

Impact of COVID-19 pandemic on general surgery training program: An Italian experience

The outbreak of COVID-19 infection in Italy started in late February with a rapid and dramatic spread. The hospitals in the most hit regions of Northern Italy started modifying their working schedule and, on the March 9, 2020, the Government approved the lock-down of the whole Country in order to minimize the further spread of the infection and to optimize health-care resources. This drastic measure transformed all hospitals activities, including suspension of all non-urgent outpatient visits and postponable surgeries. The aim of this paper is to evaluate how this new organization affected the role of residents in their last year of training at a General Surgery Department in a tertiary center of North-East Italy (Trieste).

In this period of National emergency, our Department changed its workflow in line with the Italian Healthcare System guidelines. In order to prevent the virus spread and to rationalize personal protective equipment (PPE), we discontinued all non-urgent outpatient activities and surgical procedures for benign disease whilst maintaining on-call duties, outpatient visits for oncological follow-up, emergency surgery and oncological procedures. All the patients undergoing surgical procedures, both urgent or elective, was tested for COVID-19 before being admitted to our Department or before going to the OR.¹ Multidisciplinary Meetings were carried on by on-line platforms. This new way of working reshaped completely our General Surgery Department but most of all the clinical activity of surgical residents.

The usual role of the residents in our Department concerned ground-rounds, outpatient visits, Multidisciplinary Meetings, on-call duties and all kind of surgical activities. Another perk of residency training is the possibility to rotate in a wide inter-hospital network, both National and International, which creates a popular opportunity especially among the last year surgical trainees. The outbreak of COVID-19 pandemic impaired this schedule because of the optimization of human resources and the limitation of transfers among regions and countries. However, since the principal concerns of residents are to progressively improve clinical and practical skills and build up the basis of their first employment, such hard times can make these tasks much more difficult.

To evaluate the effect of the COVID-19 pandemic on our residents, their surgical activity during the lock-down period (between March 9th and May 3rd, 2020) was compared with the one during the earlier two months of the same year (between January 9th and March 8th 2020). There are 6 Post Graduate Year 6 (PGY-6) residents in our Department: two of them were already in our inter-

hospital network at the time of lockdown (one in Milan and the other in Turin), whilst the other four were in Trieste. One of the latter asked to be re-allocate in the ICU Service. The other three continued the clinical, surgical and academical activities of the Department. Both the residents displaced in Milan and in Turin completely ceased their surgical activity because of the transformation of their Hospitals in dedicated COVID-19 structures. The total number of interventions performed by residents, filling either the role of first operator or assistant, showed a statistically significant decrease during the second period of the study ($p = 0.033$). This reduction affected especially the number of medium-complexity surgeries, usually performed by the PGY-6 residents as first operator ($p = 0.036$). Furthermore, even if no significant difference was showed, our data highlighted a trend towards decreased participation of the PGY-6 residents to all surgeries, regardless of either the role or the complexity (see [Table 1](#)).

This data shows how the COVID-19 crisis drastically reduced the practical activity of our residents. This can be explained with the complete cessation of benign surgical activity (e.g. laparoscopic cholecystectomies, herniorrhaphies, proctological procedures) that were usually managed in autonomy by the PGY-6 residents. The dramatic reduction of the admissions to the Emergency Department (ED) also contributed to this data. In fact, during the lock-down period, patients accessed to the ED with more advanced disease (e.g. perforated appendicitis, obstructing or bleeding colon cancers) and the procedure required in this case could rarely be performed by a senior resident. In some cases, the emergency surgery was performed on a COVID-19 patient. Since for such cases our hospital policy requires the involvement of as few staff as possible in order to minimize the contagion risk and prevent the waste of valuable PPE, residents of any specialty were not admitted to these procedures. As for elective procedures, only non deferrable oncologic pathologies and high level surgeries were performed, usually conducted by experienced surgeons to reduce operative time and risk of complications.

