Original Article

The Impact of COVID-19 on Medical Training: An Observational Study from a University-Affiliated Health Network's Experience

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ABSTRACT

Objective: An anonymous online survey was conducted at a university-affiliated health network to witness the impact of COVID-19 on Internal medicine residents and subspecialty fellows. **Methods**: This study involved a 28-question online survey for internal medicine residents and subspecialty fellows. Descriptive outcomes were provided for all respondents. We compared the impact of COVID-19 on training using a chi-square test for fellows versus residents, with a significance level of $p < 0.05$. Subgroup analyses and an open-ended question were also included. **Results**: The survey had a 67% response rate (52/78). Three-fourths of the respondents were residents (39/52), and the rest were fellows. Among all trainees, 33% (17/52) had <1 year of training left, with 59% (10/17) being residents. Overall, 82.7% (43/52) reported a "neutral or negative" impact on training, and 17.3% (9/52) reported a "positive or very positive" effect. 56% reported a decrease in procedures. In open-ended responses, 6 were positive, and 9 were negative. **Conclusions:** Our survey, consistent with current international literature, shows a negative impact on training due to changes in healthcare delivery during the pandemic. This led to a reduction in procedural opportunities and limited educational sessions. A follow-up study may help identify longer-lasting effects and areas for improvement.

Key words: COVID-19, Medical students, Internal Medicine Residents, Medical students and residents training

Coronavirus Disease-19 (COVID-19) is an infectious respiratory disease caused by Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that has spread worldwide, leading to significant illness, deaths, and adverse psychological effects. In March 2020, the World Health Organization declared COVID-19 a global pandemic [1]. Since then, many countries have implemented lockdowns to control the spread of the disease, leading to challenges in mental well-being for many individuals [2]. The pandemic has also significantly impacted the field of education, with schools and educational institutions closing or transitioning to remote learning as the virus's high contagiousness has disrupted traditional medical education lectures, which rely heavily on lectures and patient-based learning [3]. Medical students and residents have been particularly affected, experiencing negative and positive effects.

Traditionally grounded in in-person lectures, bedside teaching, and clinical rotations, medical education was significantly affected. Educational institutions were forced to transition to remote learning models, altering the structure of undergraduate and postgraduate medical training [3]. Medical students faced challenges such as examination delays, canceled placements, and uncertainty regarding career progression. Simultaneously, residents encountered limited opportunities for hands-on clinical training due to the suspension of elective procedures and prioritizing COVID-19 patient care [4, 5].

Particularly within internal medicine and its subspecialties, the impact of the pandemic has been multifaceted. The redirection of healthcare resources, cancellation of non-urgent consultations, and deployment of residents to COVID-19 units led to reduced clinical exposure and procedural opportunities. A national survey in the UK reported that 75% of trainees experienced training disruptions, especially in procedural specialties such as interventional cardiology, anesthesiology, trauma surgery, and otolaryngology [6–14]. This shift raised significant concerns about the short- and long-term consequences on skill acquisition and competency

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development.

While many studies have examined the effects of the pandemic on undergraduate medical education, the literature remains limited regarding its impact on internal medicine residency and subspecialty training. Edgin et al. highlighted reductions in outpatient volume, increased reliance on telemedicine, and a narrower range of clinical cases, alongside widespread reports of burnout, anxiety, and depression among trainees [15–17]. Conversely, some studies noted silver linings—greater adaptability, smoother handovers, increased collegiality, and enhanced use of digital tools for healthcare delivery and education, all contributing to a model of "transformative learning" [16,18,19].

A review of 32 articles revealed that most studies exploring training disruptions during the pandemic focused on surgical fields, with only a fraction addressing implications for career progression [20]. This knowledge gap underlines the need to investigate the experiences of internal medicine trainees more comprehensively. Therefore, this survey-based study aims to assess the pandemic's impact on internal medicine and internal medicine subspecialty fellows' clinical, didactic, and research experiences, providing critical insights into how their professional development was affected during this unprecedented time.

METHODOLOGY

In our cross-sectional observational study, a 28-question survey was developed to identify the specialty of training, graduate year, and various questions targeting clinical, procedural, and learning impacts due to COVID-19. The survey was anonymous, and all trainees were provided with the objectives of the study using the RedCap platform. One open-ended question was asked to determine how COVID-19 had positively or negatively impacted their training. The survey link was emailed to all internal medicine residents and subspecialty fellows on May 5, 2021, and closed on May 24, 2021.

