Impact of SARS-CoV-2 on Training and Mental Well-being of Surgical Gynaecological Oncology Trainees

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Running title: Impact of SARS-CoV-2 on Surgical Gynaecological Oncology Trainees

Word count: 2700

ABSTRACT

Introduction: The SARS-CoV-2 global-pandemic has caused a crisis disrupting health-systems worldwide. Whilst efforts are afoot to determine the extent of disruption, impact on gynaecological oncology trainees/training has not been explored. We conducted an international survey on impact of SARS-CoV-2 on clinical practice, medical education, and mental well-being of surgical gynaecological-oncology trainees.

Methods: In our cross-sectional-survey, a customised web-based-survey was circulated to surgical gynaecological oncology trainees from national/international-organisations (May-November 2020). Validated questionnaires assessed mental well-being. Wilcoxon rank-sum test and Fisher's exact-test tested hypothesis about differences in means and proportions. Multiple linear-regression evaluated effect of variables on psychological/mental-wellbeing outcomes. Outcomes included clinical practice, medical education, anxiety-&-depression, distress, mental well-being.

Results: A total of 127 trainees from 34 countries responded. Of these, 52% (66/127) were from countries with national-training-programmes (UK/USA/Netherlands/Canada/Australia) and 48% (61/127) from no-national-training-programme countries. Altogether, 28% (35/125) had suspected/confirmed COVID19; 28% (35/125) experienced drop in household income; 20% (18/90) self-isolated from households; 45% (57/126) had to re-use personal-protective-equipment and 22% (28/126) purchased their own. In total, 32.3% (41/127) of trainees (national-training-programme-trainees=16.6%(11/66); no-national-training-programme-trainees=49.1%(30/61), p=0.02) perceived they would require additional time to complete their training-fellowship. The additional training-time anticipated did not differ between trainees from countries with/without national-training-programmes (p=0.11) or trainees at the beginning/end of their fellowship (p=0.12). Surgical exposure was reduced for 50% of trainees. Departmental teaching continued throughout the pandemic for 69% (87/126) of trainees, albeit at reduced frequency for 16.1% (14/87), and virtually for 88.5% (77/87). Trainees reporting adequate pastoral-support (defined as allocation of a

dedicated mentor/access to occupational health support services) had better mental well-being with lower levels of anxiety/depression (p=0.02) and distress (p<0.001). National-training-programme-trainees experienced higher levels of distress (p=0.01). Mean mental well-being scores were significantly higher pre-pandemic (8.3 (SD=1.6) versus post-pandemic (7 (SD=1.8);p=<0.01).

Discussion: SARS-CoV-2 has negatively impacted surgical training, household income and psychological/mental well-being of surgical gynaecologic oncology trainees. Overall clinical impact was worse for no-national-training-programme versus national-training-programme-trainees, though national-training-programme-trainees reported greater distress. COVID19 sickness increased anxiety/depression. The recovery phase must focus on improving mental well-being and addressing lost training opportunities.

HIGHLIGHTS

1. COVID19 has negatively impacted training, income, mental well-being of gynaecologic oncology trainees.
2. COVID19 sickness increased anxiety/depression amongst trainees.
3. The recovery phase must focus on improving mental well-being and addressing lost training opportunities.

INTRODUCTION

On March 11, 2020 the World-Health-Organization (WHO) declared the outbreak of Coronavirus-disease-2019 (COVID-19) a pandemic given its spread and severity. The cause was identified to be a novel coronavirus named severe-acute-respiratory-syndrome-coronavirus-2 (SARS-CoV-2). SARS-CoV-2 has swept the world infecting 164 million individuals and causing 3.4 million deaths worldwide (as of May 2021).[1]

Globally an array of guidelines have been produced and implemented to restrict/modify elective-surgical and oncology practice during the pandemic.[2] These guidelines are intended to reduce pressure on healthcare-systems, intensive-care-units, ventilator usage, and minimise risk of nosocomial SARS-CoV-2 infection and the postoperative sequelae that may ensue. Many recommendations are pragmatic deviations from standard of care management, aiming to balance risk of treatment and available resources during this pandemic. It remains to be seen how short and long-term oncological-outcomes will be affected.[3, 4]

Whilst data are emerging on impact of the pandemic on surgical-outcomes following cancer-surgery and its impact on healthcare-systems, there is a paucity of data on impact on trainees and no data on the impact specifically on gynaecological-oncology trainees. We present data from an international survey on impact of SARS-CoV-2 pandemic on: 1) clinical-practice, 2) medical-education, and 3) mental well-being of surgical gynaecological-oncology-trainees.

METHODS

We sent an anonymised web-based, voluntary, open-survey to trainee surgical gynaecological-oncology members of the European-Network-of-Young-Gynae-Oncologists (ENYGO), Society-of-Gynecologic-Oncology (SGO), and British-Gynaecological-Cancer-Society (BGCS) between May-November 2020. A survey link was circulated via social-media and email to ENYGO/BGCS/SGO

members and included in society newsletters. The survey was in English. Participants were informed of the length of time of survey, how data were stored, investigator names and study purpose.

