

Addressing the opioid crisis: An assessment of clinicians' training experience, practices, and attitudes within a large healthcare organization

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ABSTRACT

Objective: To assess provider practices and attitudes toward addiction care and pain management within a large healthcare system, as well as to determine the impact of prior training and perceived effectiveness of organizational implementation strategies.

Design: A cross-sectional study.

Setting: Large healthcare organization comprising 21 hospitals.

Participants: Three hundred and thirteen healthcare providers within a large healthcare organization.

Main outcome measures: Training, practices, and attitudes toward opioid-related care.

Methods: One thousand providers including physicians (MD/DO) and physician extenders (NP/PA) were contacted via email request. The Mann-Whitney test or Fisher's exact test, as appropriate, was used for comparisons of continuous and categorical variables, respectively.

Results: Providers lacked prior pain management (36 percent), addiction (38 percent), or buprenorphine training (92 percent). Few providers were confident in treating opioid use disorders (OUD) (19 percent) and opioid tapering (24 percent) but interested in safe prescribing practices (81 percent). While most providers preferred to refer patients for OUD (89 percent), only a small portion felt appropriate services were readily available (22 percent). Trained providers appear significantly more engaged in checking Prescription Drug Monitoring Program database [median = 1 (Q1 = 1, Q3 = 2) vs 2(1, 3); $p < 0.001$], comfortable obtaining urine drug screens [2(2, 3) vs 3(2, 4); $p < 0.002$], and willing to treat OUD with additional support [3(2, 4) vs 4(3, 4); $p < 0.022$] compared to non-trained providers. Primary care providers were more likely to view OUDs in their scope of practice [4(2, 5) vs 4(3, 5); $p < 0.016$] and willing to treat OUD with additional support [3(2, 3) vs 3(2, 4); $p < 0.0007$] compared to specialists. Buprenorphine providers appear to have more confidence in skills for OUD [2(1, 3) vs 4(3, 4); $p < 0.0001$] and tapering [2(1, 2) vs 4(3, 5); $p < 0.0001$], and diminished preference to refer [2(1, 5) vs 1(1, 2); $p < 0.0009$] compared to non-buprenorphine providers.

Conclusions: Providers within a large healthcare system lack training and confidence in management of opioid-related care. Buprenorphine training positively modified key attitudes toward addiction care, yet engagement in medication-assisted treatment remains limited. Providers are concerned about opioid risks, and view guideline implementation and direct input from addiction specialists as effective organizational strategies. Further research is needed to clarify the efficacy of such approaches.

BACKGROUND

Over the past two decades, the US opioid crisis reached epidemic proportions and continues to intensify. Recent epidemiological data suggest over 300,000 Americans have died from opioid overdoses since 2000.¹ Surveillance data also reveal shifts in opioid use patterns; initially from prescription opioids to heroin, and now a rapid rise in mortality rates associated with synthetic opioids is evident.² Beginning in 2013, overdose deaths associated with synthetic opioids such as fentanyl and its analogues (ie, illicitly manufactured fentanyl) demonstrate a near-exponential rate of increase.² Evidence-based approaches to contain the opioid crisis are available; however, progression of the epidemic is outpacing implementation of effective responses. Despite ongoing public policy efforts and changes in clinical practices, the accelerating trajectory of the opioid epidemic is evidenced by an estimated 64,000 drug deaths in 2016, from preliminary data, which would represent the largest annual opioid-related mortality rate in US history.³ In the face of this profound public health crisis, there is growing urgency to mobilize action from large healthcare systems and their supportive infrastructure for improved identification, early intervention, addiction treatment, and pain management.^{4,5}

