

Covid-19: exploring the “new normal” in gastroenterology training

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has led to unprecedented disruptions in fellowship training programs worldwide. In gastroenterology, the strain in healthcare service provision and the emphasis on preventing viral transmission has adversely impacted hands-on training opportunities, with trainees facing the constant pressure to meet training requirements under the continuous threat of viral transmission. Emerging evidence highlight the scale of the problem, specifically with regard to endoscopy competence due to cancellation of elective endoscopic procedures, provision of inpatient and outpatient consultative care as well as academic education and the mental well-being of trainees. As such, it has been necessary for trainees, trainers and training programs collectively to adapt to these challenges and incorporate novel and adaptive solutions to circumvent these training barriers. This review aims to summarise data on the global impact of COVID-19 on gastroenterology training and the practical interventions that could be implemented. (*Acta gastroenterol. belg.*, 2021, 84, 627-635).

Keywords: COVID-19, education, gastroenterology, endoscopy, training, interventions.

Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic has had far reaching disruptions on almost all walks of medicine, including gastroenterology health-related services and training. In Europe, preliminary data are alarming; studies report a more than 90% reduction in all endoscopic procedures performed by trainees. Causes include redeployment towards non-endoscopy departments (COVID-19 departments), reduction of hands-on training, changes to institutional policies, and mentorship unavailability (1). The classic apprenticeship model for acquiring endoscopic skills of “*learning by doing*” or even fulfilling competency-based curricula has been put on strain by the COVID-19 measures, which has led to compromises in trainee education and autonomy (2). The American Gastroenterological Association (AGA), European Society of Gastrointestinal Endoscopy (ESGE) and European Society of Gastroenterology Nurses and Associates, in their recently published Guidelines regarding best practice in endoscopic procedures during the COVID-19 pandemic, opted for a profound reorganization of the gastroenterology departments advocating in favor of only essential and fully trained personnel being present in endoscopy suites (3,4). This causes increasing challenges since the unsatisfactory quality of endoscopy training was pre-

viously observed in trainees’ curriculum, in the pre-COVID-19 era. According to the 2016 British Society of Gastroenterology (BSG) trainees’ survey of endoscopy training, 12.5% of trainees had no access to a regular training list, with 53% of final year trainees not achieving full certification in colonoscopy. A significant percentage (9%) of final year trainees reported not feeling confident in upper gastrointestinal (GI) bleeding endoscopic management (5).

During the COVID-19 pandemic GI departments downsized inpatient consultation services, embraced virtual forums for educational activities and minimized fellows participating in endoscopic procedures (6-10), while scientific societies published guidance for trainees (11). In this article, we aimed to review the impact of the COVID-19 outbreak in gastroenterology training with regard to trainee training and their well-being. To retrieve relative literature, we conducted a PUBMED search for all articles published in English language till 30th November 2020 including the terms “COVID-19” and “gastroenterology or endoscopy training”.

COVID-19 impact on gastroenterology training

Data from international and national surveys

Pawlak *et al.* (12), undertook an international survey regarding the COVID-19 outbreak recruiting 770 gastroenterology trainees from 63 countries. The primary outcome was the reduction in monthly procedure volume before and during COVID-19. The vast majority of participants (93.8%) reported a significant ($p < 0.0001$) reduction in endoscopic procedures of all types. Moreover, the median percentage reduction in procedural volume was 99% [interquartile range (IQR), 85%-100%], a finding that varied by procedure type ($p < 0.001$), but not by trainee specialty ($p = 0.658$) or whether procedures were performed under supervision or independently ($p = 0.614$). Colonoscopy was the endoscopic procedure with the higher percentage reductions