The St Luke's Institutional Review Board exempted this qualitative, phenomenological research study. We presented descriptive outcomes across all survey respondents. For fellows versus residents, we compared how COVID has impacted their training (either positively or negatively) using a chi-square test, with $p < 0.05$ denoting statistical significance. We conducted subgroup analyses for specific questions using separate t-tests for proportions, with $p < 0.05$ denoting statistical significance and no adjustment for the multiple comparisons.

RESULTS

Table 1 entails the number of respondents. The response rate was 67% (52/78). Thirty-five percent (18/52) had just started their training. Amongst all the trainees, 33% (17/52) had <1 year left of their training at the time of the survey, of which 59% were residents (10/17).

Table 1: Master Chart of Participant Details

Category	Count	Percentage
Fellows	13	25.0
Residents	39	75.0
Total Respondents	52	100.0

Concerning impact on clinical exposure, 61.5% (32/52) of trainees reported a reduction in outpatient exposure, with 25% stating it was "significantly reduced." 53.8% (28/52) indicated that their inpatient experience remained stable, although 38% noted an increase in COVID-specific patient management, which limited exposure to diverse pathologies. 40.3% (21/52) felt their ability to conduct comprehensive physical examinations had declined due to PPE constraints and infection protocols. Overall, amongst all trainees, 82.7% (43/52) reported a "neutral or negative" impact on training, and 17.3% (9/52) reported it having a "positive or very positive" effect ($p= 0.29$).

The number of procedures was reported to have "decreased or significantly decreased" in 56% (29/52) of respondents. Of those, 48% indicated a moderate reduction, while 8% reported a complete halt in elective procedures during the pandemic's peak. Residents were disproportionately affected compared to fellows (62% vs. 38%, $p = 0.04$). Key impacted procedures included central lines, lumbar punctures, and paracenteses in general medicine, and endoscopy or cardiac catheterizations in subspecialties.

When asked how effective discussions have been during lectures presented virtually, 42% (22/52) said they were effective, 35% (18/52) felt they were very ineffective, and the remaining (23%) were neutral ($p= 0.52$). 71% reported a reduction in bedside teaching opportunities. 50% noted that interdepartmental or specialty-specific conferences were cancelled or significantly delayed.

In response to research opportunities' related questions, 34.6% (18/52) of respondents indicated reduced access to research mentors or projects during the pandemic. 21% (11/52) reported being involved in COVID-19-related research, while only 11.5% were able to present or publish during the study period. 30% of respondents reported delays in Institutional Review Board's approvals or inability to conduct in-person data collection, limiting academic output.

Psychological and Professional Development was impacted with 59.6% (31/52) experiencing increased stress or burnout, citing workload, lack of social support, and fear of infection. 19% (10/52) sought formal mental health or wellness support offered by the institution. 36% expressed concern over long-term competency, especially procedural skills. Conversely, 17% felt that the pandemic helped them build resilience, leadership, and adaptability.

In response to the open-ended question, 15 responses were analyzed. Six had positive responses, including "opened doors to virtual lectures," "has taught me resilience," and "increased my abilities as a physician." Negative responses included "Redundancy with the same type of patient with the same protocol," "decreased didactics, decreased diversity of patients," and "decreased quality of conferences."

DISCUSSION

The results of the present study revealed acceptable knowledge, attitudes, and practices regarding the COVID-19 outbreak. The findings also highlight its potential to reach medical students and transform medical training. During the pandemic's peak in March 2020, the Association of American Colleges (AAMC) supported medical schools by pausing all student clinical rotations to minimize unnecessary exposure (AAMC) [21]. Similarly, in February 2020, Singapore's Ministry of Health elevated its Disease Outbreak Response System Condition (DORSCON) and suspended all clinical activities for medical students and students' permission to enter healthcare institutions [22].

Postgraduate training persisted and not without repercussions, seen early on, including a reduction of outpatient volumes. The ill-occurring outpatient visits were converted to virtual visits that took away from hands-on physical exams. Traditional in-person and hands-on training are being replaced by new virtual training methods such as online lectures, tutorials, and webinars [23]. Many medical schools have had to replace clinical rotations with recorded vignettes, videos, and online lectures. While online simulation is a good alternative for clinical teaching, it is less fidelity and realism than in-person experiences [4]. In addition, during the COVID-19 pandemic, non-COVID patient pathology declined, reducing trainees' exposure to bread and butter and uncommon diseases [2]. In highly complex specialties such as electrophysiology, one survey noted that 41% of fellows and 35% of program directors reported increased competition amongst the fellows for cases due to the decline [1]. In one study, a resident felt she missed out on several procedural opportunities related to specialties requiring in-person exams, such as dermatology [18]. In a survey conducted in the United States early in the pandemic, 43.3% of students felt unprepared for their clerkships.

