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Unprecedented Training: Experience of Residents During the COVID-19 Pandemic

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0196-0644/$-see front matter

https://doi.org/10.1016/j.annemergmed.2022.01.022

INTRODUCTION

Although we are beginning to understand the toll that the coronavirus disease 2019 (COVID-19) pandemic took on health care workers, less is known about the experience of the next generation of our emergency medicine leaders—resident physicians—during this pivotal time.[1-5] The COVID-19 pandemic significantly disrupted both the clinical training and personal lives of resident physicians, pushing the bounds of their ability to adapt and spur rapid innovation in medical education. The challenges and successes of residents during the pandemic may shape the future of emergency medicine and aid in encouraging adaptation and resilience for future leaders in the field. This article aims to further describe the COVID-19 pandemic's impact on emergency medicine resident physicians in 2 interrelated parts: first, by summarizing what is known to date based on a broad literature review, and second, through an in-depth analysis of emergency medicine residents' experiences with burnout and adaptation at a residency program in the United States.

Literature Review

Over a year from the start of the pandemic, the literature has increasingly explored how COVID-19 affected trainees, particularly in 4 areas: clinical training, didactic education, board certification, and physical and psychological health (Table 1).

Clinical training effects. The COVID-19 pandemic profoundly affected residents' clinical training, although the gravity of these effects varied based on time and location. One major issue is related to many emergency departments (EDs) experiencing an overall decrease in patient volumes and a variety of patient presentations throughout the pandemic.[6-10] In 1 study, the COVID-19 pandemic led to a decrease in the number of patients per hour seen by residents (1.68 patients per hour at baseline to 1.33 patients per hour) during the first 3 months of the pandemic.[8] Although there are no reported significant changes in the severity of illness, lower patient volumes and a decreased variety of patient presentations have subsequently reduced emergency medicine residents' exposure to cases in some instances. It is possible that the decreases in case volumes and types might have several effects, such as delayed attainment of clinical competency and decreased clinical efficiency, although the existence or duration of these effects is currently unknown.[8-11]

A second key way in which COVID-19 affected clinical training is that efforts to protect residents from the virus resulted in fewer procedures and canceled clinical rotations. Early during the pandemic, although many institutions experienced critical personal protective equipment (PPE) shortage, resident participation and clinical exposure were limited to preserve PPE and decrease residents' risk of contracting the virus.[12,13] For example, several training institutions adjusted their intubation teams to minimize viral exposure; this resulted in the most experienced airway clinician—often, the attending physician—performing intubations in place of trainees, limiting residents' clinical exposure to this critical procedure.[9,14] Additionally, some off-service rotations were canceled to augment ED staffing and/or further limit viral exposure and PPE use.[15-17]

Considering these challenges, many training programs innovated outside of the clinical environment to augment clinical exposure to close the gap in these areas using methods such as simulation, virtual reality, and mental imagery.[18-21] One surgical program used a multimodal hands-on strategy to prevent the decay of procedural skills, which included a robust array of interventions such as at-home box trainers and virtual reality programs, homemade simulators, video games, and procedural videos.[21] Other programs added virtual rotations and created telehealth training to expand clinical scope and exposure.[22-24] Through such innovations, training programs added a new value to their clinical education that may endure beyond the current pandemic.

Didactic education effects. Because of concerns about viral spread at in-person gatherings, the COVID-19

Table 1. Summary of trainee-focused challenges and innovations during the COVID-19 pandemic.

Context	Key Challenges	Highlighted Innovations
Clinical training	Decreased case exposure Limited procedures Cancelled clinical rotations	Home computer-based simulation Virtual reality, video games Mental imagery Homemade procedural models New rotations (eg, telehealth)
Didactic education	Restricted in-person didactics Limited simulation and labs Challenged engagement	Combination of live or recorded lectures Guest lecturers (alumni, experts) Varied formats (eg, small groups) Synchronous engagement tools (eg, Slack, Poll Everywhere, Kahoot) Virtual, friendly simulation scenarios Expanded use of FOAM
Board examinations	Postponed in-person examinations	Flexible examination dates Virtual oral board examinations
Physical and Psychological Health	Increased physical exhaustion Limited ability to self-isolate Amplified stress and separation Decreased coping mechanisms	Open communication Virtual information platforms Counseling services access Mentorship opportunities Meal support

FOAM, Free open-access medical education

pandemic affected residents' didactic education, primarily via transition from in-person to virtual didactics. The literature has indicated that nearly every training program in the United States switched from in-person to virtual didactics at some point during the pandemic.[25-29] Virtual didactics take a variety of forms, including live sessions and recorded lectures designed for asynchronous viewing. Although the transition to virtual sessions allowed for the continuity of didactic education, virtual didactics might result in less overall engagement and limit high-value in-person sessions such as simulation and procedure laboratories.[29-31]