A number of evidence-based strategies to defray the impact of the opioid crisis are well established. These are summarized as seven target domains of opportunity: (1) prescribing guidelines, (2) prescription drug monitoring programs, (3) pharmacy management benefit, (4) engineering strategies (ie, drug safety profile and administration), (5) overdose education and naloxone distribution programs, (6) addiction treatment, and (7) community-based prevention, such as Screening Brief Intervention and Referral to Treatment protocols (SBIRT).⁶ Yet, fractures at the intersections of public policy and clinical practice along with an incongruent interface between healthcare systems and community-need contribute to deepening treatment gaps in care. In 2014, for instance, only one in 10 US adults that required care for a substance use disorder accessed any form of treatment.⁷ Bridging this treatment gap, which broadly refers to the mismatch between public need and clinical capacity of delivery systems, will hinge on innovations within system redesign sciences.⁸ Large healthcare systems and their clinical providers occupy a critical place in any potential sustainable framework for change. Physicians

and physician extenders (eg, physician assistants and nurse practitioners) are increasingly the target of efforts to engage in safe opioid prescribing practices and expand their clinical repertoire to address challenges specific to pain and substance use disorders. The practices of primary care physicians, in particular, warrants focus, as they account for over 50 percent of all opioid prescribing, yet often lack any formal training in addiction or pain management.⁹⁻¹¹ Prior work identifies common barriers for physician engagement in addiction care, specifically medication-assisted treatment (MAT), and emphasizes the role of institutional support.¹²⁻¹⁶ US physicians increasingly work within large practice settings, however, few studies to-date have evaluated physicians perceptions of system-level strategies for improving opioid-related management.¹⁷ This need is exquisitely heightened given recent evidence that suggests a > 10-fold increase in mortality risk for patients with opioid use disorders (OUD) within general medical settings.¹⁸

Northwell Health is one of the largest healthcare systems in the northeastern United States with 22 hospitals and serves a catchment area of 8 million New Yorkers. In 2016, Northwell Health formed a multidisciplinary Opioid Management Steering Committee to develop potential system-wide solutions to address challenges in managing issues of chronic pain and addiction. With the understanding that there is no standalone solution, multiple workgroups were created to identify and implement solutions in a collaborative interdisciplinary and interprofessional fashion. The Opioid Prescriber Guidelines Workgroup was tasked with developing specific strategies to implement standardized guidelines for judicious prescribing, handle management and referral of pain and addiction care, and determine effective methods for increasing physician engagement. As such, a system-wide assessment of clinicians was undertaken to inform our implementation process. We were particularly interested in the following: (1) clinical knowledge, (2) current practices, (3) impact of prior training in pain management, addiction, or buprenorphine management, (4) willingness to change current practices, and (5) perceptions toward effectiveness of system-level interventions. This effort will serve as a precursor to inform the redesign of the delivery of care within our system and, hopefully support concurrent developments within other large healthcare organizations across the country.

METHODS

Survey design

The Northwell Health Opioid Prescriber Guidelines Workgroup developed a novel provider survey. The survey consisted of five sections: (1) demographics, (2) perceptions toward opioid epidemic, (3) knowledge about opioids, (4) barriers to treating OUD, and (5) willingness to change practices toward opioid management. The initial version of the survey was a mix of multiple choice, 5-point Likert preference scales, and free-text questions, with a total of 69 fields. Following the pilot phase, data and survey feedback was reviewed by the workgroup, and the survey was edited to eliminate four problematic prompts, which were redundant or vague. The final survey consisted of 65 fields. In the (1) demographics section, we asked respondents about features of their medical education and practice setting including: degree type, years in practice, hospital affiliations, and payer mix. To determine the scope of providers' prior training, we asked respondents about any prior addiction, pain management, and buprenorphine training as well as at which point in their education this occurred. We also examined provider engagement in MAT practices for OUD, by asking respondents about buprenorphine provider status and to quantify the volume of buprenorphine and naltrexone prescribed in the past year. Subsequently, we examined (2) providers' perceptions, by using a 5-point Likert scale (strongly agree to strongly disagree), toward various aspects of the opioid epidemic such as: veracity of actual epidemic, perceived prevalence of heroin/opioid use and burden of opioid overdose risk, treatability of OUD, and degree of self-confidence in distinct aspects of opioid management. In the next section, (3) respondents' knowledge of opioids, specifically MAT pharmacotherapy and outcomes, was ascertained with multiple-choice prompts. Respondents were asked to indicate (4) barriers to treatment on a 5-point Likert scale (strongly agree to strongly disagree) such as: utilization of screening tools (eg, SBIRT), accessibility of I-STOP (New York State's prescription drug monitoring program), concerns and hazards of opioid and MAT prescribing, organizational supports and financial considerations. Finally, using a 5-point Likert scale (strongly agree to strongly disagree), we assessed (5) factors that impact providers' willingness to change their

