Influence of Future Prescribers' Personal and Clinical Experiences With Opioids on Plans to Treat Patients With Opioid Use Disorder

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Context: Recreational use of opioids is a growing problem in the United States, particularly in the Midwest. Educators have called for inclusion of pain- and opioid-specific courses in health professional school curricula, yet more research is needed to address future prescribers' beliefs, experiences, and postgraduate plans related to opioids.

Objective: To examine health professional students' perceived severity of the opioid crisis and opioid-related beliefs, experiences, and postgraduate plans.

Methods: Using a descriptive, cross-sectional design, researchers evaluated health professional students from 3 academic programs (nurse practitioner [NP], physician assistant [PA], and doctor of osteopathic medicine [DO]) using a 25-item survey that assessed perceived opioid crisis severity and opioid-related beliefs, experiences, and postgraduate plans. Demographics of respondents were assessed using descriptive statistics and frequencies. Responses were compared between academic programs with 1-way analysis of variance or Kruskal-Wallis tests, and relationships between students' experiences and postgraduate plans were assessed.

Results: A total of 491 students (mean [SD] age, 27.2 [5.4] years; 62.7% female; 68.2% DO students) participated in the survey (response rate, 40.4%). The opioid crisis was perceived to be severely impacting the health care system (mean [SD] score, 79.7 [16.8] out of 100), and most respondents (415 [84.5%]) reported that opioid use affected their communities. Clinical experience varied by program, with NP students (75 [81.5%]) reporting the most experience treating acute overdose. Most respondents (317 [64.6%]) agreed that their postgraduate practice would involve caring for patients addicted to opioids; however, only 232 students (47.3%) felt confident in their ability to treat patients with addiction. Experiences managing acute overdose and handling drug-seeking behavior were positively associated with a belief that postgraduate work would involve working with patients with addiction (U=38,275.5, Z=5.92, P<.001; U=25,346.0, Z=4.94, P<.001) and confidence in treating patients with opioid addictions (U=36,806.5, Z=4.96, P<.001; U=23,765.5, Z=3.66, P<.001).

Conclusion: Although health professional students had similar beliefs and perceptions regarding the opioid crisis, there were notable differences between academic programs. Students with clinical opioid experiences were more likely to plan on working with patients addicted to opioids and be confident in treating these patients. Thus, the inclusion of experiential learning in the medical curricula may be beneficial for both students and their future patients.

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ecreational opioid use has increased dramatically in the United States. When opioids are prescribed for chronic pain, rates of prescription opioid misuse range from 21% to 29%, while rates of addiction are much lower, ranging from 8% to 12%. The rise in prescription abuse has been accompanied by increased heroin use.2 A 2016 study found that 7.5% of people who misused illicit prescription opioids transitioned to heroin.³ Although this transition rate remains fairly low, those who use heroin are more likely to have misused prescription opioids in the past.⁴ Additionally, recreational use of opioids has resulted in a steep increase in opioid-related overdose deaths across the country, especially in Midwestern states. This rise in deaths has been attributed to the increased use of synthetic opioids like fentanyl.⁵

Although the opioid crisis is a relatively recent and unique public health problem, addiction and substance abuse are not new issues that health professional students will have to contend with. Previous studies have documented that medical students and residents hold negative attitudes toward tobacco and alcohol addiction, specifically toward the efficacy of treatment options and confidence in their own skills.6-9 These negative attitudes have been shown to adversely affect physicians' abilities to detect and treat patients with alcohol and drug addiction.8,10,11 One study from 2018 that assessed medical students' opioid-specific knowledge and attitudes found that medical students and physicians lacked knowledge regarding patients at highest risk for opioid overdose as well as best treatment practices for opioid use disorder. 12 Additionally, medical students held more negative attitudes than physicians regarding the efficacy of recovery treatments. 12 Therefore, negative attitudes toward opioid addiction might act as barriers to the care of patients struggling with opioid dependence.

To address the concerns of inadequate opioid-related care and excessive prescribing practices, educators have called for pain- and opioid-specific courses in health professional school curricula with a focus on the psychosocial components of pain. ¹³⁻¹⁶ Experiential learn-

ing may be one way for health professional schools to accomplish this task.¹⁷ A study of medical students in Connecticut demonstrated that a lecture-based intervention accompanied by clinical training was effective in improving students' attitudes toward general addiction and confidence in their treatment abilities. Although the study included some opioid-specific questions, its aim was to investigate addiction attitudes in general.9 To our knowledge, there has been limited research on opioid-specific attitudes and beliefs of health professional students. Additionally, research has not described the opioid-related experiences that students are already exposed to as part of their academic programs and daily lives. Understanding how these experiences influence postgraduate plans could inform the development of future curricular interventions.