The place for residents, in such big cases, was just to assist as second or third surgeon, as shown in the data. This can be really valuable in terms of theoretical learning but, in normal times, the most of the cited procedures could be managed by last year residents with their mentor's strict supervision. During this social distancing period, e-learning and academic activities were improved. This way, shelter-in-place was guaranteed and the time spent away from hospital duty was optimized with near-

Table 1
PGY-6 residents' surgical activity.

	January–March 2020 Mean surgeries (\pm SD)	March–May 2020 Mean surgeries (\pm SD)	p (Welch t-test)
First operator	11.8 \pm 7.9	4.5 \pm 5.8	0.099
Low-complexity	5 \pm 4.5	2 \pm 3.5	0.230
Medium-complexity	6.3 \pm 3.2	2.3 \pm 2.3	0.036
High-complexity	0.5 \pm 0.8	0.2 \pm 0.4	0.409
First assistant	16.0 \pm 17.5	6.17 \pm 4.2	0.143
Low-complexity	3.2 \pm 2.5	0.8 \pm 0.8	0.071
Medium-complexity	9.0 \pm 7.9	2.8 \pm 2.3	0.117
High-complexity	3.8 \pm 4.4	3.3 \pm 3.3	0.292
Second assistant	5.7 \pm 6.5	3.3 \pm 3.3	0.458
Low-complexity	0.33 \pm 0.8	0.0 \pm 0.0	–
Medium-complexity	1.5 \pm 1.6	0.0 \pm 0.0	–
High-complexity	3.8 \pm 4.4	3.3 \pm 3.3	0.830
Total	36.2 \pm 21.4	14.0 \pm 4.9	0.033

SD, standard deviation.

constant education. All residents attended to at least two Webinars per week, the weekly Journal Club was maintained (carried on by means of online platforms) and the hours dedicated to medical research was improved.

As one of the most hit countries in the world by COVID-19, practical and academic education of the Italian surgical residents was really impaired. About that, Amparore et al. conducted a nationwide survey concerning the impact of this pandemic upon Italian Urology residents. For residents attending the final year of training, they detected a reduction from 84% to 44% ($p < 0.001$) of the minimally invasive procedure and from 82% to 46% ($p = 0.002$) of major surgery.² The solution applied by Porpiglia et al. was to focus on constantly improving e-learning platforms and surgical simulation training programs.³ In Lombardy, Italy's most hit region, surgical residents completely discontinued their usual duties to supply the lack of personnel in dedicated COVID-19 units.⁴

The problem of residents education was not just regional and confined to our National borders; the worldwide spread of COVID-19 infection affected all training programs all over the world.

Scullen et al. noticed a big reduction of neurosurgical activity in New Orleans during this pandemic and they were able to split their residents into two group, either on-service or self-quarantined. They encouraged their residents to use simulation and artificial intelligence technologies to maintain surgical skill and take advantage of the opportunity to practice more complex operative techniques.⁵ Orthopaedics and Otorhinolaryngologists too were concerned about the future of the respective residents. Both Kogan M et al. and Stambough J et al. focused on improving surgical simulation and video-base educational programs to ensure the minimum required case^{6,7} even though Crosby D et al. anticipated that the effect on operative experience will be most noticeable for residents who are in the final 2 years of training.⁸ The lack of practical education did not concern only surgeons in training but also medical students that aim to access to surgical residency programs.⁹

In conclusion we think that the COVID-19 outbreak mostly compromised surgical specialties affecting hands-on surgical experience and case logs determining a significant disruption of residency training. Luckily this is just a partial problem for the education of our senior residents because the minimum number of procedure required for graduation was already abundantly exceeded at the time of the analysis. We worked hard to improve and promote among residents all kind of self-education material, from webinars to video-base education, including pelvic-trainer simulation. We firmly believe that the job of a surgeon is mainly

clinical and practical and both of these aspects were highly impaired by COVID-19 pandemic. The current situation will not be sustainable for much more time and we need to be prepared with specific programs in case of another pandemic occurs.

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Declaration of competing interest

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