Adaptive questioning was incorporated to reduce number/complexity of questions. Respondents had the option to review/amend answers through the use of a "back" button prior to submission. IP (internet-protocol) address of the client computer was used to identify potential duplicate entries from the same user. Duplicates were excluded for data-analysis, with the first entry included. All incomplete questionnaires were included in the analysis irrespective of the number of questions completed. The eighty-one item questionnaire (Appendix-1) included a customised section covering baseline characteristics regarding the respondent's training post, practice setting, postgraduate experience and socio-demographics. Additional questionnaire-items covered: changes in clinical and research activities/tumour board functioning/workload since pandemic onset; access to personal-protective-equipment and rest-facilities whilst on shift; redeployment; COVID-19 sickness; departmental teaching; medical rotations; mental well-being. For questions pertaining to mental well-being, in addition to a customised ten-point linear scale, the validated fourteen-item Hospital-Anxiety-and-Depression-Scale[5] to assess anxiety and depression and fifteen-item Impact-of-Events-Scale)[6] to assess distress were used.

Questionnaire-development

An initial hard-copy draft was developed following a literature-review. Each question was systematically discussed and reviewed by gynaecological-oncology clinicians (five-trainees/five-trainers from UK/US/India/Sweden) in an initial consensus meeting held face-to-face virtually. Each item was given a relevance score from 1 (least-relevant) to 4 (most-relevant) based on knowledge/experience; and identified additional questions. A second face-to-face virtual consensus meeting was held with the same ten gynaecological-oncology clinicians to review initial questionnaire responses, delete low-relevance items, optimise questionnaire length and facilitate

compliance. A pilot of the electronic-survey was undertaken for usability/technical functionality/layout. For the pilot, twenty ENYGO/BGCS/SGO members reviewed the electronic-survey.

Statistical-analysis

Descriptive-statistics calculated for baseline-characteristics, clinical activities/pathways, personal-protective-equipment, COVID-19 sickness, medical education. Wilcoxon rank-sum test and Fisher's exact test were used for testing differences in means and proportions respectively.

Multiple linear-regression was used to model the effect of variables on HADS, IES, mental wellbeing scales. Multiple-analyses were adjusted for gender, ethnicity, income, marital-status, religion, income, age and postgraduate experience. Two-sided p-values are reported for all statistical tests. Statistical analysis was performed using R version 3.5.1. In accordance with the journal's guidelines, we will provide our data for the reproducibility of this study in other centres if such is requested.

RESULTS

A total of 127 participants from 34 countries responded. Using the human-development-index classification (a composite index of life expectancy, education, per capita income indicators, used to rank countries into four tiers of human development: very-high, high, medium, low),[7] 100 respondents were from very-high human-development-index countries (Australia-1, Austria-2, Belgium-2, Canada-2, France-2, Germany-2, Hungary-2, Ireland-1, Italy-3, Kazakhstan-1, Netherlands-2, Poland-1, Portugal-1, Romania-1, Russia-2, Singapore-4, Slovenia-2, Spain-2, Switzerland-1, Turkey-5, UK-24, USA-37); 10 from high- human-development-index countries (Azerbaijan-2, Brazil-1, Colombia-1, Indonesia-1, Philippines-1, Serbia-2, Sri Lanka-1, Ukraine-1); 17 from medium-HDI countries (Guatemala-1, India-15, Nepal-1). Baseline characteristics are displayed in Table 1. In total,

52% (66/127) of respondents were from countries with national-training-programmes (UK/USA/Netherlands/Canada/Australia) and 48% (61/127) from countries without national-training-programmes. National-training-programme-trainees versus no-national-training-programme-trainees, were earlier on in their fellowship ($p<0.01$), but mean total length of fellowships ($p=0.27$) and mean years of postgraduate experience ($p=0.14$) were similar. The pandemic caused a negative impact on household income for 28% (35/125) of respondents, more so for no-national-training-programme (47.5%(28/59)) than national-training-programme (10.6%(7/66)) trainees ($p<0.01$). Almost a quarter (31/127) reported to be shielding (Table 1). Shielding was defined as "staying at home at all times and avoiding any face-to-face contact if you or someone in your household are clinically extremely vulnerable". This was more common for no-national-training-programme than national-training-programme trainees ($p<0.01$). Whilst shielding, 83.9% (26/31) of respondents were performing research activities, 35.5% (11/31) audits, 41.9% (13/31) telephone clinics, and 9.7% (3/31) no work-related activities.

Overall, 28% (35/125) of trainees (national-training-programme=28.8%(19/66); no-national-training-programme=27.1%(16/59)) had been off work with suspected/confirmed COVID-19. Only 82.9% (29/35) reported access to SARS-CoV-2 testing. Since the onset of the pandemic, 20% (18/90) of trainees (national-training-programme=10.4% (5/48) versus no-national-training-programme=31% (13/42), $p=0.02$) chose to self-isolate from their household.