To build on the limited body of research, this study was conducted to address future prescribers' beliefs, experiences, and postgraduate plans related to opioids. In addition, the study explored the relationship between personal and clinical experiences with opioids and postgraduate plans. We hypothesized that opioid-related experiences would be positively associated with postgraduate plans to engage in opioid-related work after graduation.

Methods

This descriptive cross-sectional survey-based study assessed health professional students' (1) perceived impact of the opioid crisis, (2) beliefs regarding opioids, (3) personal and clinical experiences with opioids, and (4) postgraduate plans regarding opioids. The Ohio University Office of Research Compliance approved the protocol (18E195).

Respondents

An anonymous electronic survey was distributed via email and learning management systems to students in the nurse practitioner (NP), physician assistant (PA), and doctor of osteopathic medicine (DO) programs at Ohio University in April and May 2018. Students in the DO program were grouped by training level: students in years 1 and 2 were in the preclinical group and students in years 3 and later in the clinical group. Participation in the study was completely voluntary. Respondents received a \$10 gift card as compensation for participating in the study.

Outcome Measures

This investigation was a pilot study of the newly developed Opioid Impact, Beliefs, and Experiences Survey. Respondents completed a short demographic form as well as the survey, which consisted of 25 items. Eight items used a sliding scale from 0 (not at all) to 100 (extremely) to measure perceived severity of the opioid crisis. The remaining 17 items made up the beliefs, experiences, and postgraduate plans subscales, which were measured on a conventional 5-point Likert scale, with higher scores reflecting higher level of agreement. A panel of experts in behavioral research, qualitative methods, data and analytics, polypharmacy, and health care education developed the survey. To establish face and content validity, this panel reviewed and rated each question to determine whether it was necessary, useful, and relevant to the constructs being measured. Given that this study was the first administration of the survey, we used exploratory factor analysis to build evidence for validity of the affective items using a Likert scale. Principal component analysis with Varimax rotation was used to explore the subscale structure of the 17 Likert scale responses by reducing the number of dimensions measured.¹⁸ The internal consistency of the 8 sliding and 17 Likert scale items was evaluated using the Cronbach α.

Data Collection

Respondents completed the survey via Qualtrics, an online questionnaire platform. To consent, respondents clicked a radio button indicating "Yes, I consent to participate in this study. I may withdraw my participation at any time." To decline, respondents clicked a radio button indicating "I decline to participate." To avoid coercion, the online survey screen and the informed

consent document both specified that participation was voluntary. Informed consent explicitly informed potential respondents that their responses had no bearing on academic performance. Completion of the survey took approximately 15 minutes.

Data Analysis

Basic sociodemographic characteristics were assessed using descriptive statistics. Frequencies of individual question responses were calculated and presented as sample sizes and percentages. Nonparametric tests were used for ordinal measures and instances of severe violations of normality and homogeneity of variance. The Bonferroni correction was used when conducting multiple inferential tests on single dependent variables. One-way analysis of variance (ANOVA) was conducted to examine differences in perceived severity by academic program. Nonparametric Kruskal-Wallis rank comparisons were conducted to examine differences in beliefs, experiences, and postgraduate plans by academic program. The relationship between experience and postgraduate plans was explored using Mann-Whitney U tests. Statistical significance was defined as P<.05 unless a Bonferroni correction was used. All analyses were conducted with SPSS statistical software version 25.0 (IBM).

Bias Reduction

All students currently enrolled in each academic program were invited to participate to prevent undercoverage bias. The anonymous nature and self-administration of the survey were designed to limit social desirability bias, ¹⁹ and Likert scale questions were written with a balanced 5-point scale to prevent questions from being biased toward a negative or positive response.

Results

Of the 1216 students invited, 510 consented to participate. Nineteen students did not complete all subscales in the survey and were consequently removed from

analyses. The remaining 491 respondents had complete data and were included in analyses (response rate, 40.4%). Ninety-two respondents were NP students, 64 were PA students, and 335 were DO students.

The mean (SD) age of respondents was 27.2 (5.4) years; NP students were, on average, 10 years older than their PA and DO counterparts (F_{2.485}=143.61, P < .001). Women comprised the majority of respondents (308 [62.7%]) and were proportionally more prevalent in the NP and PA programs than in the DO program (χ_2^2 =36.04, P<.001). The majority of the sample was white (394 [80.4%]) and in the first 2 years of their program (379 [77.2%]). The majority of respondents grew up in a rural community or town (256 [52.1%]), and more NP students than DO students grew up in this type of community ($\chi_4^2=12.46$, P=.014). Approximately half of respondents (260 [53.0%]) reported wanting to enter primary care. More NP students than PA and DO students chose primary care as their preferred specialty (χ_2^2 =22.51, P<.001) (**Table 1**).

