



# The state of general surgery residents in Italy after COVID-19 outbreak: a nationwide cross-sectional study

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## Abstract

**Introduction** A significant reorganization of working activities including those of teaching hospitals occurred after COVID-19 outbreak, leading to the need to re-assess the current status of training after the pandemic. This study aimed to investigate the state of general surgery (GS) residency in Italy. The impact of COVID-19 on GS residents was also assessed.

**Methods** Between October and November 2020, an anonymous online survey was distributed to GS residents across Italy. Email addresses were provided by the Regional Committees of the Italian Polyspecialistic Society of Young Surgeons. The residents completed a set of questions regarding their training schedule and three standardized questionnaires to measure burnout and psychological distress.

**Results** Overall, 1709 residents were contacted and 648 completed the survey. Almost two-thirds of the residents (68.4%,  $n=443$ ) reported to not reach the minimum annual operative case volume. According to ordinal logistic regression analysis, two of the most perceived effects of COVID-19 by trainees on training were reduction of surgical activities (OR = 2.21,  $p < 0.001$ ) and increased concerns about future employment (OR = 1.14,  $p = 0.025$ ). Loss of training opportunities was also associated with a significant increase of distress (OR = 1.26,  $p = 0.003$ ) but not with burnout.

**Conclusions** This study provided a snapshot of the situation of GS residents in Italy after COVID-19 outbreak. Reduction of activities due to pandemic highlighted the need to improve the level of surgical education in our country by implementing all the new available tools for training and ensuring at the same time the well-being of the residents.

**Keywords** General surgery · Burnout · Training · Occupational stress · Unemployment · Epidemics

## Introduction

Italy was the first European country to be heavily hit by COVID-19 spread. Increase of hospitalization rates and intensive care unit (ICU) admissions due to the rapid

circulation of the virus led to the reduction or even complete interruption of elective surgery [1, 2]. As a result, surgical residents reported a significant drop of operative procedures in case logs [3] as well as a profound reorganization of training activities. Considering that the Italian system had been

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already questioned in the past about surgical training, especially when compared to other European countries or to the United States [4], the need to assess the effects and the perception of these changes among surgical residents is urgent.

To date, only few surveys have been conducted on surgical residents in our country [5-8] but none of these have ever examined comprehensively the general surgery (GS) specialty. Considering the pivotal role played by GS in health care, we launched a national survey to investigate the situation of GS training in Italy. Moreover, given the recent pandemic and also the possible emergence of SARS-CoV-2 variants which may lead to inevitable and further disruptions of elective surgery in the near future [8], we also investigated how and to what extent COVID-19 impacted GS trainees. These findings may be of value to training program directors in developing and prioritizing strategies to address the needs of residents which could be valid also in the post-COVID-19 era. Accordingly, we designed a study with three objectives: (1) to provide a national socio-demographic profile of GS residents; (2) to identify factors associated with the perceived impact of COVID-19 on training; and (3) to assess the relationship between COVID-19 experience and the mental well-being of residents using standardized occupational stress scales.

## Methods

### Participants and survey design

In October 2020, residents of GS programs across Italy were contacted through personal emails and asked to complete a web-based survey using the Google Forms platform. Email addresses were provided by the Regional Committees of the Italian Polyspecialistic Society of Young Surgeons (SPIGC). The length of GS residency in Italy is 5 years (6 years for residents who entered before 2014) and surgical training programs are coordinated at a local level by University Hospitals: within GS program facilities, residents may perform clinical rotations including periods in Non-University Hospitals and abroad, upon agreements with program directors. At the time of the survey, 40 residency programs were identified ([www.miur.gov.it](http://www.miur.gov.it), Allegato 1 D.M.15/09/2020 prot. n. 650). All respondents started their GS residency program before the COVID-19 pandemic outbreak.

The survey was conducted according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [9]. A reminder email was sent two weeks after the initial distribution to encourage participation and the survey was closed in November 2020 (3 weeks). Participants were informed that the participation was voluntary and that survey was completely anonymous but they were blind to the hypothesis of the study.

