

Impact of COVID-19 pandemic on training of pharmacy residents and fellows: Results from a national survey of postgraduate pharmacy trainees

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DOI 10.1093/ajhp/zxab114

Purpose. The coronavirus disease 2019 (COVID-19) pandemic has impacted the activities of healthcare workers, including postgraduate pharmacy trainees. Quality training experiences must be maintained to produce competent pharmacy practitioners and maintain program standards.

Methods. A cross-sectional survey of postgraduate pharmacy trainees in the United States was conducted to evaluate training experience changes and assess perceived impacts on residents and fellows following the COVID-19 pandemic's onset.

Results. From June 4 through June 22, 2020, 511 pharmacy trainees in 46 states completed the survey. Participants' median age was 26 (interquartile range [IQR], 25-28) years, with included responses from postgraduate year 1 residents (54% of sample), postgraduate year 2 residents (40%), and postgraduate fellows (6%). Compared to experiences prior to the onset of the COVID-19 pandemic, fewer trainees conducted direct patient care (38.5% vs 91.4%, $P < 0.001$), more worked from home (31.7% vs 1.6%, $P < 0.001$), and less time was spent with preceptors per day (2 [IQR, 2-6] hours vs 4 [IQR, 1-4] hours, $P < 0.001$). Sixty-five percent of respondents reported experiencing changes in their training program, 39% reported being asked to work in areas outside of their routine training experience, and 89% stated their training shifted to focus on COVID-19 to some degree. Most respondents perceived either major (9.6%) or minor (52.0%) worsening in quality of experience, with major and minor improvement in quality of experience reported by 5.5% and 8.4% of respondents, respectively.

Conclusion. Pharmacy resident/fellow experiences were perceived to have been extensively impacted by the COVID-19 pandemic in varying ways. Our findings describe shifts in postgraduate training and may aid in the development of best practices for optimizing trainee experiences in future crises.

Keywords: COVID-19, pharmacy education, pharmacy fellowship, pharmacy residency training, postgraduate training

Am J Health-Syst Pharm. 2021; XX:0-0

Coronavirus disease 2019 (COVID-19), caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has led to a pandemic causing significant morbidity and mortality and major impacts to healthcare systems.^{1,2} While all individuals have experienced the effects of the pandemic, healthcare workers, including trainees, have simultaneously

grappled with shifting societal customs while being at the center of COVID-19 care.³

Healthcare trainees, including pharmacy residents and fellows, are particularly vulnerable to changes from the COVID-19 pandemic as program directors, institutions, and accrediting bodies determine program curricula and training activities without

trainee input. The American Medical Association has emphasized the importance of maintaining satisfactory learning experiences and graduation requirements for medical residents and fellows during the pandemic.⁴ Similarly, ASHP has offered recommendations surrounding licensure, staff furloughs, and program accreditation for pharmacy residents.⁵ However, as of November 2020 there was no consensus around how to maintain quality pharmacy training experiences during the pandemic.

While the pandemic may require modifications to daily workflow, sponsoring programs must nonetheless maintain quality training to produce competent pharmacy clinicians and researchers. However, pandemic-related workflow changes may vary substantially by institution, location, and program characteristics. For instance, many institutions transitioned to remote work, utilized conferencing technology, alternated on-site scheduling, and encouraged fewer direct patient care interactions to minimize COVID-19 transmission.⁶ On the other hand, not all sites implemented these changes. Due to variation in case counts and the diverse nature of postgraduate pharmacy training programs, it is unclear how residents and fellows have been affected by COVID-19. Program decision makers should consider the viewpoints of pharmacy trainees to better understand how they have been impacted by the pandemic and to shape future training structures. We aimed to describe how COVID-19 affected the nearly 6,000 pharmacy trainees⁷ and to assess their perceptions and attitudes towards these changes.