Measure Validation

Principal component analysis using the covariance matrix and Varimax rotation detected 5 subscales that collectively accounted for 56.7% of the variance in the Likert scale responses. The themes of the 5 subscales were clinical expectations, social connection and selfpreservation, perceived clinical capability, perceived efficacy of opioid therapy, and opioid-use and morality. Although this exploratory analysis identified subscales that did not match those defined by the researchers a priori, principal component analysis does not question the validity of responses to individual items. Cronbach α indicated that the internal consistency of the sliding scale items was acceptable (α =0.87); however, it fell below the acceptable range for the Likert scale items (α =0.42). This finding suggests that Likert scale items were attempting to measure multiple constructs.

Perceived Severity Subscale

When aggregated across the 3 programs, the mean (SD) rating was highest for the "impact on Ohio's health care

systems" item (79.7 [16.8]) and lowest for the "impact on Ohio's minors" item (64.3 [23.0]) (Table 2). One-way ANOVA tests yielded statistically significant differences when comparing ratings among the 3 academic programs for 6 of the 8 items. For "impact on Ohio's adult population," post hoc pairwise comparisons detected significant differences between NP and PA respondents ($F_{2,488}$ =5.45; P=.005). For the remaining items yielding statistically significant ANOVA findings, a pattern emerged in which post hoc comparisons were significant when comparing NP respondents with the other 2 academic programs, in which DO and PA students emerged as a homogenous subset: (1) "impact on your profession's ability to provide quality patient care" $(F_{2.488}=4.64; P=.010)$, (2) "impact on Ohio's health care systems" ($F_{2.488}$ =4.77; P=.009), (3) "impact on health care funding in Ohio" $(F_{2.488}=6.22; P=.002), (4)$ "impact on Ohio's suburban communities" ($F_{2,488}=7.17$; P=.001), and (5) "impact on Ohio's urban communities" ($F_{2.488}$ =8.17; P<.001).

Beliefs Subscale

Several of the beliefs questions yielded statistically significant differences among students in NP, PA, and DO programs (Table 3). The majority of respondents (421 [85.7%]) agreed with the statement "I believe addiction is a disease" (H₂=15.98; P<.001); pairwise comparisons were significant between NP and PA students and between NP and DO students, with NPs reporting lower levels of agreement. The majority of respondents (428 [87.2%]) also agreed that "persons in my profession need to establish boundaries with patients who have opioid addiction" (H₂=18.59; P < .001); pairwise comparisons were significant only between NP and DO students, with NPs reporting higher levels of agreement. Only 120 respondents (24.4%) agreed that "Persons in my profession need to be able to detach from patients with opioid addictions" $(H_2=17.17; P<.001)$; pairwise comparisons were significant among NP and PA students and among NP and DO students, with NPs reporting the highest level of agreement.

Table 1.

Health Professional Students' Personal and Clinical Experiences With Opioids: Sample Demographic Characteristics of Study Respondents^a

naracteristic	NP (n=92)	PA (n=64)	DO (n=335)	Total (N=491
Age, y, mean (SD) ^b	34.1 (7.2)	25.8 (6.0)	25.6 (2.5)	27.2 (5.4)
Gender ^c				
Male	13 (14.1)	16 (25.0)	154 (46.0)	183 (37.3)
Female	79 (85.9)	48 (75.0)	181 (54.0)	308 (62.7)
Race/Ethnicity ^d				
Asian or Pacific Islander	0	3 (4.7)	32 (9.6)	35 (7.1)
Black or African American	2 (2.2)	1 (1.6)	13 (3.9)	16 (3.3)
Hispanic or Latino	1 (1.1)	2 (3.1)	4 (1.2)	7 (1.4)
Middle Eastern	1 (1.1)	0	13 (3.9)	14 (2.9)
Multiracial	0	1 (1.6)	15 (4.5)	16 (3.3)
American Indian or Alaskan Native	1 (1.1)	0	0	1 (0.2)
White	86 (93.5)	54 (84.4)	254 (76.0)	394 (80.4)
Other	1 (1.1)	3 (4.7)	3 (0.9)	7 (1.4)
Year in Program ^e				
Year 1	28 (30.4)	46 (71.9)	117 (34.9)	191 (38.9)
Year 2	59 (64.1)	18 (28.1)	111 (33.1)	188 (38.3)
Year 3	2 (2.2)	NA	44 (13.1)	46 (9.4)
Year 4	3 (3.3)	NA	58 (17.3)	61 (12.4)
Year 5	NA	NA	5 (1.5)	5 (1.0)
Community Where Student Grew Upf				
Metropolitan (500,001 to >1 million)	7 (7.6)	4 (6.3)	43 (12.8)	54 (11.0)
City (50,001 to 500,000)	24 (26.1)	30 (46.9)	127 (37.9)	181 (36.9)
Rural or town (<2,500 to 50,000)	61 (66.3)	30 (46.9)	165 (49.3)	256 (52.1)
Postgraduate Specialty ^g				
Specialty care	23 (25.0)	31 (48.4)	177 (52.8)	231 (47.0)
Primary care	69 (75.0)	33 (51.6)	158 (47.2)	260 (53.0)