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(median, 100%; IQR, 88%-100%) vs. endoscopic retrograde cholangiopancreatography (ERCP) (median, 100%; IQR, 60%-100%; $p=0.003$) and upper GI bleeding procedures (median, 100%; IQR, 50%-100%; $p<0.001$). Of interest, 73.5% and 3.6% of the trainees reported a $\geq 50\%$ decrease or cancellation of all endoscopic activities, respectively. The most important reductions were seen in Europe and North America compared to Asia and South America ($p<0.001$). Among trainees who still had access to endoscopic procedures, 36.1% could perform endoscopy on patients at low risk or negative for COVID-19, whereas only 6.2% reported no endoscopic restrictions. Key barriers to endoscopic training included institutional policy changes (79.9%), a reduced number of patients (58.3%) and limited availability of personal protection equipment (PPE) (28.8%). These results were confirmed in a national level when the aforementioned survey was distributed among UK trainees (132 responders) (13). Among different endoscopic procedures, the most significant difference was noted between upper GI bleeding procedures (mean reduction 78%) and ileocolonoscopy (mean reduction 97.2%; $p<0.0001$). Once again, these differences reported were attributed to institutional policies that excluded trainees from procedures (75.8%), lack of cases (56.8%), and reassignment to other clinical areas (47.7%). All participants reported a reduction in the endoscopy case volume with 96.0% of them reporting a $>50\%$ reductions.

In the study conducted by the Italian Association of Young Gastroenterologist and Endoscopist (AGGEI) 183 trainees in gastroenterology and/or young gastroenterologists were included (14). Almost all participants (96.7%) reported a change of daily activity in their units during the COVID-19 outbreak with a 91% reduction of the endoscopic volume compared to the activity before the COVID-19 outbreak. Interestingly enough, 84.5% of the participants felt that the COVID-19 outbreak had an impact on the training curriculum due to mentorship unavailability and procedural trainees' involvement interruption (52.6% and 66.4%, respectively). Across the Atlantic, Clarke *et al.* (15), reported the results of a survey among 177 gastroenterology fellows. More than half (53.9%) reported partial restriction in endoscopic procedures (fellows could participate while on call, but not for routine cases), with 18.5% reporting complete restriction. The only study published so far researching the COVID-19 impact on pediatric gastroenterology fellow training (United States, Canada and Mexico) revealed similar findings (16). Overall, in 43% and 52% of the training programs fellows stopped participating in outpatient clinics and endoscopy, respectively. Similarly, 51% of the programs directors reported reduced numbers of on-site fellow inpatient consultations, with 27% reporting rates of $\geq 50\%$.

Single-center experience

A retrospective study from two European large-capacity endoscopy units (17) compared 2 different timeframes

[before (2019) and during the COVID-19 era (2020)]. Trainees' involvement in esophagogastroduodenoscopies (EGD) and ileocolonoscopies significantly reduced between the two periods [from 245/709 (34.6%) to 101/370 (27.3%) and from 208/426 (48.8%) to 28/162 (17.3%), respectively; $p\leq 0.015$]. Similar reduction was noted for ERCP [from 63/87 (72.4%) to 35/73 (47.9%); $p<0.001$]. Overall, the most significant decrease in trainees' involvement was noted in ileocolonoscopy [Prevalence Odds ratio (POR) (95% CI): 0.219 (0.139-0.343)]. These data are in line with results from a tertiary care hospital in Germany, where gastroenterology fellows had to be transferred to ICUs and infectious disease units leading to a 56% reduction of fellows' participation in endoscopic procedures in just 4 months (January 2020-April 2020) (18). In an Italian center 12 doctors had started training in the first trimester of 2020, but immediately after Italy was declared in a state of emergency all of them left (19). Even more alarming was the fact that the general administration of the hospital ceased all types of scientific studies, patient screenings, follow-up, and protocol(s) enrollment (20). In a single center study conducted at an academic medical center in Pennsylvania the authors demonstrated a significant disruption of first-year endoscopic training and estimated that the current first year fellows would experience a significant delay in their competence assessment according to the ASGE core curriculum since they would not be able to perform almost 20% of the procedures needed to reach that level (21). Palchadhuri *et al.* (22), briefly described changes imposed by the COVID-19 outbreak in their Pennsylvania gastroenterology 6 fellows/year fellowship program. With 30 residents being quarantined at the beginning of the epidemic, rounds were conducted on a virtual platform and no trainee was allowed in the endoscopy suite due to the high risk of exposure and, of note, due to limited PPE access. Research laboratories were closed and outpatient procedures were substantially reduced. To substitute for the aforementioned changes a revised program aiming to minimize overlapping of team members and cumulative exposure per fellow was introduced. A fellow was assigned to an attending at each site rotating between them tandem and each fellow was on service for only a week at a time with a week break. Finally, all pre-existing didactic activities were converted into virtual sessions. Similar experience was reported by Ong *et al.* (23) in Singapore, where many gastroenterology residents stopped their training and were allocated to work in isolation and pneumonia wards. At that case endoscopy theoretical training was substituted, exclusively, by online material. Studies exploring the impact of COVID-19 on endoscopy training are summarized in Fig 1.