Methods

A cross-sectional online survey of pharmacy residents and fellows in the United States was conducted in June 2020. The survey was reviewed by advisors and validated by current residents uninvolved in the design. A pretest review was used to revise survey questions prior to distribution. The survey included both Likert-scale

KEY POINTS

- A cross-sectional survey of 511 pharmacy residents and fellows was conducted to describe changes in postgraduate training programs following the onset of the COVID-19 in the United States.
- Trainees reported conducting less direct patient care, less time spent with preceptors, and increased remote work, with diminished preceptor contact perceived to be associated with worsening of their training experience.
- Program directors and accrediting bodies should encourage development of innovative ways to support and maintain quality training programs to ensure goals and objectives of residents and fellows continue to be met during unprecedented circumstances.

and free-response questions and was conducted online through Google Forms (Google, Mountain View, CA). Participants were contacted via email and social media platforms. All responses were anonymous and no incentives were provided. The study was deemed exempt by the Northwestern University institutional review board.

The primary objective was to assess for any changes in training experiences following the onset of the COVID-19 pandemic. Secondary objectives included characterizing trainee perceptions and attitudes regarding these changes, as well as institutional practice shifts, and the relationship between these perceptions and COVID-19 case burden in states of survey respondents.

Results were summarized with descriptive statistics as medians and interquartile ranges (IQRs). Textual responses were analyzed through

thematic analysis following independent review by 2 study investigators. COVID-19 case data were abstracted from The COVID Tracking Project website (The Atlantic Monthly Group, Washington, DC).² COVID-19 burden was defined as daily totals of positive cases, cumulative hospitalizations, and cumulative deaths, which was paired to each respondent's state on the date the survey was submitted. When analyzing responses denoting program structure before and after the onset of COVID-19, data were treated as paired. Continuous and ordinal variables were compared between groups with a paired *t* test and the Wilcoxon signed rank test, respectively. Nominal variables were compared with a McNemar test or exact multinomial symmetry test, as appropriate. Associations between COVID-19 case numbers and perceived changes reported by respondents were evaluated with univariate and multivariate logistic regression. COVID-19 case numbers were logarithmically transformed to normalize the distribution. Significance was prespecified at an α level of 0.05. A power calculation estimated a sample size of 362 respondents was needed to have 95% confidence and a 5% margin of error to represent the approximate 6,000 postgraduate pharmacy residents and fellows in the United States. Analysis was completed in R, version 4.0.0 (R Core Team, R Foundation for Statistical Computing, Vienna, Austria).

Results

Baseline characteristics. From June 4 to June 22, 2020, a total of 511 postgraduate pharmacy trainees completed the survey. There were 277 postgraduate year 1 (PGY1) residents (54.2% of the sample), 203 postgraduate year 2 (PGY2) residents (39.7%), and 30 fellows (5.9%). Respondents represented 46 states and the District of Columbia. Baseline demographics are summarized in [Table 1](#). The median age of respondents was 26 (IQR, 25-28) years, and 390 participants (76%) self-identified as female. Trainee practice areas included PGY1 pharmacy

practice (46%), infectious diseases (7.6%), and ambulatory care (7.2%), with additional representation across the majority of pharmacy specialties and program types (Tables 1 and 2).

Program or institutional changes related to practice and learning experiences. Trainees compared their experiences before and after the onset of the pandemic (“post COVID-19”) (Table 3). Respondents reported spending less time with preceptors (2 [IQR, 1-4] daily hours vs 4 [IQR, 2-6] daily hours, $P < 0.001$), with a higher proportion providing on-site direct patient care (38.5% vs 91.4%, $P < 0.001$) and a higher proportion performing on-site nondirect patient care (35.4% vs 25.4%, $P < 0.001$) post COVID-19. Reported workflow changes due to COVID-19 included shortened rotation duration (36%), new COVID-19-specific responsibilities (26%), and additional atypical operational responsibilities, including clinical evaluation (23%) and order verification (19%). Most trainees (61%) were not asked to work in areas outside of their training experiences, but 65% of respondents reported a COVID-19-related rotation change or cancellation (Table 4).

Respondents reported a hybrid model of remote and on-site work, with more trainees primarily working from home post COVID-19 (64.2% vs 4.9%, $P < 0.001$). A significant decrease in reported hours worked after the onset of COVID-19 was observed, as was a significant increase in the number of reported operational shifts per week, driven by several large pairwise increases. The majority of program leaders (76%) discussed changes to training programs with their residents or fellows.