Despite these drawbacks, several studies uncovered the positive effects of the transition to virtual didactic education. Virtual education sessions allow for asynchronous learning via session recordings, which grants residents more control over their schedules and enables them to review sessions in the future.[27,31] Additionally, virtual education eliminates geographic barriers, which expands opportunities for outside lecturers—including nationally and globally recognized experts—to join individual training programs for their didactic sessions.[26,32] To help support engagement and interaction in the virtual format, training programs are employing a variety of strategies that boost interactive learning, such as small-group breakout sessions and synchronous engagement tools such as Slack, Poll Everywhere, and Kahoot.[32,33]

The changes in resident didactic education necessitated by the COVID-19 pandemic are also precipitating other innovations in education content and delivery. For example, although in-person simulation laboratories are typically central to resident didactic education, a variety of options for the virtual format have surfaced, including telesimulation, which is delivered via online platforms that use standardized patients with faculty facilitators for simulations ranging from breaking bad news to leading resuscitations.[26] Many training programs are expanding their use of free open-access medical education resources for supplemental learning using a broader network to extend local resources.[33,34] Ultimately, despite the challenges posed by the limitation of in-person didactic education, many programs created alternative education models that may prevail—at least in part—after the pandemic eases.

Board examination effects. The ever-changing environment precipitated by the COVID-19 pandemic required dramatic adaptations in the board certification process. The American Board of Medical Specialties, which houses certification boards such as the American Board of Emergency Medicine, sought safe alternative methods to administer initial certification examinations to board-eligible physicians.[35,36]

For many medical boards, including the American Board of Emergency Medicine, this initially meant postponing the standard in-person board examinations, coupled with extending eligibility deadlines to accommodate extraordinary circumstances caused by COVID-19. In many cases, this postponement was followed by flexible examination dates and pilot transitions to virtual oral board examinations.[36-39]

Although most medical boards are yet to make definitive statements on future board examination formats, recent statements have reaffirmed commitments to maintaining high standards while also preserving the safety and well-being of candidates.[36-40]

Physical and psychological effects. Resident physicians, given their roles as both learners and clinicians, faced a unique combination of challenges posed by the COVID-19 pandemic. These challenges led to a range of physical and psychological effects that had far-reaching consequences on trainees.

Physically, many residents reported increased levels of exhaustion due to the rigors of residency coupled with long hours of wearing PPE.[41-43] Despite often desiring to self-isolate from partners and families to help reduce the risk of infectious spread after exposure to patients infected with COVID-19, many residents felt that they were unable to do so in light of financial constraints or the lack of accommodation.[42,44] Residents also expressed concern about their physical health due to the risk of infection, especially in times of exponential infection spread and PPE shortage.[45]

Psychologically, the COVID-19 pandemic led many resident physicians to experience increased levels of stress and depression.[46-51] The loss of control over many aspects of life and a decrease in coping mechanisms, such as gym workout and in-person gatherings, made residents vulnerable to symptoms ranging from anxiety to exhaustion. This loss of control, coupled with minimal amounts of time available during residency training to reflect and decompress, led to increased anxiety among many trainees.[48-52] Many residents also experienced increased isolation: at work, due, in large part, to PPE limiting communication and the ability to connect with colleagues; and at home, as a result of social distancing and shelter-in-place recommendations.[43] One study found that residents with regular exposure to COVID-positive patients experienced a higher prevalence of stress than their peers who were not regularly exposed to patients with COVID-19 infection (29.4% versus 18.9%, respectively).[52]

To support residents' physical and psychological well-being during the pandemic, institutions implemented a range of programs. Some of the most effective interventions included the construction of platforms to disseminate rapidly changing clinical information, improved access to psychological counseling services, increased mentorship opportunities, and augmented meal support.[53-56] Many of these innovations may offer benefits beyond the pandemic and may further support trainees' physical and psychological health in the postpandemic era.

INSIGHT FROM THE FIELD

Given the profound impact of the COVID-19 pandemic on everything ranging from residents' education to their health, our team set out to further explore how residents experienced the crisis in terms of burnout and adaptation. An investigation of these 2 critical components of well-being and career longevity will shed additional light on important factors that shape future health care leaders while they train during a chaotic and atypical time.