COVID-19 impact on trainee well-being

Burnout, a psychological syndrome characterized by exhaustion, cynicism, and inefficiency is a chronic

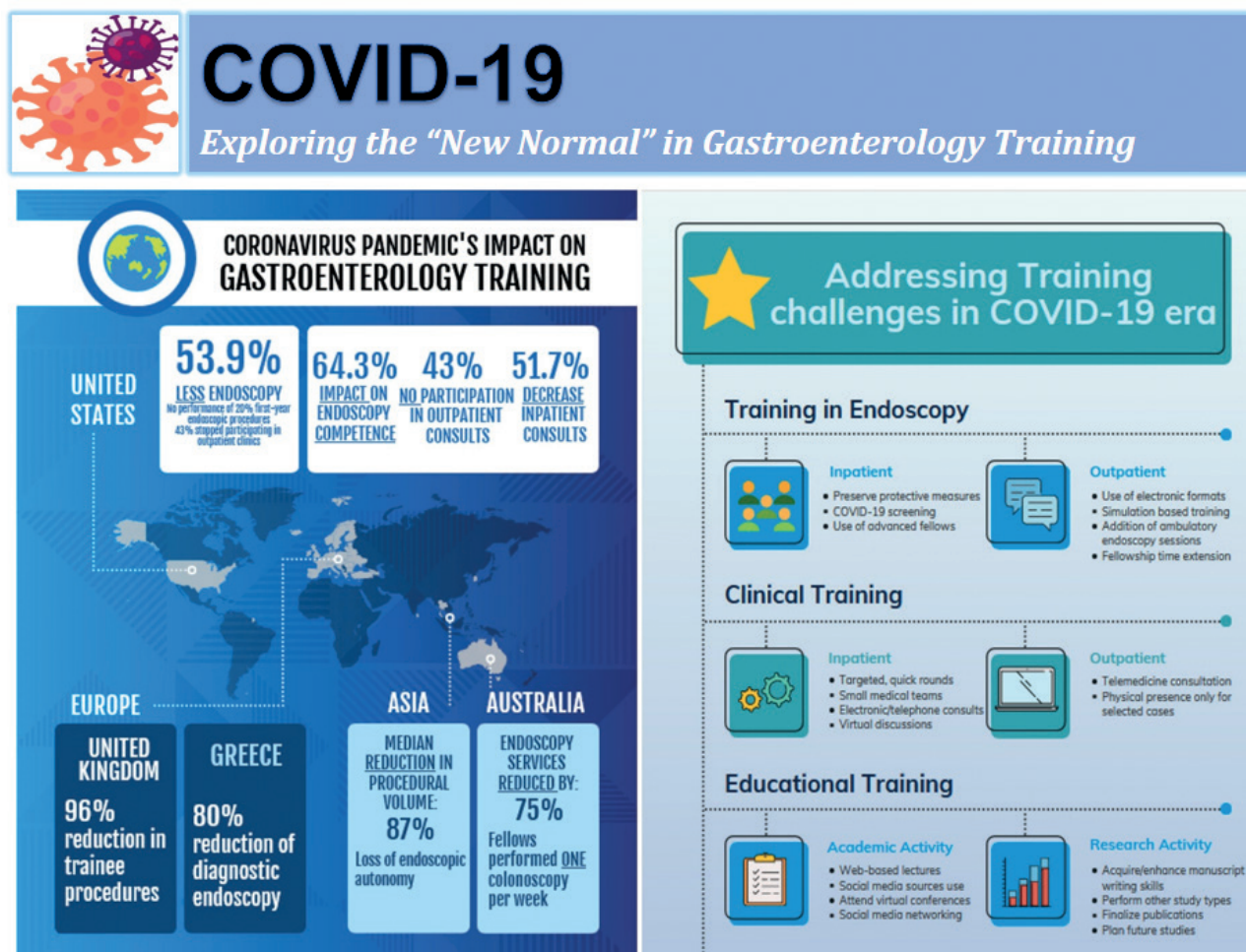


Figure 1. — Infographic summarizing the impact of COVID-19 on gastroenterology training and how to address it.