a Data are reported as No. (%) except where otherwise noted. Three repeated χ^2 analyses were used to compare gender, community, and postgraduate specialty by program. Critical P values were adjusted for multiple comparisons using a Bonferroni correction. The critical P value for the χ^2 analyses was set at .0167 corrected for 3 pairwise comparisons.

Abbreviation: NA, not applicable.

Three respondents (1 physician assistant [PA] and 2 doctor of osteopathic medicine [DO] students) did not report their age. One-way analysis of variance was performed to determine differences in age by program. Nurse practitioner (NP) students were older than their PA and DO counterparts (P<.001).</p>

Respondents in the NP and PA programs were primarily female (NP vs PA, P=.086; NP vs DO, P<.001; PA vs DO, P=.002).

d One DO student did not report his or her race/ethnicity. Statistical analyses could not be completed for race/ethnicity because of the low number of responses for most groups.

^e A "Year 5" option is included in the "year in program" category because some DO students completed dual-degree programs (eg, MBA, MS) or a primary care/osteopathic manipulative medicine fellowship, which adds an additional training year to the standard 4-year program. The PA program lasts a maximum of 2 years, and the NP program lasts a maximum of 4 years. Statistical analyses were not performed for year in program because each program has a different duration.

f The distribution of students who grew up in a metropolitan area, city, or town was different between NP and DO students. More NP students were raised in rural areas (NP vs PA, P=.027; NP vs DO, P=.014; PA vs DO, P=.208).

⁹ Pediatrics, internal medicine, and family medicine were categorized as primary care. More NP students intended to go into a primary care specialty (NP vs PA, P=.002; NP vs DO, P<.001; PA vs DO, P=.519).</p>

Table 2. Health Professional Students' Perceived Severity of the Opioid Crisis in Ohio: Mean (SD) Scores on the Perceived Severity Subscale^a

ow severe is the impact of the opioid crisis	NP	PA	DO	Total	ANOVAb		
n each of the following?	(n=92)	(n=64)	(n=335)	(N=491)	F _{2,488}	P Value	
Impact on Ohio's adult population	77.5 (17.1)	67.3 (20.7)	72.8 (19.3)	73.0 (19.3)	5.45	.005	
Post hoc P value							
NP		.003	.116				
PA	.003		.099				
DO	.116	.099					
Impact on Ohio's minors	68.3 (23.6)	63.2 (22.3)	63.4 (22.9)	64.3 (23.0)	1.73	.178	
Post hoc P value							
NP		.516	.211				
PA	.516		>.999				
DO	.211	>.999					
Impact on your profession's ability to provide quality patient care	71.8 (22.0)	61.8 (21.9)	64.3 (23.7)	65.4 (23.3)	4.64	.010	
Post hoc P value							
NP		.025	.019				
PA	.025		>.999				
DO	.019	>.999	•••				
Impact on Ohio's health care systems	84.1 (15.0)	76.2 (18.5)	79.2 (16.7)	79.7 (16.8)	4.77	.009	
Post hoc P value							
NP		.011	.039				
PA	.011		.557				
DO	.039	.557					
Impact on health care funding in Ohio	76.9 (19.9)	66.7 (20.4)	69.2 (20.7)	70.3 (20.7)	6.22	.002	
Post hoc P value							
NP		.007	.005				
PA	.007		>.999				
DO	.005	>.999					
Impact on Ohio's rural communities	78.6 (19.7)	77.7 (23.3)	80.3 (18.7)	79.6 (19.5)	0.65	.525	
Post hoc P value							
NP		>.999	>.999				
PA	>.999	•••	.984				
DO	>.999	.984	•••				
Impact on Ohio's suburban communities	78.1 (17.3)	67.1 (24.7)	70.0 (20.0)	71.2 (20.5)	7.17	.001	

(continued)

Table 2 (continued). Health Professional Students' Perceived Severity of the Opioid Crisis in Ohio: Mean (SD) Scores on the Perceived Severity Subscale^a