### Outcome measures

The survey included 41 questions (Supplemental File) and collected the following measures:

- *Socio-demographic characteristics and work conditions*  
This questionnaire was used to obtain information regarding socio-demographic characteristics (age, gender, postgraduate year -PGY-), training (type of hospital, lectures, availability of surgical simulators), and working conditions (average number of working hours per week/night shifts performed in the 30-day period preceding the completion of the questionnaire).
- *Impact of COVID-19*  
Participants indicated on a 5-point Likert scale (0 = “not at all”, 4 = “extremely”) to what extent COVID-19 has adversely affected their training [10]. Reduction of surgical activities was rated according to the percentage of reduction (0%-25%-50%-75%-100%) compared to the pre-pandemic period. To define high COVID-19 regions, we used the classification based on the ordinance issued by the Italian Ministry of Health (“red zone”, i.e. median occupancy rate ICU > 30% or median hospitalization rate > 40 per 100.000 people). COVID-19 statistics were calculated from a Git repository hosting service (<https://github.com/pcm-dpc/COVID-19>).
- *Satisfaction, perceived time constraint and worries about future employment*  
Participants answered six questions regarding the degree of satisfaction with specialty (program, specialty choice, training, relationships with other residents and supervisors) and with salary. They indicated also whether their work schedule left them enough time for extracurricular activities, social interactions, lectures and research/studying. Concerns for future employment after the end of residency were also investigated. Responses were rated on a 5-point Likert scale (ranging from “not at all” to “extremely”). Since the items regarding “*perceived time constraint*” and “*satisfaction with specialty*” were highly correlated among them, they were summed to obtain a single measure, as previously described [11].
- *Burnout*  
The prevalence of burnout was measured using an Italian version [12] of the validated 22-item Maslach Burnout Inventory [13]. Participants were considered to experience burnout symptoms if they scored in the highest tertile for emotional exhaustion (EE) ( $\geq 24$  points) or depersonalization (DP) ( $\geq 9$  points).
- *Psychological distress*

Two Standardized questionnaires were measured:

- 1) Effort–Reward Imbalance (ERI) Model: the Italian version of the short questionnaire was used [14]. This consisted of 10 items with responses ranging on a 4-point Likert scale from “1 = strongly disagree” to “4 = strongly agree”. A weighted ratio > 1 between effort and reward indicates an imbalance (i.e. high risk of work-related stress disorders). With the assessment of overcommitment (OC), the ERI model takes also into account a personality trait which reflects the difficulty of withdrawing from the obligations imposed by the work environment.
- 2) Demand Control Support Questionnaire (DCSQ): The DCSQ is derived from the longer Job Content Questionnaire [15] and comprises 17 items to be rated on 4-point Likert scale from “1 = strongly disagree” to “4 = strongly agree”. The questionnaire provides scores on three subscales: the “Demand” subscale refers to the job's psychological demands, such as work overload. The “Job Control” subscale assesses the use and development of skills and autonomy in decision-making. Job strain was defined as a weighted relationship between demand and control (D/C) > 1 [16]. The “Social Support” subscale taps into the quality of relationships among coworkers and with supervisors. An already existing and validated Italian version was used [17].

We classified residents who had both an ERI > 1 and a D/C ratio > 1 as "in distress". Distress is not yet a disease state, but it represents a high risk condition for developing mental and physical illnesses [18].

### Statistical analysis

Descriptive statistics were expressed as median and interquartile range (IQR). Ordinal logistic regression analysis was used to analyze the association between the perceived negative impact of COVID-19 on training and several potential explanatory (independent) variables. After crude association analysis (univariable analysis), all these variables were analyzed together to obtain a full model. Since the dependent variable (perceived negative impact of COVID-19) was an ordinal variable measured on a 5-point Likert scale, an ordinal logistic regression model was chosen for analyzing this outcome. Brant test was performed to evaluate the parallel assumption [19]. Binary logistic regression analysis, adjusted for gender and age, was instead performed to assess the association between the negative perceived impact of COVID-19 on training (independent variable) and the occurrence of burnout/distress set as the dependent variable. Spearman's correlation coefficients were computed to evaluate the relationship with the separated items of each occupational stress scale. All statistical tests were two-tailed, and differences were considered significant at a p-value of  $\leq 0.05$ . The statistical software used for all analyses was

Stata version 15 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LP).