In total, 52% (66/127) of respondents administered chemotherapy, with 32% (21/65) reporting an increase in administration. The mean proportion increase was similar for trainees from both countries with/without national-training-programmes (20.9% (SD=11.6, range=10-50) versus 28.3% (SD=14.6, range=10-50), $p=0.19$). A total of 85%(108/127) of trainees stated multidisciplinary-team/tumour-board meeting logistics had changed with no statistically-significant differences

between national-training-programme and no-national-training-programme-trainees (p=0.71). Overall, 80.6% (87/108) of trainees stated that meetings became virtual (instead of face-to-face), 16.7% (18/108) reported shorter face-to-face meetings, and 18.5% (20/108) had less frequent meetings. When evaluating recruitment to gynaecological-oncology-studies, 74.4% (93/125) stated that this had completely-stopped/somewhat-reduced, 23.2% (29/125) reported no change, and 2.4% (3/125) reported it had somewhat-increased/increased.

Table-S1 summarises access, re-use and personal purchase of personal-protective-equipment. Overall, 67% (85/126) of respondents reported adequate personal-protective-equipment "all-of-the time" and 30% (38/126) reported "some-of-the time". In total, 45% (57/126) of respondents had to re-use and 22% (28/126) had to purchase their own personal-protective-equipment. Personal-protective-equipment access was worse for no-national-training-programme trainees (p=0.003). As an example, 80% (53/66) of national-training-programme-trainees compared to 53% (32/60) of no-national-training-programme trainees had personal-protective-equipment access "all-of-the-time". Only 5% (3/60) of no-national-training-programme-trainees lacked personal-protective-equipment access "most of the time". National-training-programme-trainees were more-likely to re-use personal-protective-equipment (53% (35/66) versus 36.7% (22/60)). More no-national-training-programme-trainees needed to purchase their own personal-protective-equipment (31.7% (19/60) versus 13.6% (9/66), p=0.019). Fewer no-national-training-programme (79.7% (47/59)) versus national-training-programme-trainees (90.8% (59/65), p<0.005) had adequate on shift access to rest facilities "all/some-of-the time".

In total 13.5% (17/126) of trainees were redeployed, with majority redeployed to Obstetrics-&-Gynaecology (64.7%, 11/17). National-training-programme-trainees were redeployed for shorter times (mean=35.1 (SD=30.3; range=3-80 days) than no-national-training-programme-trainees (mean=49.6 (SD=52.8; range=1-120) days, p=0.88). Overall, 88.2% (15/17) of trainees had adequate

supervision during redeployment, while 29.4% (5/17) felt/were asked to work beyond their level of clinical competence (more likely for no-national-training-programme-trainees (p=0.03, Table-S2). Overall adequate pastoral support (defined as allocation of a dedicated mentor/access to occupational health support services) during the pandemic was reported by 62/125 (49.6%) all-of-the time and 40/125 (32%) some-of-the time (Table-S3). This was greater for national-training-programme (87.5% (56/64)) than no-national-training-programme (75.4% (46/61)) trainees.

Pre-pandemic training involved rotation to different hospitals for 56.1% (37/66) of national-training-programme and 33.3% (20/60) of no-national-training-programme-trainees (p=0.01). Rotations were suspended due to SARS-CoV-2 for 36.8% (20/57) of respondents, more-likely for no-national-training-programme (75% (15/20)) than national-training-programme (16.2% (6/37)) trainees (p<0.01). Departmental teaching continued throughout the pandemic for 69% (87/126) of trainees, albeit predominantly virtually for 88.5% (77/87), at reduced frequency for 16.1% (14/87), and without practical hands-on teaching for 21.8% (19/87) (Table-S4). In total, 70.1% (61/87) and 62.9% (78/124) were “very-satisfied/satisfied” with departmental-teaching during and pre-pandemic respectively (Table-S5). The majority, 88% (110/125) accessed e-learning resources during the pandemic (Table-S6). National-training-programme-trainees were more likely to access BGCS/SGO e-learning and no-national-training-programme trainees preferred ESGO/IGCS (International Gynecologic Cancer Society) e-learning. The mean satisfaction with quality of e-learning provided by ESGO/IGCS/BGCS/SGO was overall high, ranging from 7.1-8.6 (1=not-at-all satisfied, 10=very satisfied) (Table-S7).

Half (63/126) of the trainees reported reduced surgical exposure (“yes” respondents). Table 2 summarises the mean (%) reduced exposure according to surgical modality/procedure. Greater levels of reductions were seen in no-national-training-programme versus national-training-

programme-trainees. Table-S8 summarises the reasons for reduced exposure with the commonest reasons being postponement of cases (76.2%, 48/63) and referral reduction (57.1%, 36/63).

Overall, 68.5% (87/127) reported a decrease in outpatient workload with the mean decrease similar for trainees from countries with/without national-training-programmes (46.6% (SD=24.3, range=12-100) versus 47.5% (SD=19.8, range=10-100), p=0.59). Reasons reported for reduced outpatient workload included reduced referrals from primary-care/community-practitioners (44.9% (57/127) cases), and patients not attending scheduled outpatient-appointments (41.7% (53/127) respondents). Just 15.2% (19/125) of trainees stated their overall workload had increased and 84.8% (106/125) reported decreased overall workload. Degree of workload reduction for national-training-programme-trainees (27.5% (SD=13.1% (SD=13.1; range=10-50) was lower than no-national-training-programme-trainees (41.2% (SD=18.6; range=15-100), p=0.04).