How severe is the impact of the opioid crisis	NP	PA	DO	Total	ANOVA		
on each of the following?	(n=92)	(n=64)	(n=335)	(N=491)	F _{2,488}	P Value	
Post hoc P value							
NP	•••	.003	.002				
PA	.003		.856				
DO	.002	.856					
Impact on Ohio's urban communities	83.7 (14.2)	72.5 (21.3)	77.6 (17.5)	78.1 (17.7)	8.17	<.001	
Post hoc P value							
NP	•••	<.001	.010				
PA	<.001		.095				
DO	.010	.095					

a The perceived severity subscale was measured on a scale from 0 to 100, where 0 was not at all severe and 100 was extremely severe.

Abbreviations: DO, doctor of osteopathic medicine; NP, nurse practitioner; PA, physician assistant.

Experiences Subscale

Four of 5 survey items assessing respondents' direct experiences relevant to the opioid crisis yielded statistically significant differences (Table 4). Overall, 100 respondents (20.4%) agreed with the statement "Opioid use has impacted my nuclear family" $(H_2=11.65; P=.003);$ pairwise comparisons were significant, with NP students reporting higher levels of agreement than DO students. The overwhelming majority of respondents (415 [84.5%]) agreed with the statement "Opioid use has impacted the community where I permanently reside" ($H_2=13.52$; P<.001); pairwise comparisons were significant among NP and PA students and among NP and DO students, with NPs reporting the highest level of agreement (86 [93.5%]). "I have treated a patient with an acute opioid overdose" (H₂=74.79; P<.001) yielded statistically significant pairwise comparisons among NP and PA students and among NP and DO students, with NPs again reporting the highest levels of agreement (75 [81.5%]). Only 27 PA students (42.2%) and 108 DO students (32.2%) reported treating a patient with an acute opioid overdose. Similarly, the statement "I have had clinical encounters with patients who are drug seeking" (H_2 =45.59; P<.001) yielded statistically significant pairwise comparisons among NP and PA students and among NP and DO students, with NPs reporting the highest levels of agreement (89 [96.7%]) and DOs reporting the lowest (253 [75.5%]).

Postgraduate Plans Subscale

Postgraduate Plans by Profession

Nearly half of the respondents (232 [47.3%]) agreed with the statement "I am confident I will be able to deal effectively with patients who have an opioid addiction" (H_2 =13.17; P=.001); pairwise comparisons were significant among NP and DO students, with 56 NP students (60.9%) in agreement compared with 146 DO students (43.6%) (**Table 4**).

Postgraduate Plans by Personal Experiences

Respondents whose nuclear family was affected by opioids reported higher agreement with the statement "My work upon graduation will likely involve dealing

b One-way analysis of variance (ANOVA) was performed on each scale item. Post hoc tests with Bonferroni corrections were performed to determine differences between groups. Significance was set at P<.05.</p>

Table 3.
Health Professional Students' Beliefs Surrounding the Opioid Crisis: Mean (SD) Scores on the Beliefs Subscale^a

	NP	PA	DO	Total	Kruskal- Wallis ^b	
eliefs Subscale Item	(n=92)	(n=64)	(n=335)	(n=491)	H ₂	P Valu
I believe addiction is a disease.	3.86 (1.09)	4.34 (0.90)	4.31 (0.82)	4.23 (0.90)	15.98	<.001
Post hoc P value ^c						
NP		.004	<.001			
PA	.004		>.999			
DO	<.001	>.999				
Alternatives to opioids are not effective for treating chronic pain.	1.89 (0.76)	1.91 (0.83)	1.81 (0.81)	1.84 (0.81)	1.78	.411
Reducing opioid prescribing will end the opioid crisis.	2.48 (0.96)	2.53 (0.84)	2.40 (0.87)	2.43 (0.88)	1.70	.427
Persons in my profession need to establish boundaries with patients who have opioid addiction.	4.48 (0.78)	4.30 (0.66)	4.14 (0.81)	4.22 (0.79)	18.59	<.001
Post hoc <i>P</i> value ^c						
NP		.116	<.001			
PA	.116		.651			
DO	<.001	.651				
Persons in my profession need to be able to detach from patients with opioid addictions.	3.13 (1.09)	2.55 (0.93)	2.61 (1.01)	2.70 (1.03)	17.17	<.001
Post hoc <i>P</i> value ^c						
NP		.003	<.001			
PA	.003		>.999			
DO	<.001	>.999				
Medication-assisted treatment (methadone or buprenorphine) are nothing more than substitutes for continued drug abuse.	2.78 (0.95)	2.45 (0.83)	2.06 (0.85)	2.25 (0.91)	51.98	<.001
Post hoc <i>P</i> value ^c						
NP		.184	<.001			
PA	.184		.001			
DO	<.001	.001				
Opioid analgesics are effective for treating long-term chronic pain.	2.77 (1.08)	2.72 (1.09)	2.96 (1.11)	2.89 (1.11)	3.76	.153
The thought of treating patients with opioid addiction causes me to feel stress.	2.98 (1.25)	2.86 (1.15)	2.94 (1.14)	2.93 (1.16)	0.34	.843
I hope to avoid working with patients who have an opioid addiction.	2.47 (1.03)	2.17 (0.87)	2.35 (1.02)	2.35 (1.01)	2.92	.233