In comparison, 56.7% felt unprepared for their national board exams during the COVID-19 pandemic [24]. Most students (66.2%) expressed dissatisfaction with learning practice-oriented subjects, such as anatomy online. Additionally, due to technical barriers, many students, especially those from low-income countries, needed more online learning and training resources [24]. The lack of infrastructure and technology posed a significant barrier to medical education. All aspects of medical education have been impacted by the COVID-19 pandemic, including classes, clinical clerkships, electives abroad, residency program matching, and postgraduate training [25]. However, on a positive note, adapting to the changes with a virtual format allowed some residents to learn how to be still comforting over the phone [18]. Regardless of specialty, virtual lectures, simulation training, and even virtual reality gaming scenarios have replaced in-person training.

One study related to Interventional Radiology experience reported that 24% will have a delay in beginning their careers as attendings. An additional research study described the lower caseload for anesthesia residents who rely on increased volume to achieve procedural competence. They felt the need for subspecialty experience, and supervised procedures impaired their learning. Educational disruption due to a disease outbreak is not new, having had other pandemics with H1N1 and SARS. Fortunately, such suspension of clinical teaching was shorter than the COVID-19 pandemic that began in March 2020 [11]. Medical schools successfully adopted several modalities during those times to simulate the "live" patient, including videotaped vignettes, student volunteers, online chat rooms, and webcasting.

Table 2: Summary of key findings on COVID-19's impact on Medical Training

Sl. no	Study / Source	Setting / Group Studied	Key Findings
1.	AAMC (March 2020) [21]	U.S. Medical Students	Paused all clinical rotations to prevent exposure
2.	Singapore MOH (Feb 2020) [22]	Singaporean Medical Students	Suspended clinical activities; restricted hospital entry
3.	Interventional Electrophysiology Survey [1]	Electrophysiology Fellows & Program Directors (PD)	41% of fellows, and 35% of PDs noted increased competition for fewer procedures
4.	U.S. Student Survey [24]	U.S. Medical Students	43.3% felt unprepared for clerkships; 56.7% for board exams; 66.2% were dissatisfied with online learning for practical subjects like anatomy

5.	Resident Feedback [18]	Various Specialties	Missed procedural training (e.g., dermatology); but learned remote communication skills
6.	Interventional Radiology (IR) Study	IR Trainees	24% expected delays in becoming attendings
7.	Anesthesia Training Survey	Anesthesia Residents	Reduced case volume, impaired procedural competence, and limited subspecialty experience
8.	Lim et al. [11]	General Medical Students (Post-SARS/H1N1)	Prior pandemics had shorter disruptions; modalities included vignettes, online chats, and webcasting
9.	Current Study (University-Affiliated Health Network)	52 Internal Medicine Trainees	Acceptable COVID-19 knowledge and practice; challenges in clinical exposure, increased reliance on virtual education, and mixed psychological effects

Limitations

One limitation of this study is that not all trainees participated in the survey, which may have impacted the diversity of specialties represented in the results. This selective participation could lead to overrepresenting or underrepresenting specific experiences and perspectives, potentially skewing the findings. Additionally, the voluntary nature of the survey might have introduced response bias, as those who chose to participate may have had more pronounced experiences or opinions regarding the impact of COVID-19 on their training. The survey may have been subject to variability due to interest and engagement among different postgraduate years. (i.e., the third years would have been set to graduate, so they may not have been invested as seriously.)

The absence of input from non-respondents means that some variations in the challenges faced by residents across different specialties may not be fully captured. Consequently, the generalizability of our findings to all internal medicine residents or trainees in other specialties may be limited. An additional area of focus could include how the pandemic may have helped reshape certain aspects of medical education and possible benefits. Future research with more comprehensive participation across various specialties would help provide a more holistic understanding of the impact of the pandemic on medical training [26].

CONCLUSION

The COVID-19 pandemic hurt the training of many residents and fellows in the Department of Internal Medicine and internal medicine subspecialties. However, the long-term effects of the pandemic on medical student training are still uncertain. As we move past the pandemic, it is essential for medical schools and teaching hospitals to provide extra support for residents and fellows whose training was affected. While virtual teaching methods have become more common, further research is needed to assess their effectiveness.

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