progressive medical entity that can ultimately lead to real life morbidity and even mortality. A plethora of risk factors that can possibly lead to a burnout, among them younger physician’s age (trainees/residents), procedure complexity, procedure-related adverse events, work-life imbalance, and changes in health care reimbursement, have been destabilized in the COVID-19 era. Three major components of burnout searched in clinical studies include emotional exhaustion, depersonalization, and low sense of personal accomplishment (24,25). A worldwide anonymous, voluntary, web-based survey that was undertaken in midst of the COVID-19 pandemic among 319 fellows (85 GI trainees) revealed that trainees taking care of COVID-19 patients were increasingly more likely to report burnout compared with trainees who did not take care of patients with COVID-19 (26). In the international survey by Pawlak *et al.* (12), trainees expressed their concerns about the impact of COVID-19 on their physical health. In details, 79.3% were concerned with being infected with the virus, while 23.9% reported taking time off work for COVID-19-related reasons, 76.8% for themselves and the remaining 23.4% for a member of their family. Of interest, more than half of the trainees (52.4%) reported mild, moderate or severe anxiety, that was independently associated

with female gender, PPE adequacy, lack of institutional support for emotional health, and training prolongation concerns [odds ratio [OR]≥1.60; p≤0.013]. Finally, up to 18.8% of trainees met the criteria for burnout. Similarly, in the UK study half of the trainees reporting experiencing significant anxiety, while 10.8% officially met the criteria for burnout. What is comforting though was that institutional emotional support strategies were available to 90.8% of trainees (13). On the other hand, in the study conducted in Singapore, staff personal interactions with residents revealed several factors that potentially contributed to worsening burnout (23). Gastroenterology residents assigned to COVID-19 wards lost all physical contact with their colleagues due not only to isolated working environmental surroundings but, also, due to many imposed self-isolation periods away from their families, thereby, virtually, levelling all social interactions. Needless to say, working beyond their specialty-related competencies, handling high-qualified non-endoscopic instruments and caring for large numbers of infectious patients with a poorly understood disease may cross the trainees’ comfort zone alongside their well-being. Some of the interventions implemented to cope with increasing fear and burnout issues included a 24-hour psychologist hotline, provision of formal letters

Table 1. — Data from studies evaluating the impact of the COVID-19 outbreak in gastroenterology training

