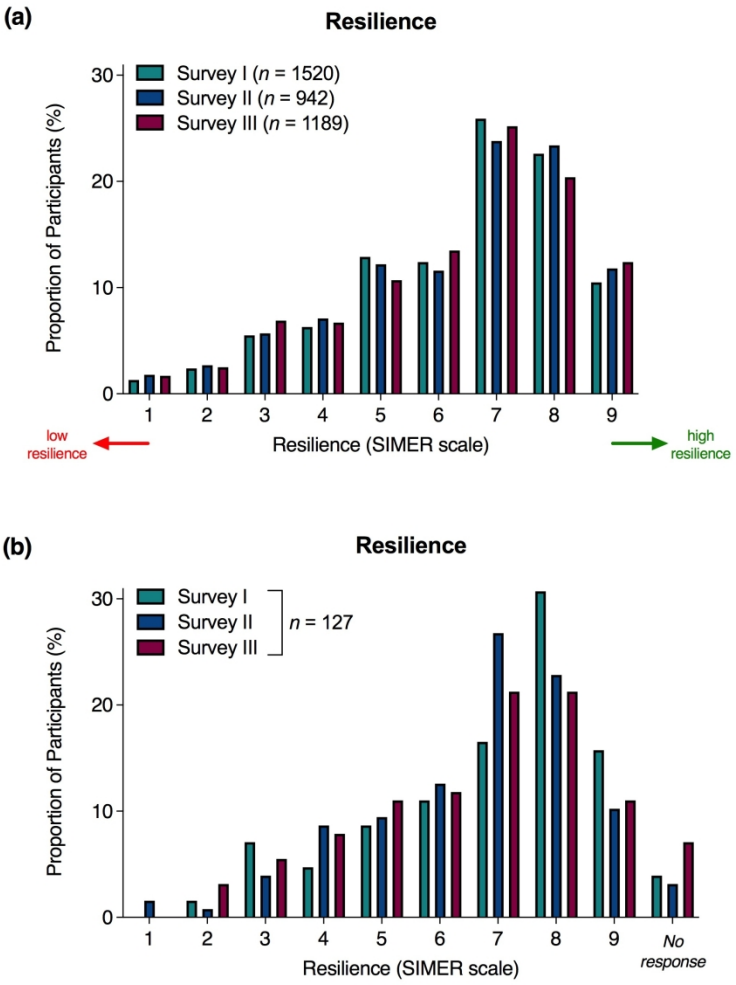
Figure S2

Self-reported levels of psychological resilience since the outbreak of the COVID-19 pandemic (Survey I: April-May 2020, Survey II: July-August 2020 and Survey III: February-March 2021) (supplementary data to Figure 1). (a) Baseline self-reported psychological resilience amongst participants as measured by the single-item bipolar measure for employee psychological resilience (SIMER); scale 1 to 9 – low to high psychological resilience. (b) Baseline self-reported psychological resilience amongst the subgroup of participants who answered to all three surveys ($n = 127$).



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