Methods

As a part of a larger study of the effects of COVID-19 on teamwork in the ED, we studied 2 EDs affiliated with an academic medical center and emergency medicine residency program in California, United States, between June 2020 and January 2021. One training site was based at a large safety-net hospital and trauma center, whereas the other was located at a quaternary care center with a relatively smaller ED. Residents training at the emergency medicine residency program split their time between these 2 sites, and both the hospitals experienced similar relative numbers of COVID-positive patients during the study period.

We administered 2 waves of surveys to emergency medicine residents and others working in the ED. The surveys included validated questions to assess adaptation and burnout. Participants were recruited through a combination of email, flyers, and face-to-face communication. The total sample frame included 43 resident responses across 2 waves. We received 18 resident responses to the first survey (June to July 2020), with a response rate of 31.6%; 25 residents responded during the second survey (December 2020 to January 2021), yielding a response rate of 43.9%. In addition to survey administration, our team also conducted interviews with 8 resident physicians from June to August 2020; the interviewees were selected via convenience sampling, and they represented all training years. The 30- to 45-minute interviews were semistructured and based on a guide that was developed through iterative discussions among the research team. The interviews were recorded on Zoom (version 8) and subsequently transcribed verbatim. Before the administration of the surveys and interviews, this study received institutional review board approval from the University of California, San Francisco, and Harvard University.

Results

The resident physicians reported low initial levels of burnout during the first survey period (June to July 2020),

but these levels rose as the pandemic continued. During the initial wave of the surveys, most residents reported that they felt "occasionally under stress, but not burned out" (mean, 2.22; standard deviation [SD], 43). However, when asked the same question during the second survey period 6 months later (December 2020 to January 2021), most residents felt that they were "definitely burning out and have one or more symptoms of burnout, such as physical or emotional exhaustion" (mean, 3.00; SD, 0.96) (Table 2). The interviews revealed that many resident physicians experienced an initial sense of purpose and mission—bolstered by encouraging messages from friends, family, and broader society—and enjoyed more time to spend with individual patients because of reduced ED volumes, which gradually trended toward baseline volumes as the pandemic wore on.

Our team also assessed perceived adaptation to the COVID-19 pandemic through a series of validated Likert-based survey questions (ranging from "strongly disagree" to "strongly agree") that included "we have invented new ways of providing care to adapt to this crisis," "the processes of caring for patients during this crisis have been improving every day," and "we regularly receive information that helps us track and improve care for COVID patients." The adaptation measures were relatively high among the resident physicians, especially regarding innovation in health care delivery (mean, 4.22; SD, 0.54), which highlights the resilience and creativity that is central to emergency medicine (Table 3). In addition to a sense of innovation, the interviews revealed that the residents also attributed other factors to their ability to adapt, such as self-driven learning and leadership on the parts of both coresidents and faculty. The common themes surrounding challenges to adaptation included the residents feeling overloaded with a constant influx of information, especially when rotating among several different clinical sites, and struggling with balancing their clinical training alongside risks to personal safety (Table 4).

Table 2. Resident burnout measure.

	Wave 1			Wave 2		
Measure	**N**	**Mean***	**St. Dev**	**N**	**Mean***	**St. Dev**
Burnout	18	2.22	0.43	25	3.00	0.96

St. Dev, Standard deviation.
*Values based on the burnout scale: 1 = no burnout symptoms, 2 = occasional stress but no burnout, 3 = occasional burnout symptoms, 4 = constant burnout symptoms, and 5 = complete, distressing burnout.

Discussion

Our data provided key insights into emergency medicine residents' levels of burnout and adaptation during the COVID-19 pandemic, which continue to change as the pandemic evolves. Worsening burnout among emergency medicine residents is of utmost concern and, based on interview themes, is likely because of a combination of factors ranging from societal effects to the prolonged duration of the pandemic. In addition, the stress caused by issues such as the lack of PPE, combined with social isolation and decreased access to typical coping mechanisms, likely affects the ability of residents to fully process their experiences in ways that help mitigate burnout.

Despite burnout challenges posed by the pandemic, many emergency medicine residents learned to adapt to their changing environment to continue honing their clinical skills and provided high-quality care for patients. Adaptation, or the process of adjusting to different conditions, is a critical skill for resident physicians to learn and refine throughout training, and it is affected by factors ranging from cultural to psychological.[57,58] High adaptation measures among emergency medicine residents highlight the resilience and determination of many residents to maximize their learning experiences despite challenging circumstances. For example, one junior resident highlighted that "for residents that rotate from site to site on a week-to-week basis, it was really hard to figure out, 'what am I supposed to be wearing at this hospital to stay safe?'" In response to this challenge of uncertainty and information overload, the residents developed various workarounds; one noted that a critical intervention was resident voice and leadership when their "chiefs worked so hard to streamline information," and another found empowerment when they "started listening to more EM:RAP" podcasts to stay up to date on the latest

Table 3. Resident adaptation measures.