## Results

### Socio-demographics and work-related characteristics

Of the 1709 residents invited, 648 completed the survey (response rate: 37.9%). The median age of the respondents was 30 years (IQR 28–31). (Table 1) There were 350 females (54%) and 38 (5.9%) have one or more children. Distribution of respondents according to their PGY level, type of hospital and geographical area of working is shown in Table 1.

In median, residents reported working 50 h per week (IQR 40–60) and 390 (60.2%) working night shifts with a median of 3 night shifts per month (IQR 2–4). Before COVID-19 emergency, they reported working in median

**Table 1** Socio-demographics and work characteristics of the entire population

Variable	n = 648
Age, median (IQR), yrs	30 (28–31)
Gender M/F	298/350
Marital status, n (%)	
Single	373 (57.6)
Married/ Partnered	90/185 (13.9/28.5)
Children, n (%)	38 (5.9)
PGY level, n (%)	
1	70 (10.8)
2	124 (19.1)
3	194 (29.9)
4	63 (9.7)
≥ 5	197 (30.4)
Working hours per week, median (IQR), hours	50 (40–60)
Working night shifts, n (%)	390 (60.2)
Night shifts per month, median (IQR), n	3 (2–4)
Working on-call, n (%)	407 (62.8)
Nights on-call per month, median (IQR), n	6 (4–10)
Type of hospital, n (%)	
University	364 (56.2)
Non-university	190 (29.3)
Private	8 (1.2)
Not specified	86 (18.8)
Geographical area of working, n (%)	
North	361 (55.7)
Center	184 (28.4)
South and Islands	97 (15)
Abroad	6 (0.9)

F female, IQR interquartile range, M male, PGY postgraduate year

60 h per week (IQR 50–65): accordingly, 68 respondents (10.5%) reported to work more, 271 (41.8%) to work the same and 309 (47.7%) to work less than before the pandemic. The average number of 48 working hours/week stipulated by the European Working Time Directive (EWTD) was reported to be exceeded (pre-pandemic) by 82.4% ( $n = 534$ ) of respondents as well as the minimum daily consecutive rest period of 11 h, observed only by 39.3% of respondents ( $n = 255$ ).

### Residency programs' characteristics

The number of respondents according to the residency program is shown in Supplementary Table 1. For 527 respondents (81.3%), GS was selected as their first choice with 154 of them (29.2%) reporting to have matched with their preferred GS residency program. Availability of surgical simulators (e.g. pelvic trainers) within own training institution was reported by 239 participants (36.9%). Three hundred and seventy-seven respondents (58.2%) reported that scheduled lectures were not given. Four hundred and thirty-eight residents (67.6%) reported to be actively involved in research (basic/clinical/translational).

One hundred and 21 residents (18.7%) reported to reach the minimum annual operative case volume (according to the Ministerial Decree 68 and 402/2015) whereas 443 (68.4%) did not achieve case minimums. Eighty-four respondents (12.9%) reported they did not know these requirements. About half of the residents (52.3%) felt to be not adequately trained (not at all/slightly) and 68.3% reported concerns (moderately/very much/extremely) about their preparedness for independent practice. The 78.6% of residents reported to be not satisfied with their salary. Satisfaction with specialty, with salary and perceived time constraint are shown in Fig. 1a-b.