^a Mean item scores for the beliefs subscale were calculated by averaging Likert scale responses (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree) across 3 health care professional graduate programs (nurse practitioner [NP], physician assistant [PA], and doctor of osteopathic medicine [DO]).

b Nonparametric Kruskal-Wallis rank comparisons were used to determine differences between academic programs. Significance was set at *P*<.05.

^c Post hoc tests with Bonferroni corrections were performed when significance was found with the initial independent samples Kruskal-Wallis test.

Table 4.
Health Professional Students' Experiences and Postgraduate Plans Related to the Opioid Crisis: Mean (SD) Scores on the Experience Subscale^a

	NP	PA	DO	Total	Kruskal-Wallis ^b		
em	(n=92)	(n=64)	(n=335)	(N=491)	H ₂	P Value	
Experience Subscale ^c							
Opioid use has impacted my nuclear family	2.58 (1.55)	2.03 (1.18)	1.98 (1.26)	2.10 (1.33)	11.65	.003 ^d	
Post hoc <i>P</i> value							
NP		.148	.002				
PA	.148		>.999				
DO	.002	>.999					
Opioid use has impacted my circle of friends	2.68 (1.47)	2.52 (1.33)	2.41 (1.40)	2.47 (1.41)	2.77	.250	
Opioid use has impacted the community where I permanently reside	4.48 (0.69)	4.05 (0.98)	4.12 (0.95)	4.18 (0.92)	13.52	.001 ^d	
Post hoc P value							
NP		.009	.002				
PA	.009		>.999				
DO	.002	>.999					
I have treated a patient with an acute opioid overdose	4.17 (1.20)	2.83 (1.51)	2.56 (1.51)	2.90 (1.58)	74.79	<.001 ^d	
Post hoc P value							
NP		<.001	<.001				
PA	<.001		.607				
DO	<.001	.607					
I have had clinical encounters with patients who are drug seeking	4.66 (0.65)	3.83 (1.25)	3.82 (1.29)	3.98 (1.24)	45.59	<.001 ^d	
Post hoc P value							
NP		<.001	<.001				
PA	<.001		>.999				
DO	<.001	>.999					
Postgraduate Plans Subscale ^e							
My work upon graduation will likely involve dealing with patients who are addicted to opioids	4.00 (0.93)	3.66 (0.96)	3.64 (1.08)	3.71 (1.04)	9.11	.011	
I am confident I will be able to deal effectively with patients who have an opioid addiction	3.71 (0.93)	3.41 (0.87)	3.31 (0.91)	3.40 (0.92)	13.17	.001 ^d	
Post hoc P value							
NP		.154	.001				
PA	.154		>.999				
DO	.001	>.999					

(continued)

Table 4 (continued).

Health Professional Students' Experiences and Postgraduate Plans Related to the Opioid Crisis: Mean (SD) Scores on the Experience Subscale^a

	NP	PA	DO	Total	Kruskal-Wallis ^b		
to provide medication-assisted treatment for patients in need of methadone, naltrexone, or	(n=92)	(n=64)	(n=335)	(N=491)	H ₂	P Value	
•	3.49 (1.07)	3.56 (0.89)	3.30 (1.04)	3.37 (1.03)	4.76	.093	

- ^a Mean item scores for the experience and post-graduate plans subscales were calculated by averaging Likert scale responses (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree) across 3 medical professional graduate programs (nurse practitioner [NP] students, physician assistant [PA] students, and doctor of osteopathic medicine [DO] students).
- b Nonparametric Kruskal-Wallis rank comparisons were used to determine differences between academic programs. Post hoc tests with Bonferroni corrections were performed if significance was found with the initial independent samples Kruskal-Wallis test.
- Significance for the experience subscale was set at P<.05.</p>
- d Statistically significant.
- ^e For the postgraduate plans subscale, the 3 postgraduate plans items were compared across 6 independent variables, 1 being academic program, necessitating cutoffs for statistical significance to be adjusted to *P*<(.05/6=.008).

with patients who are addicted to opioids" (U=23,579.0; Z=3.34; P=.001) (**Table 5**). Similarly, respondents whose communities were affected by opioid use reported higher agreement that their work upon graduation would involve dealing with opioid addiction (U=19,696.0; Z=3.62; P<.001).