A. Studies evaluating the Covid-19 effect on gastroenterology training					
First author, (ref)	Country	Study design	No. of Participants	Study's main finding	Other findings
Pawlak et al.(12)	Poland, Czech Republic, Canada, USA, China, Saudi Arabia; Australia, Spain, Mexico, Germany, UK	Cross-sectional web-based survey	770	<ul style="list-style-type: none"> 93.8% trainees reported reduction in monthly endoscopy volume 99% median percentage reduction in procedural volume 	<ul style="list-style-type: none"> 90.1% of trainees concerned about competency 71.9% concerned about need to prolong specialty 79.3% concerned with being infected 52.4% reported anxiety and 18.8% burnout
Siau et al.(13)	UK	Cross-sectional web-based survey	132	<ul style="list-style-type: none"> 93.5%, 96.3%, and 96% reductions for supervised, unsupervised, and all trainee procedures reductions in endoscopy volume reported by 100%, 96.0% reporting reductions in excess of 50% 	NA
Marasco et al.(14)	Italy, Portugal, Romania, Spain, France	Prospective web-based survey	183	<ul style="list-style-type: none"> 91% reduction of endoscopic volume reported by 96.7% 75.3% reported a reduced workload, due to low outpatients* (87.5%) and endoscopic volume (91%) 	NA
Clarke et al.(15)	United States	Cross-sectional web-based survey	177	<ul style="list-style-type: none"> 53.9% partial restriction in endoscopy, 18.5% complete restriction 51.7% no restrictions regarding inpatient consults 46.6% partial restrictions 	<ul style="list-style-type: none"> 64.3% reported impact on endoscopic skills involvement in telemedicine clinics by 74%
Mallon et al.(16)	United States	Cross-sectional web-based survey	77 (pediatric GI fellowship program directors)	<ul style="list-style-type: none"> 43% stopped participating in outpatient clinics 52% stopped participating in endoscopy programs; Reduced fellow staff, limitations in entering rooms, remote rounds 	NA
Zorniak et al.(17)	Poland, Germany	Retrospective study across 2 time frames [- (2019) vs. early phase (2020)]	709 (2019) vs. 370 (2020) overall procedures	<ul style="list-style-type: none"> Trainees' involvement procedures reduced EGD from 34.6% to 27.3% ileocolonoscopies from 48.8% to 17.3% ERCP from 72.4% to 47.9% 	
Roemmele et al.(18)	Germany	Single-center, retrospective study	1587 (pre COVID-19) vs. 1029 (during COVID-19) overall procedures	<ul style="list-style-type: none"> 63.2% reduction in cases performed by gastroenterology fellows educational, endoscopy meetings, outpatient appointments cancelled 	NA
Bovskoski et al.(20)	Italy	Single-center, retrospective study	1811 (March 2019) vs. 291 (March 2020) overall procedures	<ul style="list-style-type: none"> 84% reduction in the total number of procedures 33% reduction in urgent endoscopies 	NA
Kumar et al.(21)	United States	Single-center, retrospective study	Procedures 20/03–01/05 2020 vs. total procedures required for competency	<ul style="list-style-type: none"> Fellows performed 66 procedures vs. 270 required for competency No performance of 20% of first-year endoscopic pro-cedures 	NA
Palchaudhuri et al.(22)	United States	Single-center, retrospective report	NA	<ul style="list-style-type: none"> No trainee in the endoscopy suite rounds conducted on a virtual platform research laboratories closed outpatient procedures reduced 	NA
Ong et al.(23)	Singapore	Single-center, retrospective report	NA	<ul style="list-style-type: none"> Many gastroenterology residents stopped hands-on endoscopy training 	<ul style="list-style-type: none"> Loss of autonomy contributed to fears about their training completion and career progress

Cravero <i>et al.</i> (26)	United States	Worldwide web-based survey	1420 medical trainees (1031 residents and 280 fellows)	NA	* Trainees who took care of COVID-19 patients were more likely to report burnout * trainees were concerned about negative effects on training opportunities and professional development
Karampekos <i>et al.</i> (38)	Greece	Web-based survey	77 fellows/18 fellowship program directors	<ul style="list-style-type: none"> 81.8% fellows vs. 55.6%, fellowship program directors (p=0.038) reported adverse impact of COVID-19 pandemic on fellowship training Mainly concern was endoscopy training (83.1% vs. 27.8%, P<0.001) Unknown timeframe of measures, suspension of endoscopic procedures were named by all responders as factors negatively affecting training 	NA
B. Studies assessing strategies to address training in the post-pandemic era					
First author, (ref)	Country	Study design	No. of Participants	Study's main objective	Strategies proposed
Clarke <i>et al.</i> (15)	United States	Cross-sectional web-based survey	177	Evaluate fellows' perceptions, changes in clinical duties and education during the pandemic	<ul style="list-style-type: none"> Adoption of telemedicine clinics Introduction of online/virtual didac-tics
Soetikno <i>et al.</i> (2)	United States	Single-center prospective	24 (12 Fellows/12 Attending)	Illustrate the use of simulation-based mastery learning (SBML) in assisting gastroenterologists	* Simulation-based mastery learning (SBML)
Prince <i>et al.</i> (37)	Australia	Cross-sectional web-based survey	83	Assess the impacts of COVID-19	<ul style="list-style-type: none"> 99% were involved in telehealth consultations 45% were in favor of additional 'catch-up' endoscopy training and 36% of extended training duration
Karampekos <i>et al.</i> (38)	Greece	Cross-sectional web-based survey	95 (77 fellows/18 fellowship program directors)	Assess trainees' and fellowship directors' perceptions on the impact of pandemic on training	<ul style="list-style-type: none"> Most fellows (49.4%) proposed prolongation of training period Most program directors (44.4%) favored an increase in the daily workload Deployment to another gastroenterology department Performance of additional courses by national GI Society or web
Keihanian <i>et al.</i> (40)	United States	Cross-sectional web-based survey	230 (165 attending physicians/ 49 fellows/ 16 other)	Assess the impact of telehealth adoption on clinical practice and gastroenterology training programs	<ul style="list-style-type: none"> Respondents favored telehealth during the pandemic Ability to have face-to-face interaction (88.3%), patient trust/satisfaction (57.3%), and sharing screen/image (38%) were the foremost reasons for preferring video vs. phone visits Most respondents (95.2%) foresee a valuable role for telehealth in gastroenterology beyond the pandemic
Mallon <i>et al.</i> (16)	United States	Cross-sectional web-based survey	51	Evaluate fellowship program directors' perceptions of impact of COVID-19 on fellowship training	<ul style="list-style-type: none"> Institution of telemedicine Adapting conferences and personal check-ins to virtual meetings
Paichaudhuri <i>et al.</i> (22)	United States	Single-center prospective	30	Describe the local response of GI training program to the pandemic	<ul style="list-style-type: none"> Prioritize Safety of Patients and Trainees Revise the Clinical Schedule Continue Fellows' Education (virtual sessions)