### Impact of COVID-19

At the time of the survey, corresponding to the beginning of the second wave of COVID-19 epidemics in our country [20], 366 out of 644 residents (56.8%) were working in regions with a median occupancy rate ICU beds higher than 30% and 351 (54.5%) in regions with a median hospitalization rate higher than 40 per 100.000 people. One hundred and seventy-one respondents (26.4%) reported they had been relocated in wards dedicated to the COVID-19 during the first wave, and 49 out of 171 (28.6%) were additionally paid for emergency. Reduction of surgical activities was reported by 510 residents (78.7%) of whom 204 (31.5%) reported a 25% reduction, 162 (25%) a 50% reduction, 126 (19.4%) a 75% reduction and 18 of them (2.8%) a complete interruption.

Overall, 78.5% of respondents ( $n = 509$ ) agreed with a statement that COVID-19 has negatively impacted training (moderately/very much/extremely) while 2.8% ( $n = 18$ ) had no concerns (Fig. 2). To determine which factors might explain the perceived impact of COVID-19 on training, ordinal logistic regression analysis was fit for each independent variable to examine associations. As shown in Table 2, older aged residents (OR=0.95,  $p=0.048$ ) and those belonging to increasing PGY level (OR=0.88,  $p=0.020$ ) were less affected. Also, residents who reported to work more hours per week (OR=0.71,  $p=0.002$ ) and had the possibility of using surgical simulators (OR=0.71,  $p=0.024$ ) or were involved in research activities (OR=0.71,  $p=0.026$ ) felt less the impact on training. Similarly, higher satisfaction with specialty (OR=0.93,  $p<0.001$ ) and with salary (OR=0.80,  $p=0.006$ ) significantly reduced the perceived negative impact of COVID-19. On the contrary, reduction of surgical activity (OR=2.29,  $p<0.001$ ) and increasing concerns about future employment (OR=1.16,  $p=0.009$ ) were significantly associated with COVID-19. Final multivariate ordinal logistic regression model included reduction of operative cases (OR=2.21, 95% CI 1.90–2.58,  $p<0.001$ ) and increasing employment concerns (OR=1.14, 95% CI 1.01–1.30,  $p=0.025$ ).