practices with a range of prompts related to: effectiveness of continuing medical education (CME), implementation of organizational guidelines, input from addiction experts, and financial incentives. This study approved by the Institutional Review Board (IRB) office at the Northwell Health Feinstein Institute for Medical Research and granted exemption from IRB review.

Data collection

From October 2016 to March 2017 (pilot: 10/2016 to 1/2017, final 2/2017 to 3/2017), we conducted a cross-sectional online survey of healthcare providers at Northwell Health. We surveyed potential providers of MAT for addiction, including physicians, nurse practitioners, and physician's assistants. A pilot phase was completed at eight hospitals to pre-test survey questions. Survey requests were sent by email to a limited set of providers at each site. The pilot study yielded a sample size of 72 ($n = 72$). In turn, the final survey was distributed across 21 hospitals. The survey request was sent as an email request from local medical directors to all providers within their own respective clinical departments. Participation was voluntary and no incentives were offered for survey completion. An estimated 1,000 providers received an email request with one follow-up reminder request. The final survey response rate was 31.3 percent, as one respondent was eliminated due to an incomplete survey, yielding a final survey sample size of 313 ($n = 313$). Given modifications made to the format of the survey from the pilot to final version, only data from the final version are reported here.

All study data were collected and managed using REDCap electronic data capture tools hosted at Northwell Health. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.¹⁹

Statistical analysis

Provider data from each survey section were analyzed with descriptive statistics and between-group

comparisons. For the descriptive portion, we determined percentages of each response for multiple choice prompts and 5-point Likert scale questions. Responses of “agree” and “strongly agree” were combined and reported as agreement. For the narrative responses, data were tabulated into percentages after core themes were independently assigned and scored by two investigators. Of note, one question from the final survey version regarding risks for opioid overdose was excluded from post-analysis due to ambiguity of the correct response.

We evaluated attitudes, barriers, and practices across three between-group comparisons: (1) trained versus non-trained providers, (2) primary care providers (PCPs) versus specialists, and (3) buprenorphine providers versus non-buprenorphine providers. Trained providers were defined as any provider that responded “yes” to prior training in any of the three areas queried (ie, addiction training, pain management training, or buprenorphine provider course) at any point in their education. If a provider indicated no prior training in these domains, then they were coded as “non-trained.” For the second comparison, PCPs were defined as any provider that selected internal medicine, family medicine, or pediatrics as their specialty of practice. All other respondents were considered to be “specialists.” For the final between-group comparison, buprenorphine providers were counted as any respondent who replied “yes” to the prompt regarding prior completion of buprenorphine provider course.

For the between-group comparisons, we coded responses on the 5-point Likert scales ranging from 1 (strongly agree) to 5 (strongly disagree), with 3 (undecided) in the middle. Smaller numerical scores represent higher degrees of agreement and larger scores represent disagreement. The Mann-Whitney test was utilized for comparisons of continuous variables, and the Fisher’s exact test was used to test the association between categorical variables. A result was considered statistically significant if $p < 0.05$. Statistical analysis was performed using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Respondent characteristics

A majority of survey respondents were physicians with a MD or DO degree (81 percent) with remaining respondents being nurse practitioners (17 percent)

and physician assistants (2 percent). The respondents were from 21 hospitals in the Northwell Health Organization with the largest representation from the North Shore University Hospital (21 percent) and Long Island Jewish Medical Center (16 percent). Most participants had over 10 years in practice (80 percent) (see Table 1). We captured a wide representation of specialties (> 50 specialties) and practice settings. Of the total number of survey respondents, the largest areas of practice represented were: 22 percent internal medicine, 8 percent emergency medicine, 6 percent family practice, 6 percent psychiatry, 6 percent orthopedic surgery, and 44 percent other specialty practices. Among the subset of other specialty practices, the largest group was from cardiology (9 percent of the other specialty practices surveyed and 4 percent of the total respondents). Key training deficits were identified within the total group, as 38 percent lacked prior addiction training, 36 percent lacked prior pain management training (see Table 2). Among providers with addiction or pain management training, such education most often occurred in the post-training period. Most respondents lacked prior training in buprenorphine management (92 percent). Engagement in MAT for OUD was low, as 90 percent of respondents indicated past year prescribing of both buprenorphine and naltrexone as “zero” (see Table 3).