Resident and fellow perceptions of and attitudes towards reported changes. Eighty-nine percent of respondents reported the incorporation of COVID-19-related efforts into their training program. Most trainees (59%) reported experiences with minor incorporation of COVID-19-related activities, but this varied by specialty and setting, as 30% reported a shift entirely

Table 1. Baseline Characteristics of Study Participants ($n = 511$)

Characteristic	No. (%) ^a
Age, median (IQR), y	26 (25-28)
Female	390 (76)
Current position	
PGY1 resident	277 (54.2)
PGY2 resident	203 (39.7)
Fellow	30 (5.9)
Practice area	
PGY1 pharmacy	234 (45.8)
PGY2 or fellowship	277 (54.2)
Infectious diseases	39 (7.6)
Ambulatory care	37 (7.2)
Critical care	34 (6.7)
Hematology/oncology	26 (5.1)
Administration/HSPAL	22 (4.3)
Emergency medicine	19 (3.7)
Pediatrics	14 (2.7)
Cardiology	12 (2.3)
Internal medicine	12 (2.3)
Transplant	12 (2.3)
Pharmacotherapy	10 (2.0)
Other	40 (7.8)

Abbreviations: HSPAL, health-system pharmacy administration and leadership; IQR, interquartile range; PGY, postgraduate year.
^aAll data are number (percentage) of respondents unless otherwise indicated.

Table 2. Training Program Data for Study Participants ($n = 511$)

Program Characteristic	No. (%) ^a
Practice site type ^b	
Academic medical center	383 (74.9)
Community hospital	115 (22.5)
University or college of pharmacy	51 (9.9)
Outpatient clinic	7 (1.3)
Other	20 (3.9)
No. of PGY1 residents at site, median (IQR)	6 (4-10)
No. of PGY2 residents at site, median (IQR)	4 (1-9)
No. of fellows at site	
1 to 5	105 (20.5)
>10	7 (1.4)

Abbreviations: IQR, interquartile range; PGY, postgraduate year.
^aAll data are number (percentage) of respondents unless otherwise indicated.
^bRespondents could select multiple answers.

Table 3. Comparison of Training Activities Before and After Onset of COVID-19 Pandemic

Variable	Before (n = 511) ^a	After (n = 511) ^a	P Value
Preceptor and working hours			
No. daily hours with preceptor ¹	4 (2-6)	2 (1-4)	<0.001 ^b
No. hours worked each week			<0.001
20 to 39	1 (0.2)	18 (3.5)	
40 to 49	77 (15.1)	111 (21.7)	
50 to 59	161 (31.5)	156 (30.5)	
60 to 69	181 (35.4)	138 (27.0)	
70 to 79	74 (14.5)	68 (13.3)	
80 or more	17 (3.3)	20 (3.9)	
No. weekly service shifts, median (IQR)	1 (1-2)	1 (1-2)	0.004
Work environment ^c			
On-site direct patient care	467 (91.4)	197 (38.5)	<0.001 ^d
On-site nondirect patient care	130 (25.4)	181 (35.4)	<0.001 ^d
Hybrid model of remote and on-site work	17 (3.3)	166 (32.5)	<0.001 ^d
Remote work/work from home	8 (1.6)	162 (31.7)	<0.001 ^d

Abbreviations: COVID-19, coronavirus disease 2019; IQR, interquartile range.

^aAll data are number (percentage) of respondents unless otherwise indicated.

^bSigned rank; exact multinomial test.

^cParticipants could select multiple answers.

^dMcNemar test.

to COVID-19 responsibilities. Most respondents perceived major (9.6%) or minor (52.0%) worsening in quality of experience, compared to major (5.5%) or minor (8.4%) improvement in quality of experience (Table 5). Reasons for perceived worsening included increased difficulty delivering patient care (32%), teamwork and communication challenges (29%), less preceptor interaction (27%), and cancelled or altered learning experiences (24%). The most common improvements described were additional administrative (26%) or clinical (25%) knowledge gained, improved technology use (18%), and increased remote work (14%) (Table 4). Trainees describing a major program shift towards COVID-19 were less likely to perceive worsening quality of their training experience (odds ratio [OR], 0.33; 95% confidence interval [CI], 0.15-0.65). Most trainees working remotely (49%) indicated they would not choose

to continue, but nearly as many (48%) indicated a preference for a hybrid model of remote and on-site work.