COVID-19: coronavirus disease 2019; EGD: esophagogastroduodenoscopy; ERCP: endoscopic retrograde cholangiopancreatography; NA: Not applicable.

Table 2. — Challenges during GI fellowship training and potential measures to address them in the COVID-19 era

	<i>Setting</i>	<i>Problems</i>	<i>Potential Solutions</i>
Training in Endoscopy	<i>Outpatient</i>	<ul style="list-style-type: none"> • Reduction of endoscopy volume due to postponement of scheduled elective endoscopic procedures (screening colonoscopy) affects acquiring/maintaining competence in endoscopic skills • Reduction of endoscopy volume affects technical and cognitive domain of endoscopy competence • Limited participation by fellows does not allow sufficient procedural volume to be achieved • Unknown timeframe of measures' implementation in hospitals 	<ul style="list-style-type: none"> ⊕ Teaching on endoscopic procedures using electronic formats (e.g. endoscopy videos or virtual reality sessions) - Tele-endoscopy ⊕ Adopt simulation-based training methods (simulator models) and Hands-on Models ⊕ GI societies conduct virtual and live-streaming endoscopy events ⊕ Add ambulatory endoscopy sessions (e.g., evening and/or weekend sessions) ⊕ Extension of fellowship program time ⊕ Deployment to another gastroenterology department
	<i>Inpatient</i>	<ul style="list-style-type: none"> • Limited involvement of fellows during procedures due to exposure to COVID-19 • Lack of personal protective equipment • Limited involvement of fellows affects competence in performance of emergency endoscopic procedures 	<ul style="list-style-type: none"> ⊕ Preserve protective measures ⊕ Appropriate COVID-19 screening and clearance prior to procedure ⊕ Incorporation of the advanced fellow back in the endoscopy room
Clinical Training	<i>Outpatient</i>	<ul style="list-style-type: none"> • Cancelled outpatient activities i.e. consultations • Potential impact on training in treating patients in gastroenterology-specific fields (i.e. inflammatory bowel diseases, hepatology) 	<ul style="list-style-type: none"> ⊕ Implement telemedicine consultative training ⊕ Consults with physical presence only for selected cases and with use of protective equipment
	<i>Inpatient</i>	<ul style="list-style-type: none"> • Cancelled team-based rounds due to social distancing • Lack of personal protective equipment • Need for minimal patient contact and exposure 	<ul style="list-style-type: none"> ⊕ Targeted and quick patient rounds ⊕ Small tactical medical teams ⊕ Electronic or telephone consults or only chart review/discussion ⊕ Virtual discussion with other team members or multidisciplinary team for complex cases
Educational Training	<i>Academic activity</i>	<ul style="list-style-type: none"> • Cancellation of traditional didactic sessions within each department • Cancellation of regional, national and international congresses • Limited networking and communication opportunities 	<ul style="list-style-type: none"> ⊕ Local web-based lectures focusing on interactive learning (grand rounds, journal clubs, fellow lectures, clinical cases presentation) ⊕ Make the most out of social media sources i.e. video streaming and e-learning platforms, webinars or lectures via GI societies ⊕ Virtual conferences at all levels national or international ⊕ Social media networking guided from GI societies
	<i>Research activity</i>	<ul style="list-style-type: none"> • Suspension of clinical and laboratory research programs that involve patient enrollment • Limited research time due to increased clinical activities 	<ul style="list-style-type: none"> ⊕ Acquire or enhance manuscript writing skills ⊕ Consider performing studies that do not require actual patient enrollment (retrospective chart reviews, survey studies, reviews, meta-analysis) ⊕ Finalize publication of completed researches ⊕ Plan future studies i.e. COVID-related