Table 1. Provider demographics and practice characteristics (n = 313)

Gender	Percent	Specialty	Percent
Male	59	Other	44
Female	40	IM	22
Other	1	EM	8
Training type	Percent	FP	6
MD/DO	81	Psych	6
NP	17	Ortho	6
PA	2	OB/GYN	5
Years in practice	Percent	Practice setting	%
>10 years	80	Outpatient	38
5-10 years	9	Mixed	35
3-5 years	6	Inpatient	20
<3 years	5	ED	8

Table 2. Provider training characteristics (n = 313)

Addiction	Percent Yes
Post training	31
Medical school	26
Residency	20
Overall	62
Pain management	Percent
Post training	33
Residency	28
Medical school	19
Overall	64
Buprenorphine management	Percent
Post training	7
Medical school	0
Residency	0
Overall	8

Table 3. Provider MAT engagement (n = 313)

Current buprenorphine provider	Percent Yes
No	94
Yes	6
Buprenorphine patient volume	Percent
0 patients	90
<5	6
<30	2
<100	1
>100	<1
Naltrexone patient volume	Percent
0 patients	90
<5	7
<30	3
<100	<1
>100	<1

Perceptions toward opioid epidemic

An overwhelming majority of respondents agreed that the United States is in the midst of an opioid crisis (94 percent) (see Table 4). Respondents' perception of opioid use among their own patients was low. Seventy-six percent of respondents estimated <5 percent of their patients used heroin in the past month. Sixty-seven percent of respondents estimated <5 percent of their patients misused opioids in the past month. Fifty-five percent of respondents estimated <5 percent of their patients were at risk for opioid overdose in past year.

Treatment beliefs and practices

The majority (89 percent) of respondents identified OUD as a treatable illness; however, only 19 percent of respondents felt confident in their ability to treat OUD (see Table 4). Despite this, 2/3 (68 percent) of respondents felt their clinical practices could impact the epidemic. Eighty-nine percent of respondents agreed they would prefer to refer patients for addiction care. Yet, less than a quarter (22 percent) of respondents felt that patients have easy access to addiction care.

In regard to safe opioid practices, our survey identified distressing trends. Only 24 percent of respondents felt comfortable with management of an opioid taper, and over half (64 percent) felt if they taper they should taper as low as possible. Few providers obtained random drug screens (15 percent) or use opioid prescription agreements (15 percent). Out of all respondents, 73 percent said they checked the New York State Prescription Drug Monitoring Program (NYS PDMP, "I-STOP") before prescribing opioids, however, many providers found I-STOP too time consuming (44 percent) or opioid screening tools too time consuming (32 percent), with 43 percent undecided. The large "undecided" response for this prompt may indicate a lack of familiarity with and utilization of screening tools. Half (51 percent) of the respondents felt comfortable obtaining urine drug screens (UDS) from their patients, while less than half (43 percent) found it feasible to use opioid risk screening tools.