### Correlation between the perceived impact of COVID-19 and burnout/distress

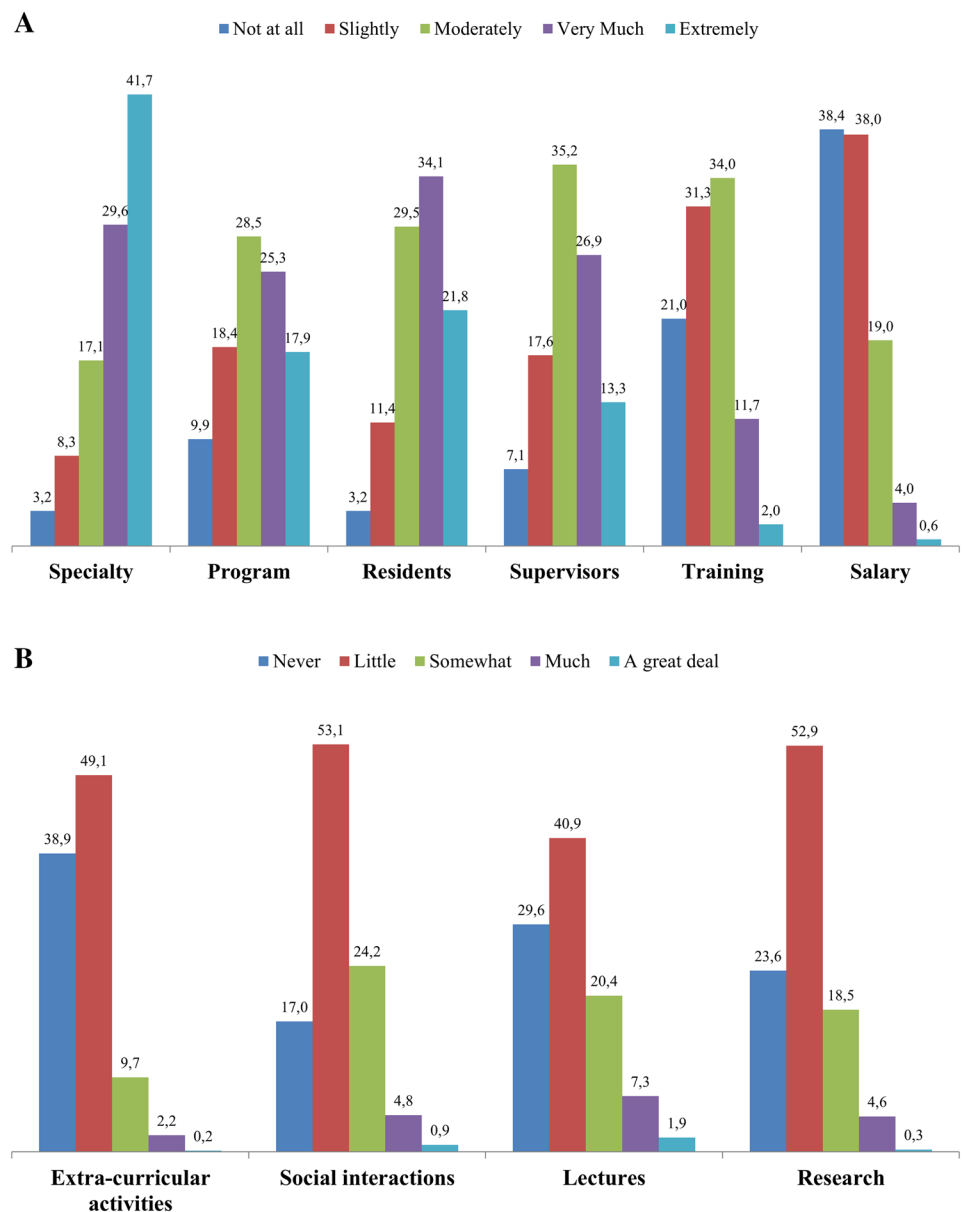
Overall, 375 residents (57.8%) reported either a high EE (42.7%) or a high DP (40.1%), meeting the criteria for burnout. ERI score was higher than unit, indicating an imbalance between effort and rewards in 62.6% of residents ( $n = 406$ ) whereas 469 respondents (72.4%) had a perceived job strain score (D/C ratio) > 1, with resulting distress observed in 350 residents (54%). Binary logistic regression analysis revealed that the perceived negative impact of COVID-19 on training was associated with a significant increase of distress (OR=1.26, 95% CI 1.08–1.47,  $p=0.003$ ) but not with burnout (OR=1.12, 95% CI 0.96–1.30,  $p=0.143$ ) (Supplementary Table 2).

Correlations coefficients between the impact of COVID-19 and the items of each scale are shown in Supplementary Table 3. The perceived negative impact of COVID-19 was significantly and positively related to overcommitment ( $r = 0.09$ ,  $p < 0.05$ ) whereas negatively related to reward ( $r = -0.15$ ,  $p < 0.001$ ), job control ( $r = -0.15$ ,  $p < 0.001$ ) and social support ( $r = -0.10$ ,  $p < 0.05$ ).

### Discussion

Herein, we report the largest Italian survey evaluating the state of GS residents in Italy. This national study confirmed the urgent need of a solution to the lack of adequate training

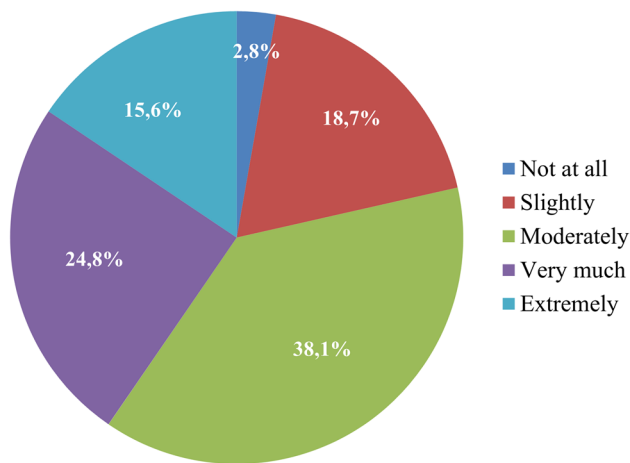
**Fig. 1** Satisfaction with specialty, with salary (a) and perceived time constraint (b) in the overall population



in GS which was increased by the recent pandemic. The loss of training opportunities may also have potential implications on the well-being of residents by increasing psychological distress.