Overall, 32.3% (41/127) (16.6%(11/66) national-training-programme; 49.1%(30/61) no-national-training-programme; p=0.02) believed they would need additional time (those who responded "definitely/probably") to complete their training-fellowship (Table-S9). The duration of additional training time anticipated did not significantly differ between trainees from countries with/without national-training-programmes (5.1 (SD=2.8, range=3-12) versus 7.8 (SD=5.6, range=1-24) months, p=0.11) or trainees at the beginning/end of their fellowship (6.2 (SD=3.1, range=2-13) versus 6.8 (SD 2.9), range=2-15), p=0.12).

Mean Hospital-Anxiety-and-Depression-Scale-total (combined anxiety-and-depression scores), Hospital-Anxiety-and-Depression-Scale-anxiety, Hospital-Anxiety-and-Depression-Scale-depression, and Impact-of-Events-Scale scores were 10 (SD=6.7; range=0-29); 6.62 (SD=3.8; range=0-17); 4

(SD=3.6; range=0-13) and 18.72 (SD=16; range=0-73); respectively. Higher scores indicate greater-levels of anxiety/depression/distress. Multiple-linear-regression-models explored association of covariates with HADS and IES mean-scores (Tables 3, 4 and S10). Trainees with higher household income (>$150,000 versus <$50,000) and adequate pastoral support (all/some-of-the-time versus no-most-of-the-time/not-at-all) had lower levels of anxiety&depression (p=0.02) (Table-2). However, being off work from COVID-19 sickness was associated with higher levels of anxiety&depression (p=0.02). Trainees from very-high/high versus medium HDI-countries (p=0.02) and those who received adequate pastoral-support (p<0.01) had lower levels of distress. However, distress levels were higher in national-training-programme versus no-national-training-programme-trainees (p=0.01). The mean mental wellbeing score pre-pandemic was higher (p<0.01) in comparison to post-pandemic (8.3, (SD=1.6, range=2-10) versus 7, (SD=1.8, range=2-10)). Mental well-being mean scores were not significantly associated with any covariates of interest on multiple linear regression (Table-5).

DISCUSSION

Summary of main results

The SARS-CoV-2 pandemic has negatively impacted surgical-training and overall well-being of gynaecological-oncology-trainees. Overall, 28% of trainees had suspected/confirmed COVID-19; 28% experienced drop in household income; 24% were shielding; 20% self-isolating from their households; 13.5% redeployed; 45% re-using personal protective equipment, and 22% purchasing their own. Half reported reduction in surgical exposure and one third felt they required additional time to complete their training fellowship. This negative impact on surgical training was worse for no-national-training-programme versus national-training-programme-trainees and seen across most surgical procedures. For 69% of trainees departmental teaching continued and 88% had accessed e-learning resources. Trainees with adequate pastoral-support had significantly lower anxiety-and-depression (p=0.02) and lower distress levels (p<0.001). National-training-programme-trainees had

higher-levels of distress than no-national-training-programme-trainees (p=0.01). Mean mental well-being scores were higher pre-pandemic versus post-pandemic (p<0.01).

Results in the context of published literature

Our data demonstrate a profound detrimental impact from the pandemic on surgical training, the training environment and well-being of gynaecologic oncology trainees. The fact that 50% of trainees experienced reduced surgical training and 13.5% were redeployed, supports existing data that elective surgery across hospitals was reduced/stopped to increase critical care bed capacity for patients with SARS-CoV-2 and release staff to support wider hospital responses.[8-10] [11] This was compounded by staff shortages and sickness, reduced theatre availability and supply chain scarcities. National/international guidelines were developed to provide a framework for continuing gynaecological cancer care and aid difficult management decisions.[12, 13] This identified groups of patients where therapy may be 'delayed' for a period of time until the SARS-CoV-2 pandemic was controlled. Rapid guidance was produced for principles of delivering radiotherapy[14] and systemic anti-cancer treatment.[15] Mitigation strategies resulted in changes to surgical and systemic chemotherapy plans, treatment delays, introduction of regimens requiring less frequent treatment administration. The 37.2-80% mean reduction in surgical training opportunities for trainees observed across surgical modalities, is consistent with the overall reduction in surgical cases resulting from above strategies and findings from a global modelling analysis suggesting 38% cancer and 82% benign surgeries may be postponed during the pandemic.[16] This is also in keeping with data from other surgical specialities where trainees reported a reduction (50-90%) in surgical-training opportunities.[17-19] These effects are corroborated by our data which report increased chemotherapy administration, postponement of surgical cases, reduced referrals, treatment pathway modification and reprioritisation as key reasons for reduced surgical exposure.