Knowledge

A majority (90 percent) of respondents were able to correctly identify naloxone's clinical application as opioid overdose rescue. In contrast, a significant

Table 4. Provider attitudes, practices, and knowledge (n = 313)

Attitudes toward OUD/addiction	Percent agreeable	Practices	Percent agreeable
United States in midst of opioid epidemic	94	Check NY PDMP every time opioid prescribed	75
OUD is treatable	89	Prescribing practices can impact OUD	67
Prefer to refer out	88	Taper as low as possible	64
Worried about patients becoming addicted to opioids	80	Comfortable obtaining UDS from my patients	51
Worried about patients misuse/OD on opioids	78	Too time consuming to check ISTOP	44
Lack of organizational support for addiction treatment	56	Opioid screening tool too time consuming	32
Lack access to addiction experts	47	Comfortable with tapering	24
Concerns of legal consequences of prescribing opioids	46	Confident in ability to treat addiction	19
My scope of practice to treat addiction	25	My office requires random UDS	15
My patients can easily access treatment options	22	Patients sign a treatment contract	15
Attitudes toward buprenorphine	Percent agreeable	Clinical knowledge	Percent
My practice lacks counseling support for BUP	70	Correctly identify Naloxone use	90
Low demand among my patients for BUP	61	Correctly identify BUP's mechanism of action	56
BUP is not financially viable in my practice	34	Correctly identify Naltrexone use	54
Worried about patients misuse/OD on BUP	28		
Worried about addiction to BUP	25		
Concerned about BUP diversion	18		

portion of providers demonstrated deficits in basic knowledge of pharmacotherapies used in medication-assisted therapy (MAT) (see Table 4). Sixty-three percent of respondents were able to identify an evidenced-based clinical outcome (eg, increased likelihood of employment) associated with methadone maintenance. Yet only half of respondents were able to correctly identify buprenorphine's mechanism of action (56 percent) or naltrexone's clinical applications (54 percent).

Barriers to treatment

Many providers worried about patients misusing or overdosing on opioids (78 percent) and developing OUD(80 percent) (see Table 4). Roughly half the surveyed providers (46 percent) were concerned about legal consequences from their opioid

prescribing practices. On a systems level, over half (56 percent) of respondents felt there was a lack of organization or institutional support for substance use treatment, including a lack of access to addiction experts (48 percent). As far as barriers to specific to prescribing buprenorphine, respondents noted lack of counseling support to provide addiction treatment (69 percent), low demand for buprenorphine among their patients (61 percent), believing prescribing buprenorphine would not be financially viable in their practice (34 percent), concerns about buprenorphine overdose (28 percent), addiction (25 percent), and diversion (18 percent).

Willingness to change practices

A majority of respondents felt that clinical guidelines can impact opioid prescribing practices and

patient management and felt guideline implementation within an organization is effective (see Table 4). A smaller subset of providers (46 percent) indicated they changed their prescribing practices due to the CDC Guidelines in 2016 on Safe Opioid Prescribing Practices. Eighty-one percent of respondents were interested in learning about safe opioid prescribing practices. Providers indicated clear preferences toward specific methods for new training and education that could impact their practice behaviors (see Table 4). Interestingly, few (25 percent) of respondents felt that financial incentives could change their behavior related to addiction management. Although the significance of financial incentives was not explored further in our survey, it did appear to influence openness to complete opioid-related CME. While nearly two-third of the respondents had completed zero hours of CME on safe opioid prescribing, 58 percent would be willing to attend a conference on opioid prescribing/tapering if the health system were to reimburse for it. Similarly, 65 percent of respondents said they would be interested in completing additional training and education modules if they received CME credits.

Narratives

Respondents were given an opportunity to add a narrative response at the end of the survey and 21 percent (n = 65) left a response. Three common themes emerged including commentary on: (1) feelings that this issue was outside the scope of their practice (64 percent); (2) being receptive to practice changes (39 percent); and (3) highlighting current lack of access to substance use disorder or pain management services (23 percent).

Between group comparisons

Respondents with any prior training (of any sort) versus no-prior training. Comparing these two groups, we found trained providers (of any sort) to be significantly more confident to treat OUD, view their practices can impact the opioid epidemic, felt that OUD treatment is in their scope of practice, felt comfortable with management of an opioid taper, and more willing to treat addiction if they had more support (see Table 5). Responders with training were also more likely to agree that it is feasible to use opioid risk screening tools, check I-STOP routinely, and be comfortable obtaining a UDS from a patient.