Impact of COVID-19 statewide case burden on resident/trainee experiences. The relationship between case load and perception of training quality was analyzed. Cumulative hospitalizations (OR, 0.80; 95% CI, 0.66-0.96) and increased hours spent with preceptors (OR, 0.83; 95% CI, 0.74-0.92) were associated with lower odds of perceiving a worse training experience (Table 6). Cumulative positive cases, cumulative deaths, number of co-residents or co-fellows, and increasing number of operational shifts were not associated with increased odds of perceived worsening of the training experience.

Discussion

The national survey captured changes to US postgraduate pharmacy

training programs and associated perceptions of 511 residents and fellows following the onset of the COVID-19 pandemic. Trainees reported spending less time with preceptors, providing less direct patient care, and working significantly fewer hours. The survey captured approximately 10% of all postgraduate pharmacy trainees in the United States.⁸⁻¹¹ Due to the diverse characteristics of respondents, including geographic location, program type and size, and specialty, our results are generalizable to pharmacy training programs.

Survey responses demonstrated that less time was devoted to pharmacy residents and fellows following COVID-19's emergence in the United States. This trend was coupled with shorter rotations and increased operational responsibilities. Trainees perceived less preceptor contact as a negative change. While no specific number of hours is required for effective precepting, it has been reported that only 51.5% of preceptors felt they had adequate time for precepting prior to the current pandemic.¹² Although some trainees, particularly those in their second year of training, may have been well prepared to practice autonomously, others may have been in need of more direct supervision and coaching, which may have been limited because of the pandemic; this emphasizes the importance of communication between trainees, program directors, and preceptors, as the preferences and competencies of residents and fellows can vary. The protective effect of trainee/preceptor contact time suggests that placing greater priority on time spent between trainees and preceptors may mitigate trainees' negative perceptions of pandemic-related changes to their training experiences.

Trainees perceived fewer direct patient care opportunities as a negative change following the onset of the pandemic. Accreditation standards encourage immersion in direct patient care activities to prepare for independent practice. Through patient and prescriber interactions,

Table 4. Thematic Analysis of Changes Due to COVID-19 and Associated Perceptions of Study Participants (*n* = 511)^a

	No. (%) ^b
Perceived improvements from COVID-19 changes	173
COVID-19–related administrative knowledge gained	45 (26.0)
COVID-19–related clinical knowledge gained	44 (25.4)
Improved technology use (eg, Zoom meetings)	31 (17.9)
Increased remote work (saved time)	25 (14.4)
Increased independence	18 (10.4)
Perceived worsening from COVID-19 changes	308
Patient care more difficult, less direct patient care	99 (32.1)
Teamwork/collaboration more difficult, communication worsened	89 (28.9)
Preceptor interactions lessened or worsened	82 (26.6)
Learning experiences cancelled or changed	75 (24.3)
Learning decreased (generally)	62 (20.1)
Workflow changes due to COVID-19	140
Shortened rotation length or hours, changed rotation	50 (35.7)
COVID-19–specific rotation or duties	36 (25.7)
Cover clinical pharmacist duties	32 (22.8)
Cover central pharmacist duties	26 (18.6)
Longer/additional ICU rotation	22 (15.7)
Longer hours	19 (13.6)
Cover other pharmacist duties (not otherwise specified)	18 (12.8)

Abbreviations: COVID-19, coronavirus disease 2019; ICU, intensive care unit.

^aAll data are number of participants reporting perceptions or changes or, within each category, number (percentage) of respondents.