National-training-programme-trainees were less likely to believe they would need additional time to complete their training-fellowship versus no-national-training-programme-trainees (p=0.02). This may be because they were earlier in their fellowship (mean 1.6 versus 2.3 years). It also reflects benefits of structured accredited training programmes in gynaecologic oncology which are associated with better educational climates along with better quality/higher training satisfaction.[10, 20, 21] Such programmes are more likely to adapt and implement changes to ensure timely progression and completion of training. It is encouraging that despite the increased pressure on global healthcare systems, delivery of departmental teaching continued for 69% and consistent with the move towards remote/virtual working practices, was predominantly delivered via virtual platforms in 89% cases. However, there was no practical hands-on teaching for 21.8% of trainees. Simulation training has long been used in general surgery as a supplement to clinical surgical training as part of a balanced curriculum and has been shown to flatten the learning curve of complex surgical procedures and enhance patient safety.[22-25] It is a teaching method often underutilised in gynaecologic oncology that warrants greater attention to enable the continued development of surgical skills in times of reduced exposure. The majority of trainees, 88% had accessed e-learning resources during the pandemic with high levels of satisfaction (mean satisfaction 7.1-8.6). Access to ESGO/IGCS e-learning was lower amongst national-training-programme-trainees (predominantly UK/USA trainees) potentially because a larger proportion were accessing national teaching resources produced by national organisations (BGCS–UK/SGO-USA).

Three in ten trainees had COVID19 and this was associated with increased anxiety&depression. These results are in keeping with published literature confirming a negative impact on the mental well-being of general obstetrics and gynaecology trainees.[26] Trainees with adequate pastoral-support had lower-levels of anxiety-and-depression and distress. This is in keeping with published data supporting the positive impact of pastoral support on the mental well-being of medical

practitioners.[27, 28] The reasons for higher levels of distress observed in national-training-programme-trainees versus no- national-training-programme-trainees are likely multifactorial and warrant further research. Potential reasons may include greater need to re-use personal protective equipment (53% versus 36.7%); and needing to cope with greater levels of gynaecologic oncology workloads (p=0.04). Additionally, 92.4% of national-training-programme-trainees were from the UK/USA, and the considerably higher mortality rates seen in the UK/USA populations may have detrimentally affected mental well-being. Data have suggested that country specific mortality rates have been detrimentally impacted by high levels of national obesity, low levels of national preparedness, insufficient scale of testing/track-and-trace facilities, delayed national lockdowns and delays in border closures.[29, 30] Data also indicate that prolonged and recurrent lockdowns have adversely affected mental well-being.[31] The limitations of access to personal protective equipment are unfortunate and consistent with media and literature reports.[10] Trainees have had to cope with other stresses like reduction in household income (potentially explained by increased expenditure from purchasing personal protective equipment, additional childcare costs secondary to school closures, additional accommodation costs incurred due to self-isolation; or income reduction due to shielding, COVID19 related sickness, and job loss amongst non-medical partners. It is possible that deterioration of mental well-being was confounded by aforementioned factors external to the work environment and in keeping with general population data.[31, 32]

Strengths-and-weaknesses

Strengths include that this is the first study internationally reporting impact of SARS-CoV-2 on surgical gynaecologic oncology-trainees. Validated questionnaires were used to evaluate psychological/mental well-being and changes in pre-and post-pandemic mental well-being were quantified through comparison of a customised mental well-being scale. Risk of recall bias was minimised by circulating the survey during the first pandemic wave. Limitations include that because the survey was circulated during the first SARS-CoV-2 wave and a large proportion of countries have

subsequently experienced multiple waves with sustained pressure on healthcare systems, the responses demonstrate short-term impact and long-term impact has not been evaluated. Results may not be completely generalizable to trainees globally as a number of countries are not well represented, the survey was available in English only excluding non-English speakers, there may have been an element of selection bias due to the use of social media platforms to circulate the survey link and because the majority of respondents were members of BGCS/SGO/ENYGO and likely to be motivated by career development. Responses received for subjective questionnaire items may have been influenced by the current mental state of respondents.

Implications for practice and future research

It must be the responsibility of employers in tandem with government agencies to ensure adequate supply of personal protective equipment and put in place provisions to ensure income protection. This may include the provision of free staff accommodation for individuals requiring to self-isolate or subsidised childcare costs. Training programme directors and societies have a responsibility to ensure continuation of development of surgical skills through the provision of virtual learning (webinars/surgical-videos) and simulation training. Study budgets could be used to purchase simulation equipment with simulation training included in national/international curriculums as a method for achieving surgical competencies. Pastoral support should be governed by codes of conduct with training programme directors, educational offices responsible for producing clear guidelines on how this may be accessed. The onus must be on trainees to access this support when needed. A future cohort study evaluating the long-term impact of the SARS-CoV-2 pandemic on clinical training, education, mental well-being of trainees would help guide the recovery phase.

Conclusion

Data show the SARS-CoV-2 pandemic has negatively impacted surgical training and mental well-being of surgical gynaecologic oncology trainees. Recognising medical practitioners are exposed to additional unique work-related stressors as well as shared common stressors experienced by the general population secondary to the pandemic is vital. In addition to lost training opportunities, focusing on improving the mental well-being of trainees is vital for the recovery phase.