PCPs versus specialists. As compared to specialists, PCPs were significantly more likely to agree that their own practices can impact the opioid epidemic, OUD treatment is in their scope of practice, comfortable with managing an opioid taper, and more willing to treat addiction if they had more support. There was no significant difference between PCP and specialists in confidence to treat OUD, preferring to refer patients for addiction care. PCPs were more likely to agree that they feel comfortable obtaining a UDS from patients but no significant difference in finding opioid screening tools too time consuming, checking I-Stop routinely, or finding it feasible to use opioid risk screening tools.

Buprenorphine (BUP)-trained versus non-BUP trained providers. As compared to non-BUP trained providers, BUP-trained providers were significantly more likely to agree that they feel confident in treating OUD, OUD treatment is in their scope of practice, prefer to not refer their patients for addiction care, and comfortable in managing opioid taper. At the same time, there was no significant difference between these two groups regarding willingness to treat addiction if more supports were available. These two groups did not differ in their reported utilization of safe opioid practices such as opioid risk screening tools, checking I-STOP routinely, or comfort obtaining UDS from their patients.

DISCUSSION

Clinical training in addiction and pain management skills is limited among US healthcare providers and evident within our large healthcare organization.²⁰⁻²² There was also limited engagement in MAT along with key aspects of safe opioid prescribing (ie, utilization of risk-screening tools and urine drug screens, prescription treatment agreements, and PDMP monitoring), and markedly low confidence in management of OUD and opioid tapering. Not surprisingly, the majority of providers preferred to refer care for such issues, yet concurrently indicated their patients have limited access to adequate referral options. This dissonance is a particularly alarming trend for a healthcare organization located within the largest city in the United States, and predicts the high likelihood of dire mismatches in clinical need in other regions of the country.²³ While these trends are deeply concerning, providers also indicate strong interest in gaining new competencies,

Table 5. Between group comparisons

Respondent more likely to agree with:			
Prior training (n = 237) versus No prior training (n = 76)	Prior training	No prior training	p-value
Prefer to refer patients for addiction treatment	1 (1, 2)	1 (1, 2)	0.615
Check NY PDMP every time opioid prescribed	1 (1, 2)	2 (1, 3)	0.001*
View own practice can impact epidemic	2 (1, 3)	2 (2, 3.5)	0.014*
Comfortable obtaining urine drug screens	2 (2, 3)	3 (2, 4)	0.002*
Willing to treat OUD if more support	3 (2, 4)	4 (3, 4)	0.022*
OUD treatment in their scope of practice	4 (2, 5)	5 (4, 5)	0.0001*
Comfortable with tapering	4 (2, 4)	4 (4, 5)	0.0001*
Confident to treat OUD	4 (3, 4)	4 (3.5, 5)	0.0001*
PCP (n = 96) versus Specialist (n = 217)	PCP	Specialists	p-value
Prefer to refer patients for addiction treatment	1 (1, 2)	1 (1, 2)	0.909
Check NY PDMP every time opioid prescribed	1 (1, 2)	2 (1, 3)	0.349
View own practice can impact epidemic	2 (1, 2)	2 (1, 4)	0.042*
Comfortable obtaining urine drug screens	2 (1, 3)	3 (2, 4)	0.0001*
Willing to treat OUD if more support	3 (2, 3)	3 (2, 4)	0.0007*
OUD treatment in their scope of practice	4 (2, 5)	4 (3, 5)	0.016*
Comfortable with tapering	4 (2, 4)	4 (3, 5)	0.013*
Confident to treat OUD	4 (3, 4)	4 (3, 4)	0.226
BUP-trained (n = 19) versus Non-trained (n = 294)	BUP-trained	Non-trained	p-value
Prefer to refer patients for addiction treatment†	2 (1, 5)	1 (1, 2)	0.0009*
Comfortable with tapering	2 (1, 2)	4 (3, 5)	0.0001*
OUD treatment in their scope of practice	2 (1, 2)	4 (3, 5)	0.0001*
View own practice can impact epidemic	2 (1, 3)	2 (1, 3)	0.292
Check NY PDMP every time opioid prescribed	2 (1, 3)	2 (1, 3)	0.712
Confident to treat OUD	2 (1, 3)	4 (3, 4)	0.0001*
Comfortable obtaining urine drug screens	3 (2, 4)	3 (2, 4)	0.119
Willing to treat OUD if more support	3 (2, 4)	3 (2, 4)	0.134

Median (first quartile, third quartile), lower median = more likely to agree.