^bWithin each category, respondents could select multiple answers.

pharmacy trainees improve confidence in implementing therapeutic plans to become better clinicians and to optimize patient care.¹³⁻¹⁵ Trainees further cited difficulty in building rapport with interdisciplinary teams while working remotely. With the shift to nondirect patient care, project-based work, and remote work, trainees are at risk of losing these valuable learning experiences. Additionally, trainees reported less time devoted to clinical learning on rotations due to more operational responsibilities. These changes could jeopardize the consistency of learning experiences for pharmacy trainees¹³ and underscore the need for guidance that offers trainees and programs

overarching support and direction to sustain high-quality experiences. Until guidance is available, sponsoring programs bear the responsibility of developing innovative ways to maintain quality training to ensure objectives are met.

Several improvements were perceived, including increased independence and utilization of novel technologies. Trainees reported technology to be highly valuable, allowing them to effectively work remotely and complete distance learning. Respondents noted improved work-life balance, increased time for projects, and decreased stress levels with remote work. As discussed above, on-site

direct patient care experiences may allow trainees to improve skills more traditionally associated with resident or fellow training, whereas greater emphasis on telework may enhance technological and future-state skills and facilitate administrative tasks, collaborative project management, and virtual communication.

Other noted improvements after COVID-19's emergence included knowledge and adaptability gained due to the unique nature of training during a global pandemic. Specifically, trainees who reported a significant shift in focus to COVID-19 were less likely to perceive worsening in the quality of training experiences. Novel opportunities related to COVID-19 included clinical guideline development, research, and administrative response.¹⁶ Trainees likely had to fine-tune critical thinking and literature evaluation skills to assess large amounts of rapidly developing evidence and apply it to improve patient care, research, and administrative practices.

Our survey had several limitations. There was no method to validate training status. Certain aspects of training programs, such as operational service, may differ between programs, which could introduce interrespondent variability. Additionally, the survey may not have captured all possible changes, potentially leading to measuring bias. Self-reporting of hours worked or spent with preceptors may be variable, introducing potential measurement and hindsight bias. Furthermore, the survey's voluntary nature introduced respondent bias, and a lack of accessibility to the survey may have resulted in a lower response rate. Additionally, the survey data may not be representative of global postgraduate pharmacy training experiences, nor reflective of the experiences of preceptors or program leaders. The survey did not capture the pandemic's social impact on trainees and how it may have affected the team building and relationship development that would routinely occur within their programs. Reduced socialization with

Table 5. Perceptions of and Attitudes Toward COVID-19–Related Changes Among Study Participants (*n* = 511)

Survey Question	No. (%)
Did the training experience change to focus on COVID-19?	
No, training experience remained constant, but minor COVID-related activities were incorporated	301 (58.9)
Yes, training experience shifted to primarily COVID-related focus	154 (30.1)
No, training experience remained constant, without inclusion of COVID-related activities	56 (10.9)
What is your perception of the effect of the changes due to COVID-19 on the quality of your training experience?	
Minor worsening in quality of experience	268 (52.4)
Consistent or no change in quality of learning experiences	123 (24.1)
Major worsening in quality of experience	49 (9.6)
Minor improvement in quality of experience	43 (8.4)
Major improvement in quality of experience	28 (5.5)
If currently working remotely, would you choose to continue to do so?	
No, 0% of the time	251 (49.1)
Yes, hybrid of remote and on-site work	247 (48.3)
Yes, 100% of the time	13 (2.5)

Table 6. Results of Multivariable Logistic Regression of Association of COVID-19 Case Burden Factors With Perceived Worsening of Training Experience

Factor	OR (95% CI) ^a
Cumulative positive cases	0.97 (0.93-1.01)
Cumulative hospitalizations	0.80 (0.66-0.96)
Cumulative deaths	0.98 (0.95-1.01)
No. of PGY1 residents in program	0.99 (0.96-1.03)
No. of PGY2 residents in program	1.00 (0.97-1.03)
No. of fellows in program	0.97 (0.89-1.07)
Increased no. of daily hours spent with preceptor	0.83 (0.74-0.92)
Increased no. of weekly service shifts	1.15 (0.94-1.43)

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019; PGY, postgraduate year; OR, odds ratio.

^aUnivariate logistic regression performed using COVID-19 case data by state on day of survey submission; case data were logarithmically transformed.

coworkers may be another negative impact of the pandemic, although increased use of technology may mitigate some lost relationship development.