Contribution to authorship

Conception: FG

Design & Development: FG, RM

Questionnaire development: FG, JD, LW, RM

Data collection: FG, IR, JD, LW, ZR, AS, KZ, TN, IS, NB, CT, ML, AP, MG, RM

Data analysis: FG, OB

Preparation of tables: FG, OB

Initial draft of manuscript: FG, RM

Manuscript writing, review and approval: All authors

Disclaimers/ Conflict of Interest Statement:

FG declares research funding from The NHS Grampian Endowment Fund, Medtronic and Karl Storz outside this work. RM declares research funding from Barts & the London Charity, Eve Appeal, British Gynaecological Cancer Society outside this work; an honorarium for grant review from Israel National Institute for Health Policy Research and honorarium for advisory board membership from

Astrazeneca/MSD. RM is supported by an NHS Innovation Accelerator (NIA) Fellowship for population testing.

Funding

None

Ethical approval

The study has been approved and registered with the Quality Improvement & Assurance Team (QIAT) at NHS Grampian (project ID 4963), UK.

Acknowledgements

The study is supported by researchers at the University of Aberdeen and Global Gynaecological Oncology Surgical Outcomes Collaborative (GO SOAR). We are particularly grateful to the trainees/fellows who participated in the study. We are grateful to the entire administrative staff at the Quality Improvement & Assurance Team NHS Grampian who worked on this study. We are grateful to ENYGO, BGCS Fellows and SGO for increasing awareness of our study.

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514 **Table 1. Baseline characteristics of cohort**

515

	Trainees from a country with a national training programme		**P value**
	Yes n=66, 52%	**No n=61, 48%**	
Human development Index (HDI)			
Very high	66/66, 100	34/61, 55.7	<0.001
High	0	10/61, 16.3	
Medium	0	17/61, 27.9	
Mean current year of fellowship (SD, range)	1.6 (0.7, 1-4)	2.3 (1.3, 1-8)	<0.001
Mean total years of fellowship (SD, range)	2.8 (0.7, 1-4)	2.9 (1.3, 1-8)	0.274
Mean years of postgraduate experience (SD, range)	7.2 (4.3, 1-16)	6 (3.6, 0-13)	0.140
Healthcare sector of work*			
Government/state funded	61/66, 92.4	55/61, 90.2	0.360
Private	15/66, 22.7	8/61, 13.1	
Both (government and private)	10/66, 15.2	2/61, 3.3	
Mean age (SD, range)	34.5, (3.4, 30-42)	34 (4.2, 23-45)	0.622
Gender			
Male respondents	21/66, 31.8	24/59, 40.7	0.353
Female respondents	45/66, 68.2	35/59, 59.3	
Ethnicity			
White	49/66, 74.2	34/59, 57.6	0.070
Asian	10/66, 15.2	20/59, 33.9	
Black	1/66, 1.5	2/59, 3.4	
Mixed	5/66, 7.6	3/59, 5.1	
Other	1/66, 1.5	0/59, 0	
Religion			
Muslim	2/65, 3.1	10/59, 16.9	<0.001
Christian	23/65, 35.4	23/59, 39	
Jewish	6/65, 9.2	0/59, 0	
Hindu	3/65, 4.6	15/59, 25.4	
Buddhist	0/65, 0	1/59, 1.7	
None	31/65, 47.7	10/59, 16.9	
Marital status			
Married	47/66, 71.2	33/59, 55.9	0.090
Cohabiting/living with partner	9/66, 13.6	9/59, 15.3	
Single	10/66, 15.2	13/59, 22	
Divorced/separated	0/66, 0	4/59, 6.8	
Household income in last 12 months (USD)			
<$50,000	0/65, 0	35/58, 60.3	<0.001
$50,000-$100,000	24/65, 36.9	16/58, 27.6	
$100,000-$150,000	19/65, 29.2	3/58, 5.2	
≥$150,000	22/65, 33.8	4/58, 6.9	
Shielding**			
Yes	7/66, 10.6	25/61, 41	<0.001
No	59/66, 89.4	36/61, 59	

Denominator for each demographic questionnaire item represents total number of respondents for that particular question. Incomplete questionnaires were included in the analysis resulting in varying denominators per item.

*Respondents working at “both” are also counted in the individual categories of “government” and “private”.

**Shielding defined as staying at home at all times and avoiding any face-to-face contact if you or someone in your household are clinically extremely vulnerable.

Table 2. Mean reduction in surgical exposure for trainees according to surgical modality and procedure from countries with and without a national training programme during the SARS-CoV-2 pandemic

	National training programme		P value
	Yes	No	
Surgical modality/procedure	**Mean (SD, range)**	**Mean (SD, range)**	
Robotic	46.7 (41, 0-100)	80 (30.9, 0-100)	0.041
Laparoscopic	47.2 (38.4, 0-100)	66.5 (26.1, 0-100)	0.058
Open surgical procedures	37.2 (27.5, 0-100)	48.9 (20, 0-100)	0.027
Ovarian cancer cytoreductive surgery	44 (29.4, 0-100)	45.5 (29.4, 0-100)	0.799
Exenteration procedures	34.4 (41.6, 0-100)	61.7 (41.4, 0-100)	0.036
Surgery for recurrent disease	54.2 (39.5, 0-100)	52.1 (30.2, 0-100)	0.814
Radical vulval surgery	26.3 (35, 0-100)	47.6 (32.6, 0-100)	0.016
Radical hysterectomy	20.8 (33.8, 0-100)	42.1 (31, 0-100)	0.007
Pelvic lymphadenectomy	28.4 (36.8, 0-100)	40.7 (29.6, 0-100)	0.078
Para-aortic lymphadenectomy	35.3 (40.9, 0-100)	46.6 (29.5, 0-100)	0.121
Trachelectomy	15 (31.2, 0-100)	58.3 (37.9, 0-100)	0.001

Table 3. Factors affecting HADS total mean scores

HADS – Hospital Anxiety and Depression Scale questionnaire; HDI – Human Development Index; PPE – Personal Protective Equipment.