*p-value < 0.05.

†BUP-trained more likely to disagree.

receptiveness to guideline implementation, and pathways for increasing effectiveness of clinical education.

Our assessment of perceptions toward the opioid crisis revealed an important discordance: most

providers agreed that the United States was in the midst of an opioid crisis but perceived a low burden of opioid-related illness among their own patients. These divergent perceptions likely contribute to limited engagement in safe opioid practices and

addiction care. This brings attention to the need for accurate monitoring of the prevalence of opioid-related issues throughout large healthcare systems as well as uniform implementation of systematic early identification (eg, SBIRT). Such results also highlight important dichotomies within providers' beliefs toward their general clinical practices versus specific opioid-related care that require further clarification. Resolving the mismatch between provider preference for referral and patients' limited access for such care is critical pathway to eliminate treatment gaps.

Regarding direct strategies healthcare organizations can explore, our providers indicate a favorable perception toward guidelines that emerge from the organization itself as opposed to state or federal sources. Providers indicated reminders within the electronic medical record (EMR) are useful; yet, nearly half of our respondents report PMDP monitoring and screening tools are too time-consuming to use. This is a possible opportunity to diversify clinical approaches by incorporating team-based efforts to engage patients and not utilize physician time to do so. Less than a quarter of our providers are using urine drug screens or treatment agreements, which can be due to the lack of standardized protocols, guidelines, and monitoring at a system-level. Work from other large healthcare systems, supports the efficacy of guidelines as well as automated decision support tools, such as safety alerts, risk questionnaires for prescribing providers, prompts for alternative treatments or medications, prescription-treatment agreements, as well as a incorporating a direct link from the EMR to the PMDP.^{24,25} Technological applications geared toward increasing efficiency of providers and clinical data collection can address important barriers to care. Mobile Health (mHealth) technologies are increasingly being leveraged to improve physical and mental health outcomes for patients and demonstrate improving efficacy in the pain and addiction domains.²⁶

The lack of prior training in pain, addiction, and buprenorphine training has several implications on the potential effectiveness of implementing strategies to change practices. Limited confidence in clinical skills is associated with limited engagement in safe practices and negative regard for addiction care.^{27,28} In addition, the lack of adequate clinical education is also evident in our survey samples' knowledge deficits regarding standard addiction treatments. Specifically, the lack of knowledge of MAT pharmacotherapies likely correlates strongly with low-level

prescribing of these agents reported above. In this regard, naltrexone for OUD may represent a more readily modifiable practice change, as it is not a controlled substance, has essentially no diversion risk, does not require an additional waiver to prescribe, and has comparable efficacy to buprenorphine.²⁹ Our findings conflict with other work that suggests higher levels of confidence among PCPs with opioid prescribing skills, which may reflect important geographic variations.³⁰ It is of note subsequent to the data collection phase of our study New York State mandated all providers complete an online "Safe and Competent Opioid Prescribing Course" course developed at Boston University School of Medicine.³¹ It will be important to assess the impact of such efforts, given evidence that a significant portion of our respondents felt such trainings are not effective (ie, passive online clinical education). Klimas and others have explored the impact of brief addiction training, and while it appears to improve knowledge deficits, the impact on provider behavior remains unclear and requires further investigation.^{28,32}