Postgraduate Plans by Clinical Experiences

Respondents who had treated patients with acute opioid overdose reported higher agreement with the statement "My work upon graduation will likely involve dealing with patients who are addicted to opioids" (U=38,275.5; Z=5.92; P<.001) and higher agreement with "I am confident I will be able to deal effectively with patients who have an opioid addiction" (U=36,806.5; Z=4.96; P<.001) (Table 5). A similar trend was found among respondents who agreed with the statement "I have had clinical encounters with patients who are drug seeking," such that they reported higher agreement that their work upon graduation would likely involve dealing with patients addicted to opioids (U=25,346.0; Z=4.94; P<.001) and higher agreement in being confident in their ability to deal effectively with patients who have an opioid addiction (U=23,765.5; Z=3.66; P<.001) (Table 5).

Discussion

This cross-sectional descriptive study assessed (1) the perceived impact of the opioid crisis, (2) beliefs regarding opioids, (3) personal and clinical experiences with opioids, and (4) future plans regarding clinical opioid-related work. Overall, students perceived the opioid crisis as severe, especially within the scope of Ohio's health care systems and rural and urban communities. One notable trend that emerged consistently across the survey's subscales was that NP students rated the impact of the crisis more severely than their PA and DO counterparts. Importantly, most students recognized that addiction was a disease and that there were alternatives to opioids for treating patients with chronic pain. Opioid addiction personally affected onefifth of students' nuclear families and one-third of their circle of friends, with NP students reporting the greatest impact on their family and friends. These students also had the most clinical experience with acute opioid overdoses and clinical encounters with patients who were drug seeking. Also, students with personal and clinical experiences were more likely to report postgraduate plans to work with patients addicted to opioids and more likely to feel confident in their ability to deal effectively with such patients.

Table 5.
Health Professional Students' Postgraduate Plans by Experience: Mean (SD) Scores^a

Postgraduate	Opioid use has impacted my nuclear family			Opioid use has impacted my circle of friends		Opioid use has impacted the community where I permanently reside			I have treated a patient with an acute opioid overdose			I have had clinical encounters with patients who are drug seeking			
Plans Subscale Item	Yes (n=100)	No (n=391)	P Value	Yes (n=152)	No (n=339)	P Value	Yes (n=415)	No (n=76)	<i>P</i> Value	Yes (n=210)	No (n=281)	P Value	Yes (n=392)	No (n=99)	<i>P</i> Value
My work upon graduation will likely involve dealing with patients who are addicted to opioids.	4.02 (0.89)	3.63 (1.07)	.001 ^b	3.87 (1.03)	3.64 (1.04)	.014	3.78 (1.02)	3.32 (1.09)	<.001 ^b	4.01 (0.97)	3.48 (1.04)	<.001 ^b	3.83 (1.01)	3.24 (1.05)	<.001 ^b
I am confident I will be able to deal effectively with patients who have an opioid addiction.	3.53 (0.89)	3.36 (0.92)	.175	3.53 (1.01)	3.34 (0.87)	.028	3.42 (0.91)	3.25 (0.95)	.154	3.63 (0.86)	3.22 (0.92)	<.001 ^b	3.47 (0.89)	3.09 (0.95)	<.001 ^b
I plan to complete the additional training necessary to provide MAT for patients in need of methadone, naltrexone, or buprenorphine.	3.46 (1.04)	3.34 (1.03)	.339	3.54 (1.02)	3.29 (1.03)	.009	3.37 (1.04)	3.36 (1.00)	.800	3.35 (1.12)	3.38 (0.97)	.971	3.34 (1.05)	3.47 (0.97)	.327

^a All students (N=491) were included in these analyses. Experiences and postgraduate plans were measured with a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). Experiences were recoded into categorical variables with 2 levels based on whether the student had the experience (0=No, 1=Yes). Mann-Whitney *U* tests were conducted to determine differences in postgraduate plans based on personal and clinical experiences. Because the 3 postgraduate plans subscale items were compared across 6 independent variables—academic program (Table 4) and the 5 experience subscale items—cutoffs for statistical significance were adjusted to *P*<(0.05/6=0.008).</p>

Abbreviation: MAT, medication-assisted treatment.