Model and variable	Coef.	Std. Err	P>|z|	95% CI
HADS model (total), n=90				
Gender	-2.024	1.401	0.154	-4.828 to 0.781
Ethnicity	1.545	1.775	0.388	-2.007 to 5.098
Income	-6.765	2.768	0.018	-12.306 to -1.225
Marital status	-0.641	2.146	0.766	-4.936 to 3.654
Religion	-1.737	1.525	0.259	-4.79 to 1.316
Age	-0.451	0.27	0.101	-0.992 to 0.09
Healthcare sector (both vs private)	2.081	3.533	0.558	-4.99 to 9.153
Healthcare sector (government vs private)	1.348	2.9	0.644	-4.456 to 7.153
Postgraduate experience	-0.075	0.231	0.748	-0.538 to 0.389
Total years of fellowship	-1.193	0.704	0.096	-2.603 to 0.216
HDI	-0.798	3.183	0.803	-7.169 to 5.573
National training programme	1.374	1.863	0.464	-2.355 to 5.103
Shielding	-1.193	1.951	0.543	-5.098 to 2.713
Additional training time	1.879	1.819	0.306	-1.763 to 5.52
Overall increase in clinical workload	0.631	2.386	0.793	-4.145 to 5.406
PPE access	-6.52	4.36	0.14	-15.247 to 2.206
COVID-19 sickness	3.754	1.493	0.015	0.766 to 6.742
Redeployment	1.064	2.17	0.626	-3.279 to 5.408
Adequate pastoral support	-5.543	1.752	0.002	-9.051 to -2.036

Multiple linear regression models evaluating the association of covariates with HADS mean scores. Models adjusted for gender, ethnicity, income, marital status, religion, income, age and postgraduate experience.

HADS is a 14 item validated questionnaire with 7 items pertaining to anxiety and 7 to depression. Each item scored on a four point Likert-scale from 0-3 and total scores ranging from 0-42. Higher scores indicate greater levels of anxiety/depression.

Gender: male versus female

Ethnicity: white (reference category) versus non-white

Income: >$150,000 (reference category) versus <$50,000

Marital status: married/cohabiting (reference category) versus single/divorced

Religion: Muslim/Christian/Jewish/Hindu/Buddhist (reference category) versus none

Age: age in years (continuous variable)

Healthcare sector: trainees working in both government and private healthcare settings versus private only (reference category)

Healthcare sector: trainees working in government only healthcare settings versus private only (reference category)

Postgraduate experience: number of years (continuous variable)

Total years of fellowship: number of years (continuous variable)

HDI: very high/high (reference category) versus medium

National training programme: yes (reference category) versus no

Shielding: yes (reference category) versus no

Additional training time: definitely/probably/don't know (reference category) versus probably not/definitely not

Overall increase in clinical workload: yes (reference category) versus no

PPE access: yes all the time/yes some of the time (reference category) versus no most of the time/not at all

COVID-19 sickness: yes (reference category) versus no

Redeployment: yes (reference category) versus no

Adequate pastoral support: yes all the time/yes some of the time (reference category) versus no most of the time/not at all

570 **Table 4. Factors affecting IES mean scores**

571 IES – Impact of Event Scale questionnaire; HDI – Human Development Index; PPE – Personal
572 Protective Equipment.

573

Model and variable	Coef.	Std. Err	P>|z|	95% CI
IES model, n=118				
Gender	-4.765	2.951	0.11	-10.636 to 1.106
Ethnicity	-1.743	3.776	0.646	-9.256 to 5.77
Income	-8.123	5.964	0.177	-19.989 to 3.743
Marital status	-5.201	4.042	0.202	-13.244 to 2.842
Religion	-4.414	3.249	0.178	-10.879 to 2.051
Age	-0.117	0.501	0.815	-1.113 to 0.879
Healthcare sector (both vs private)	0.741	6.986	0.916	-13.159 to 14.64
Healthcare sector (government vs private)	1.727	5.454	0.752	-9.125 to 12.578
Postgraduate experience	-0.099	0.445	0.825	-0.984 to 0.786
Total years of fellowship	-1.358	1.669	0.418	-4.678 to 1.962
HDI	-14.951	6.177	0.018	-27.241 to -2.66
National training programme	10.344	4.007	0.012	2.371 to 18.316
Shielding	0.719	4.015	0.858	-7.269 to 8.708
Additional training time	5.712	3.641	0.121	-1.534 to 12.957
Overall increase in clinical workload	-1.614	4.664	0.73	-10.894 to 7.666
PPE access	-18.193	10.273	0.08	-38.633 to 2.246
COVID19 sickness	1.163	3.106	0.709	-5.017 to 7.342
Redeployment	-3.614	4.651	0.439	-12.868 to 5.641
Adequate pastoral support	-14.718	4.016	<0.001	-22.71 to -6.727

574

575 Multiple linear regression model evaluating the association of covariates with IES mean scores.
576 Model adjusted for gender, ethnicity, income, marital status, religion, income, age and postgraduate
577 experience.