Remarkably, training of any sort yielded distinct attitudes that appear to persist for survey participants. This observation reinforces the vital role of addiction education in early clinical training in shaping providers attitudes.^{33,34} Taking this cue, a powerful shift recently occurred within our organization. The Zucker School of Medicine at Hofstra/Northwell expanded the 4-year medical student addiction curriculum from 3 to 26 hours beginning in 2018. The lasting impact of training also points to expanding efforts for more systematic training and continuing education for current providers. Similar to addiction care, the delivery of high quality pain management services relies on effective interprofessional care. Despite pain being one of the most common presenting health complaints, pain management education for medical and nursing students is widely regarded as inadequate.³⁵⁻³⁷ Efforts to identify strategies to enhance interprofessional care remain elusive and call for more comprehensive studies to examine physician-nursing dynamics in pain and addiction management.³⁸ Our findings also support training formats that involve interaction with addiction and pain specialists and increasing access within healthcare systems for consultation services. Prioritizing such needs would represent another vital shift in current practices. The potential for large integrated healthcare organizations to urgently mobilize widespread infrastructural support was

evident in anticipation of an Ebola outbreak in New York City in 2014. In this context, many local organizations mandated providers, of all levels, complete online modules on assessment and management of Ebola, as well as attend in-person seminars on infection control procedures. Fortunately, the full threat of Ebola did not materialize but these events offer a template for similar widespread interprofessional action that the opioid crisis warrants.

Our analysis of PCPs versus specialists revealed positive trends in the former group's perceived role toward the opioid crisis. In particular, PCPs identified opioid-management to be in their scope of practice and more willingness to treat opioid issues than specialists, which are reassuring trends. Yet, the lack of difference between these two groups—in regards to confidence in opioid-related skills or preference to refer patients for addiction care—points to the need for new approaches to engage PCPs. Only a minority of providers overall (34 percent) indicated enhancing clinical support would shift their practices toward addiction care which raises deeper issues of provider stigma that remain embedded in addiction treatment.³⁹⁻⁴¹ This is especially problematic when compounded by the lack of access to adequate referral options as discussed above. From a system standpoint, efforts to increase provider engagement must concurrently address organizational infrastructure to support providers screening, identifying, and referral options (ie, SBIRT and expansion of MAT services) for opioid-related care.

Of note, although only a small set of our survey sample, the BUP-trained providers report increased confidence in clinical skills and, most notably, do not prefer to refer patients for addiction care. Despite barriers to physician engagement, buprenorphine therapy has a well-established evidence base of clinical efficacy.^{42,43} Buprenorphine treatment is also associated with improvements in public sector healthcare such as increased management of co-morbid illnesses (ie, Hepatitis C and HIV), positive patient attitudes toward treatment and decreasing addiction treatment stigma.⁴⁴ Our data points toward a more directive tone within large healthcare systems toward expanding MAT services, possibly by way of mandating providers complete buprenorphine training courses to ensure an adequate number of active buprenorphine providers are available system-wide.

Our study has several limitations that may constrain the generalizability of our findings. Our survey

only queried providers in a limited area of the Northeast region of the United States, and a number of aspects of the opioid crisis are geographically specific. We employed a passive online survey and offered no incentives for participation, which may have contributed to a low response rate (31.3 percent). While we attempted to engage local medical directors to enhance participation, these efforts were not standardized and likely varied from hospital to hospital. Physicians working within large healthcare systems are often inundated with email requests for various surveys, from within the organization, and may have opted to not participate based on the specific topic or length of our survey. This, in turn, may have introduced a selection bias and skewed the responses we obtained. Moreover, a portion of survey questions yielded a large “undecided” response, the significance of which was beyond the scope of interpretation from the current survey. Face-to-face interviews would be useful to clarify these responses. We did not quantify the types of training (ie, didactic instruction, clinical exposure, online CME, etc) providers previously completed, which may have introduced significant variability in their subsequent perceptions. Similarly, we did not examine our provider's current rates of opioid prescribing, which could have contributed to important practice biases. The between group comparison for BUP-trained versus non-BUP trained providers was highly unbalanced, and may undermine the statistical significance of our results. Lastly, our survey attempted to merge various aspects of opioid-management, from addiction and pain management domains, which may be an over-generalization that was confusing to some respondents.

The US opioid epidemic continues to evolve with increasingly complex and devastating outcomes. Large healthcare organizations are positioned to effectively implement changes that can diminish harm. A number of areas of intervention are readily identifiable, with short- and long-term trajectories. Enhancing engagement of providers, through education, technology, and expansion of organizational infrastructure will be required for sustainable positive change.

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