Minimal research has explored providers' understanding of the opioid crisis, with most prior work focusing on addiction overall. One study assessing physicians' and medical students' knowledge and attitudes found that less than 14% of physicians and 25% of students could identify a patient at high risk for opioid-related overdose. Both physicians and students supported access to naxolone and lower-risk alternatives to chronic pain management. The current study builds on previous work by exploring health professional students' beliefs of the opioid crisis in general as opposed to focusing on treatment and recovery strategies for opioid addiction.

Additionally, the current study included a measure of perceived severity to further quantify students' understanding of the opioid crisis. As a whole, NP students perceived the crisis as more severe than their DO and PA counterparts. More of the NP students were raised in rural Appalachian communities, which have been hit hardest by the opioid crisis and which have overdose death rates that exceed the rates in urban communities.²⁰ It is plausible that NP students may have had more first-hand experience with the opioid crisis compared with PA and DO students, which in turn could have influenced their perceptions and beliefs as well as their personal

b Statistically significant.

experiences. Also, the NP students had a minimum of 2 years of full-time clinical practice as registered nurses and thus had more years of clinical education compared with a typical PA or DO student. Therefore, implementation of experiential learning could more accurately relay to students the realistic impact of opioid addiction, especially in medical programs that do not require clinical practice as a prerequisite.

Students with personal and clinical experiences related to opioids expressed a willingness to work with patients with opioid addiction. As anticipated, clinical experiences were positively associated with students' confidence in their ability to treat patients with addiction. Experiential learning has been shown to be effective in preparing students for their future medical careers through early clinical experiences, clinical rotations, and residency.¹⁷ Studies on generalized addiction attitudes have demonstrated that interactive clinical experiences can successfully improve the attitudes of medical students. 9,10 Thus, the inclusion of clinical simulations and early clinical exposures in the curricula may increase students' confidence in and willingness to treat patients addicted to opioids. In addition, educators and program directors should offer wellness resources to students in response to any psychosocial issues that may arise from personal and clinical experiences with opioids.

Although experiential learning may improve health professional students' attitudes toward and confidence in treating patients with opioid addiction, it addresses only 1 component of this complex crisis. Overdose death rates in rural areas have risen, yet the opioid prescribing rates of physicians in these communities remain elevated, possibly resulting from the lack of alternative treatment options for chronic pain.²¹ In the present study, students overwhelmingly believed that there were effective, nonopioid treatments for pain. Although this finding is encouraging, the lack of resources in rural areas may prevent health care professionals from using other treatment options. Osteopathic physicians in particular are uniquely positioned to treat patients with chronic pain via osteopathic manipulative medicine, a noninvasive manual approach to care.²² Emphasizing an integrated approach to pain management within the medical curriculum may give osteopathic medical students increased confidence and knowledge in treating patients with chronic pain. Furthermore, educating other health professional programs about the benefits of osteopathic manipulative medicine may increase its use as an alternative treatment. Finally, interprofessional training with NP, PA, and DO programs, as well as social work and clinical psychology is necessary to tackle this crisis holistically.

Limitations

Study limitations include low internal consistency of the Likert scale measures, homogeneity of the study sample from 1 university in a Midwestern state, low response rate, the cross-sectional study design, and respondents' self-reported data. Admittedly, Cronbach α for the Likert scale items suggests that in future research, investigators should revise the existing scale by either creating multiple scales for the subscales detected or simplifying the existing scale using a more grounded theoretical basis. For example, it might behoove the profession to develop a self-efficacy scale geared toward health care professionals serving patients with opioid addiction.²³ Although the response rate (40.4%) limits the ability to generalize findings to students in other contexts, particularly those where the opioid crisis is less severe, the statistical differences observed are still indicative of a pattern among health care professionals. The cross-sectional design of the study does not capture how students' professional development manifests longitudinally throughout their career and prevents discerning causality. Future research with a larger heterogeneous sample should include health professional students enrolled at multiple schools and include repeated longitudinal measures.

Conclusion

This study is the first assessment of health professional (NP, PA, and DO) students' perceived severity, beliefs, personal and clinical experiences, and postgraduate plans regarding the opioid crisis. The findings show

that health professional students with personal and clinical experiences with opioids were more likely to plan to work with and feel confident in caring for patients addicted to opioids. This finding is noteworthy because it suggests that early clinical exposure, possibly through experiential learning, may influence postgraduate plans to work with patients addicted to opioids. Additional research is needed to determine the impact of early clinical exposures on health professional students' decisions to work with patients addicted to opioids.

Author Contributions

All authors provided substantial contributions to conception and design, acquisition of data and data analysis; all authors provided substantial contributions to the interpretation of data; all authors drafted the article; all authors revised the article critically for important intellectual content; all authors gave final approval of the version of the article to be published; and all authors agree 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.

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