	Wave 1			Wave 2		
Measure	**N**	**Mean***	**SD**	**N**	**Mean***	**SD**
Adaptation	18	3.93	0.37	25	3.76	0.49
Innovation†		4.22	0.54		4.08	0.57
Process‡		3.56	0.86		3.64	0.76
Information§		4.00	0.49		3.56	0.82

SD, Standard deviation.
*Values based on the Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree
†Measure question: "We have invented new ways of providing care to adapt to this crisis."
‡Measure question: "The processes of caring for patients during this crisis have been improving every day."
§Measure question: "We regularly receive information that helps us track and improve care for COVID patients."

Table 4. Adaptation illustrative quotations.

Themes	Illustrative Quotes
Adaptation barriers	
Balancing training and safety	"The PPE shortage was really rough in the beginning. There were times when R2's were not allowed in resuscitations, which was a huge change because our main job as R2's is resuscitation, but they wanted to be careful."
Uncertainty	"Information was changing constantly, and it disrupted the confidence [I built] in how to care for patients."
Information overload	"For residents that rotate from site-to-site on a week-to-week basis, it was really hard to figure out, 'what am I supposed to be wearing at this hospital to stay safe?' Communication was a huge thing at that time, because everyone was getting 100 emails every two hours saying 'this is the new thing, that is the new thing.'"
Adaptation facilitators	
Culture of resilience	"The ED is a place of incredible flexibility and resilience […and] those things allowed us to be successful…in the throes of everything."
Resident voice and leadership	"Our chiefs worked so hard to streamline information for us. […] They definitely took on a huge burden by going to all these meetings, digesting, relaying to us., answering our questions. They were probably our biggest leaders during [COVID]."
Self-driven learning	"I started listening more to EM:RAP, this emergency medicine podcast They did huge COVID related updates, like, 'here's the latest updates; here's the randomized controlled trials.'"

COVID, Coronavirus disease; *ED,* emergency department; *PPE,* personal protective equipment; *R2,* second-year residents.

COVID-related information. Ultimately, maximizing the facilitators of—and minimizing the barriers to—adaptation are especially important for emergency medicine resident physicians as they develop their clinical acumen and prepare to take on the health care challenges of tomorrow.

This study had several limitations. The study was conducted at a single emergency medicine residency program in California, and as such, the generalizability of its results is limited. In addition, we obtained response rates of 31.6% (survey 1) and 43.9% (survey 2) and interviewed only 8 resident physicians. Although the 2-part survey component spanned multiple COVID-19 surges, the timing and intensity of the pandemic surges varied greatly across the United States and internationally, which might also limit the results' generalizability. Future work is needed to further explore the long-term effects of the COVID-19 pandemic on emergency medicine residents' burnout and adaptation.

LOOKING FORWARD

Emergency medicine resident physicians' training experience during the COVID-19 pandemic has been markedly different from their experience in prior years. By profoundly affecting their clinical training and personal lives, the pandemic posed challenges that pushed emergency medicine residents to their limits. The pressures of the pandemic also spurred accelerated innovation in graduate medical education that will likely have positive effects on learners in the future. Further work to evaluate the longer-term effects of the COVID-19 pandemic on resident physicians' education and well-being is crucial.

The COVID-19 pandemic forced the next generation of emergency medicine leaders to innovate, adapt, and act resourcefully. Although they are certainly weary after their experience, emergency medicine residents also have the potential to emerge on the other side of this crisis with a transformed capacity for adaptation and resilience. Adjusting to constant change and thriving amid limited resources are the bedrock of emergency medicine. By embodying these principles during the most profound public health crisis of our time, emergency medicine resident physicians demonstrated that the future leaders of the specialty—and the prospects of the field itself—are bright.

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All authors attest to meeting the four ICMJE.org authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships

in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist, and this article did not receive any outside funding or support. CRP reports being a consultant for FujiFilm Sonosite and Ceribell.

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IMAGES IN EMERGENCY MEDICINE

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DIAGNOSIS:

Twin ectopic pregnancy. Unilateral twin tubal pregnancy is a rare condition, with an incidence of 1 in every 125,000 spontaneous pregnancies.[1,2] In this case, surgeons performed emergency laparoscopy and found a mass lesion with hemoperitoneum (Figure 3) and 2 separate gestational sacs (Figure 4) over the left fallopian tube. After left salpingectomy, she was uneventfully discharged 2 days later.

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