from the program to recognize residents' rotations in COVID-19 wards as part of their training, the creation of supplementary teaching programs for those whose training was disrupted or, even, a 'no questions asked' policy in the event of any resident taking a sick leave (23,27). Table 1 summarizes the characteristics of studies assessing the impact of COVID-19 on gastroenterology training and trainee's well-being.

Addressing fellowship training challenges in COVID-19 era

Training in Endoscopy

Now that the disruptions caused by the COVID-19 pandemic on endoscopy training worldwide has been quantified (21), urgent action is needed to prioritize skills development in endoscopy. Several solutions could be implemented to maintain cognitive and manual skills development (Table 2). First, teaching on endoscopic procedures could be shifted towards implementation of electronic media formats (e.g. endoscopy video rounds or virtual reality sessions) (22). High-quality, full-length video sessions reviewing common but also advanced and

novel technical aspects of endoscopy can be assessed nowadays not only in social media and YouTube but also through sophisticated e-learning platforms, supported by the major GI societies. Similarly, webinars organized at a regular basis by ESGE and other societies host renowned clinicians offering the attendees the opportunity to "meet the expert" and gain from their experience, through simultaneous, interactive discussion. Optimizing existing resources could be also achieved through tele-endoscopy, as an evolution from telemedicine (28). This refers to real-time exhibition of procedures performed in the endoscopy suite (i.e. hemostasis for GI bleeding, resection of colorectal lesions, etc.) during which fellows can observe, pose questions and later on discuss with attending physicians about the various aspects of the procedure. These solutions have clearly considerable advantages, namely its widespread availability and accessibility, low-cost and easy-to-use, with its benefit being more profound in terms of the cognitive domain of endoscopy competence (application of endoscopically derived information to clinical practice i.e. knowledge of procedural indications and contraindications, pathology identification). On the other hand, its impact on the technical domain (i.e. torque steering, loop-reduction techniques) of endoscopy competence remains elusive,

while one might question their scientific validity given the fact that posted content does not undergo a rigorous peer review process. Real world data however can be rather different; results from a survey showed that only 29.1% of the participants used at least weekly social media-based education alongside endoscopy journals (15.8%), online courses from gastroenterology societies (15.0%), and institutional distant learning (9.2%). The most worrisome data however, reflect a significant percentage of trainees (37.5%) that did not access any alternate educational resources for endoscopy training (13). Another interesting initiative, to compensate for the clinical and endoscopy practice loss and in order to maintain the principles of competency-based medical education, was adopted in another setting. Interventions delivering a standardized form of learner-centered training including video conferencing, audience response systems, as well as simulation-based endoscopy teaching courses were employed, having a stronger focus on achieving competencies rather than procedural numbers (23). Hands-on models procedures and simulation-based training could be another useful alternative (29). Beyond acquaintance with an advanced endoscopy method (i.e. endoscopic submucosal dissection - ESD), hands-on can be used to establish endoscopic skills among novices endoscopists and strengthen already known techniques in more advanced ones (2,30). The utility of *ex vivo* and live models may be questionable due to their limited availability and additional financial burden, but it is surprising how efficiently they can be replaced by plastic models that are cost-effective and easy to assemble, with everyday materials that could potentially even be used in a fellow's home (31,32). In the era of a pandemic these models may be particularly useful for novice endoscopists, since a marked disruption in the first-year of endoscopic training has been noticed, while decrement in endoscopy competency due to breaks concerning advanced fellows is minimum (21,33). Similarly, the beneficial effect of implementing virtual reality simulator technology particularly in the early phase of training, resulting in shorter learning curve and performance optimization in the endoscopy suite has already been addressed (34,35). Although appealing, this option seems to be depending on the expertise of each endoscopist, while the significant cost bears an additional caveat. A third strategy involves implementation of measures towards the direction of making up for lost endoscopic training time and to serve the huge backlog of deferred cases (36). This could be achieved by adding ambulatory endoscopy sessions (e.g., evening and/or weekend sessions), extension of fellowship program time or even workload increase in the post-pandemic era, practices that can balance the large case volumes along with provision of high-quality training. “Catch-up” endoscopy training and extended training duration was favored as a solution to balance training decrement in the post-pandemic era by gastroenterology trainees in Australia (45% and 36%, respectively), a perception