Lastly, economic consequences of extremely high COVID-19 burden on institutions (or, conversely, low census volumes) and staff furloughs were not

assessed as potential causes of changes reported in the survey. The results of the survey may not capture the high variability of all training programs, as learner responsibilities and expectations differ between clinical-based residents, research-based fellows, and academic or industry-based fellows, leading to varied perceptions of the impacts of COVID-19 on the training program.

The study had several strengths. The survey results are highly generalizable to postgraduate pharmacy trainees throughout the United States. The inclusion of open-ended questions allowed for deeper insight, as trainees could provide detailed, first-hand perspectives. The nature of the survey also may allow program directors to identify and address common complaints or negative experiences to ensure consistent and high-quality training experiences at their respective institutions.

Findings regarding remote experience hybridization could provide directors with alternatives to traditional training structures. Support for remote work was not universal, with approximately equal proportions of respondents preferring continuation and cessation of remote work. However, incorporating remote work may promote job satisfaction among postgraduate pharmacy trainees. This result did not capture respondents' perceptions regarding the ideal split between the hours spent on- or off-site, and program directors should tailor their approach to this balance based on institutional requirements and learner preferences. Individual program resources and objectives as well as financial and confidentiality barriers may limit practice shifts towards increased utilization of technology.

With respect to practical management of a training program, it is important to maintain a sense of normalcy. This may consist of regularly scheduled virtual meetings, flexibility in scheduling, and encouraging increased independent work while keeping an open-door policy for both

training-related and personal needs. It is crucial to support trainee well-being in addition to ensuring their professional development, particularly during the stressful environment of a pandemic. Preceptors and directors should promote skill- and character-based growth to ensure trainees progress as clinicians and people. Regarding the assessment of this development, reduced in-person time spent with preceptors may impact evaluations, which should be addressed by program directors.

Future research should explore the impact of COVID-19 on learning experiences of residents and fellows trained exclusively during the pandemic, the perceived readiness of 2020 graduates for their first job, the role of technology as a supplement to on-site learning experiences, and the impact of COVID-19 on the employment search process in a potentially difficult job market.

Conclusion

Our study captured reported changes in training experiences and associated perceptions of pharmacy residents and fellows following the impact of the COVID-19 pandemic throughout the United States. Our results highlight practice changes and institutional decisions that pharmacy trainees found both beneficial and detrimental to their learning experiences. Respondents reported less time with preceptors, less direct patient care, and increased remote work. Preserving direct patient care experiences, routine interactions with medical teams, and increased contact time with program mentors may contribute to ensuring trainee competencies. Recognition of COVID-19-related practice changes and associated perceptions of trainees are likely useful to program leaders and accreditation bodies as they make decisions for future residents and fellows in the setting of a pandemic. Pharmacy training programs should direct future efforts toward individualizing learning opportunities and optimizing available resources to maintain high-quality experiences. Most respondents reported

at least minor changes to their program structure and some increased focus on COVID-19 during learning experiences. While the majority of trainees perceived a minor worsening in the quality of their training as a result of the pandemic, trainees who reported a major practice shift to focus primarily on COVID-19 were less likely to perceive a worsened experience. This suggests that increased resident/fellow involvement and responsibility in pandemic-related activities may contribute to high-quality training experiences.

Acknowledgments

The authors acknowledge the following individuals and groups for their assistance with survey distribution: Ashni Patel, PharmD, Patrick Nelson, PharmD, Keri Sims, PharmD, members of the American College of Clinical Pharmacy (ACCP) Resident Advisory Committee, and members of the ACCP Ambulatory Care Practice and Research Network (PRN), Cardiology PRN, Clinical Administration PRN, Central Nervous System PRN, Critical Care PRN, Education and Training PRN, Emergency Medicine PRN, Endocrine and Metabolism PRN, Health Outcomes PRN, Hematology/Oncology PRN, HIV PRN, Infectious Diseases PRN, Immunology/Transplant PRN, Nephrology PRN, and Pediatrics PRN.

Disclosures

The authors have declared no potential conflicts of interest.

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