COVID-19 deeply changed our personal lives and working conditions, including those in teaching hospitals. Even though a disruption of training was observed across different specialties—except for those directly involved in the emergency (e.g. anesthesiologists)—a clear difference was demonstrated when comparing medical and surgical residents [21]. In particular, surgical residents reported a more severe reduction or even complete suppression of training due to an overall decrease in elective and emergency surgery [2, 22–24]. The need to provide a reliable snapshot of GS residency was therefore urgent as the COVID period

profoundly changed the educational possibilities in the modern era. In particular, in our study, more than 50% reduction of exposure to operative practice was reported by almost half of the residents whereas reduction of any grade by 80% of the respondents. Moreover, residents have been frequently re-deployed to COVID-19 wards, as previously reported in other national and international studies [5, 25]. Taking into account that most of the procedures affected by the restrictions were those in which the residents were more frequently involved (e.g. hernia repair, cholecystectomy....)[3], it had to be expected that only a small percentage of residents reached the minimum annual operative case volume. However, even though COVID-19 has certainly impacted the surgical training, probably, it further disclosed an existing problem. In fact, even before COVID-19, lack of adequate operative



**Fig. 2** Perceived negative impact of COVID on training as reported by the respondents of the survey (*n* = 648)

**Table 2** Univariate ordinal logistic regression determining the predictors of the perceived negative effect of COVID-19 on training

Variable	OR	95% CI	p-value
Age	0.95	0.91–0.99	0.048
Female gender	0.81	0.62–1.08	0.160
PGY level	0.88	0.80–0.98	0.020
Decrease of surgical exposure	2.29	1.99–2.65	<0.001
Unavailability of frontal lectures	1.07	0.80–1.42	0.630
Re-deployment	1.36	0.98–1.96	0.059
Working hours	0.71	0.58–0.88	0.002
Surgical simulators	0.71	0.54–0.96	0.024
Involvement in research	0.71	0.53–0.96	0.026
Concerns for future practice	1.16	1.04–1.30	0.009
Satisfaction with salary	0.80	0.68–0.94	0.006
Satisfaction with specialty	0.93	0.91–0.97	<0.001
Perceived time constraint	0.95	0.89–1.00	0.099

PGY postgraduate year

exposure had been complained by surgical residents in Italy and prompt measures had been advocated to increase the critical level of surgical training in our country [26]. In our survey, almost two thirds of the respondents reported to not be satisfied with the current training, confirming an existing problem in most of the GS programs. Moreover, the health emergency has created a perception of instability and insecurity that was foreign to the new generations, despite the measures introduced by the Italian Ministry of Health before and during pandemic to compensate for the lack of doctors in our country, explaining their concerns about preparedness for independent practice and future employment.

Our study also allowed us to take a more comprehensive look at the state of GS residency in Italy which was investigated only in part in other recent surveys. [5] Of note,