that seems to be commonplace (49.4%) among their European colleagues, as well (37,38).

Clinical Training

During the COVID-19 pandemic the shortage of PPE and struggle to limit exposure of medical personnel, led “traditional” visits to diminish both in duration and team size, while in a similar manner outpatient clinics drastically decreased (39). In this regard, tele-health (via online video sessions) and telemedicine (via phone) consultations, feature as a sustainable solution for outpatients seeking initial evaluation or follow-up due to presence of chronic diseases (15), solution that is also favored by a large proportion (74%) of physicians (74%) in a recent survey, as well (15). Results from a large web-based survey among US gastroenterology and hepatology providers (attending physicians, fellows, nurse practitioners, and physician assistants), showed almost universal adoption of telehealth from healthcare workers, with 87.9% of physicians reporting >75% utilization in their centers (40). Notably, this percentage was even higher in gastroenterology fellows' clinics (90%), while it has increased considerably compared to that previously reported (47% of centers implemented >75% telehealth) (6), highlighting the method's growing popularity. Similar results were obtained from two other surveys from USA and Australia, respectively. The former (16), documented a major shift in telehealth with the median number of telehealth visits per week per fellow being 5 (range 1-25); 76% of programs reported having fellows use telehealth in contrast to the 98% not using telehealth in the pre-COVID19. Didactics were moved to virtual conferences in 94% of the programs with fellows utilizing various online resources. Regarding bench laboratory research, 27% of the programs reported no fellows involved, while 89% reported fellows working from home. As far as clinical research was concerned, 25% of the programs reported no changes with most 61% reported institutional restrictions. The latter documented fellow involvement in almost all telehealth consultations sessions (99%), following the pandemic crisis (37). Aside the outpatient clinic, telemedicine could be also incorporated in the management of hospitalized patients in the form of virtual clinical and imaging case review to determine subsequent diagnostic and treatment plans.

Educational Training

Although fellows are generally not primary investigators in clinical trials, they represent valuable collaborators contributing to vital steps of the whole process. This enables them to develop skills and improve their clinical decision making, through an in-depth knowledge of the evidence-based medicine process. Cancellation of national and international congresses has also deprived them of the opportunity of social networking, limiting their scientific perspectives. However, fellow-driven

research can still be pursued through alternative study types (e.g., web-based surveys, retrospective studies, systematic review and meta-analysis) that can be carried out through distant collaborations and without patient interaction. Finally, fellows may also engage in high quality multicenter studies, as evidence by the successes of the observational COVID-SURG, Protect-ASUC, SECURE-IBD studies which predominantly relies on trainee recruitment of patients to advance an understanding of the impact of COVID in gastroenterology (41-43).

Conclusion and prospects for future research

COVID-19 has negatively impacted on multiple domains of gastroenterology training, particularly in relation to endoscopy, while the long-term consequences remain unclear. Accurately identifying training gaps will assist local and international scientific societies to pursue new measures in order to address the educational needs of fellows during and after the COVID-19 pandemic. Taking into account fellows' perceptions and use of new technologies are perhaps the key changes that should be pursued made in response to the ongoing pandemic.

Conflicts of interest

None declared

Authors' contributions

P Gkolfakis conceived the idea, acquired the data, performed the search, drafted and finally approved the manuscript; K Ekmektzoglou and G Tziatzios acquired the data, drafted and finally approved the manuscript; K Siau, K Pawlak, K Triantafyllou, T Rokkas and M Arvanitakis revised and finally approved the manuscript. JYC conceived and planned the idea and wrote the manuscript.

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