578

579 IES is a 15 item validated questionnaire. Each item scored on a four point Likert-scale from 0-5 with
580 total scores ranging from 0-75. Higher scores indicate higher distress levels.

581

582 Gender: male versus female

583 Ethnicity: white (reference category) versus non-white

584 Income: >$150,000 (reference category) versus <$50,000

585 Marital status: married/cohabiting (reference category) versus single/divorced

586 Religion: Muslim/Christian/Jewish/Hindu/Buddhist (reference category) versus none

587 Age: age in years (continuous variable)

Healthcare sector: trainees working in both government and private healthcare settings versus private only (reference category)

Healthcare sector: trainees working in government only healthcare settings versus private only (reference category)

Postgraduate experience: number of years (continuous variable)

Total years of fellowship: number of years (continuous variable)

HDI: very high/high (reference category) versus medium

National training programme: yes (reference category) versus no

Shielding: yes (reference category) versus no

Additional training time: definitely/probably/don't know (reference category) versus probably not/definitely not

Overall increase in clinical workload: yes (reference category) versus no

PPE access: yes all the time/yes some of the time (reference category) versus no most of the time/not at all

COVID-19 sickness: yes (reference category) versus no

Redeployment: yes (reference category) versus no

Adequate pastoral support: yes all the time/yes some of the time (reference category) versus no most of the time/not at all

Table 5. Factors affecting mental wellbeing mean scores since the onset of the SARS-CoV-2 pandemic

HDI – Human Development Index; PPE – Personal Protective Equipment.

Model and variable	Coef.	Std. Err	P>|z|	95% CI
Mental wellbeing, n=126				
Gender	0.069	0.374	0.855	-0.674 to 0.811
Ethnicity	-0.002	0.485	0.997	-0.966 to 0.962
Income	1.034	0.741	0.167	-0.439 to 2.507
Marital status	0.292	0.511	0.569	-0.724 to 1.309
Religion	0.104	0.426	0.808	-0.743 to 0.95
Age	0.096	0.061	0.118	-0.025 to 0.218
Healthcare sector (both vs private)	-0.451	0.896	0.616	-2.231 to 1.329
Healthcare sector (government vs private)	-0.23	0.689	0.739	-1.599 to 1.138
Postgraduate experience	-0.006	0.057	0.923	-0.119 to 0.108
Total years of fellowship	0.097	0.194	0.62	-0.289 to 0.483
HDI	0.281	0.75	0.709	-1.209 to 1.771
National training programme	-0.689	0.519	0.188	-1.72 to 0.343
Shielding	0.201	0.5	0.688	-0.792 to 1.195
Additional training time	-0.8	0.465	0.089	-1.724 to 0.124
Overall increase in clinical workload	-0.224	0.598	0.708	-1.413 to 0.964
PPE access	-0.766	1.14	0.504	-3.032 to 1.501
COVID19 sickness	-0.011	0.396	0.977	-0.798 to 0.776
Redeployment	-0.59	0.545	0.282	-1.674 to 0.494
Adequate pastoral support	0.717	0.501	0.156	-0.279 to 1.714

A multiple linear regression model exploring the association of covariates with mental wellbeing mean scores since the onset of the pandemic. Model adjusted for gender, ethnicity, income, marital status, religion, income, age and postgraduate experience.

Linear customised scale where 1=extremely poor mental wellbeing, 10=excellent mental wellbeing.

Gender: male versus female

Ethnicity: white (reference category) versus non-white

Income: >$150,000 (reference category) versus <$50,000

Marital status: married/cohabiting (reference category) versus single/divorced

Religion: Muslim/Christian/Jewish/Hindu/Buddhist (reference category) versus none

Age: age in years (continuous variable)

Healthcare sector: trainees working in both government and private healthcare settings versus private only (reference category)

Healthcare sector: trainees working in government only healthcare settings versus private only (reference category)

Postgraduate experience: number of years (continuous variable)

Total years of fellowship: number of years (continuous variable)

HDI: very high/high (reference category) versus medium

National training programme: yes (reference category) versus no

Shielding: yes (reference category) versus no

Additional training time: definitely/probably/don't know (reference category) versus probably not/definitely not

Overall increase in clinical workload: yes (reference category) versus no

PPE access: yes all the time/yes some of the time (reference category) versus no most of the time/not at all

COVID-19 sickness: yes (reference category) versus no

Redeployment: yes (reference category) versus no

Adequate pastoral support: yes all the time/yes some of the time (reference category) versus no most of the time/not at all