more than half of the respondents were women confirming that the gender gap in the surgical field is slowly narrowing with more women pursuing surgical careers than before [27, 28]. With regard to the work-related characteristics, despite the work-hour restriction mandated by the EWTD, surgical residents reported to work before the pandemic in median 60 h per week and only 40% of them did have 11 of hours of rest daily. However, the debate on the effectiveness of the training programs and the potential effects of hourly limitations on residents’ education still continues, taking also into account that the number of residents who enter GS in Italy is increasing every year with a proportional decline in opportunities for hands-on training [29]. In our study, increase of worked hours significantly reduced the perceived negative impact of COVID on training, confirming in part such a hypothesis. Other factors were found to be significantly associated with COVID-19’s impact on training. Among them, PGY was inversely associated, meaning that junior residents were those who felt less comfortable with this situation [30], likely due to the higher level of expectations reported in the first years of residency [31] as well as due to the already low number of procedures normally performed by junior residents. In return, availability of surgical simulators seemed to reduce the negative impact on training, probably compensating for the decrease in surgical exposure. Besides that, salary adjustment of GS residents or creation of new sources of revenue should be also taken into account, given the existing difference in terms of work demands with their medical counterpart [11]. On the other side, the pandemic has led also to positive changes including the increase in research or e-learning opportunities (e.g. webinars, journal clubs) for residents, resulting an opportunity to explore effective methods that can be valid also in the post-COVID-19 era [32] and considering the low percentage of complied lectures reported in our survey.

With regard to the mental health effects of COVID-19 on residents, our hypothesis was that the loss of training opportunities may have implications also on the well-being of trainees by increasing job-related stress [33, 34]. No significant associations were found between the decrease in training opportunities due to COVID-19 and burnout, in line with other recent papers suggesting a marginal role of pandemic in the development of burnout symptoms among surgical residents [35–37]. Nevertheless, the present study confirmed that the prevalence of burnout is high among Italian surgical residents [11]. This finding should not be overlooked because burnout can be associated with increased rates of medical errors, suicide, depression, and absenteeism [38].

Similarly, a considerable proportion of residents had high work demands and low control capacity as well as an imbalance between effort and reward but differently from burnout, a significant association was found between the negative

impact of COVID-19 on training and distress. To develop targeted interventions, correlations between COVID-19's impact and the separated items of each occupational stress scale scores were also examined. Although "demand" and "effort" were not significantly correlated with the perceived negative impact of COVID-19, as shown in Supplementary Table 3, previous studies on health professions indicate that reduction of activities may end up damaging seriously the learning of trainees who can take a passive attitude [39], increasing also the risk of unemployment [40]. Conversely, reward, job control and social support, were significantly and negatively related to the impact of COVID-19. Job control refers to the opportunity to make decision (autonomy) and how to use personal skills in the workplace. In passive situations where work is repetitive and time needed for learning new skills is reduced, frustration and learned helplessness may occur, affecting the overall residency experience [41, 42]. The isolation in which the new pandemic procedures forced to work could induce among surgical residents feelings of not receiving the information necessary to perform their work effectively and safely, as it has been observed in intensivists [43]. For this reason, surgical directors should focus also on improving the working climate among residents to increase teamwork development as well as promoting a culture of teaching among their collaborators. Interventions such as mentoring and proctoring are able to increase both awareness of job-related autonomy and reward feelings [44, 45], with positive effects on both hospital physicians' mental health and patient care [46–48].

This study has some limitations. First, the analyses in the current study are based on cross-sectional data and, thus, even if the observed associations seem to clearly indicate the direction of the relations, only longitudinal studies can confirm causality. Second, the unique characteristics of training in Italy limit the ability to generalize these findings outside our country. Nevertheless, the teaching is standardized on a European basis and therefore we believe that the situation of our country may be similar to that of EU, even though such a problem is emerging also outside of it. [30, 35, 49, 50]. Third, distress and burnout recognize numerous root causes in health care activities; in this study we only investigated the occurrence of the pandemic and we did not disentangle this stressor from other factors in our analyses.

## Conclusion

This study provided an overall snapshot of the situation of GS residency in Italy after COVID-19. The loss of adequate exposure to operative practice reported by the residents and increased by the recent health crisis has highlighted that there is the need in Italy to reconsider core surgical training to ensure readiness for independent practice by the end of

residency, given also the lack of structured fellowships in our country. We hope that our findings may stimulate further discussion by program directors to ensure the highest surgical education among residents with every possible strategy, since the years spent in residency are critical to the career development and the next generation of general surgeons seems to be now really jeopardized.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s13304-022-01370-x>.

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## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. The local ethics committee waived the requirement for formal ethical evaluation.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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