

Implementation of Buprenorphine After X-Waiver Elimination: A Health System Review of Rural North Carolina

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ABSTRACT

Background: Increasing accessibility of buprenorphine among individuals with opioid use disorder (OUD) is essential to decreasing the prevalence of overdose-related deaths. In January 2023, the Federal Mainstreaming Addiction Treatment (MAT) Act eliminated the X-waiver requirement for clinicians to prescribe buprenorphine to increase treatment provision. Prescriber-level behaviors following this policy change are not well understood in rural areas. This study investigates how buprenorphine prescribing practices changed in one North Carolina health system after the elimination of the X-waiver. **Methods:** Data were obtained through a convergent mixed-methods online survey conducted from February-July 2025. Survey items included structured survey questions and free response opportunities. Clinicians from the East Carolina University (ECU) Health System were identified from the North Carolina Medical Board (NCMB) Roster and from an ECU Health advanced practice provider email network (N = 978). Buprenorphine prescribing behaviors were analyzed using descriptive statistics. Barriers and facilitators to buprenorphine prescription were identified using thematic analysis. **Results:** Fifty clinicians responded to the survey for a response rate of 5.1%. Prior to the MAT Act, 42% reported prescribing buprenorphine; following the MAT Act, only 28% did so. Prescribing was shaped by (1) individual clinician factors; (2) health systems-level factors; and (3) community-level factors. **Conclusions:** Findings suggest that federal policy change alone may be insufficient to increase buprenorphine prescribing in this rural health system. Implementation of evidence-based strategies addressing factors at the community, health system, and individual level can potentially strengthen institutional support, reduce community-level barriers, and enhance clinician engagement in providing medication for OUD.

KEYWORDS

Buprenorphine; X-waiver; Medication for Opioid Use Disorder (MOUD) Policy; CFIR; Rural; North Carolina; Physician Assistant; Nurse Practitioner

INTRODUCTION

Opioid misuse and opioid use disorder (OUD) are significant public health concerns in the US. People who misuse opioids have a higher mortality rate and a substantially shorter life expectancy.¹⁻³ In 2024, 4.8 million people ages 12 and older reported OUD in the past year.⁴

Access to medication for opioid use disorder (MOUD), including buprenorphine or methadone, is the most effective OUD treatment.⁵ MOUD reduces the risk of opioid overdose death by 60%.⁶ The CDC (Centers for Disease Control and Prevention) estimated that although 4% of Americans needed OUD treatment, only 25% received recommended medication.⁷ There are myriad reasons why MOUD is not accessed or utilized, including insufficient availability of MOUD prescribers,^{8,9} patient and provider stigma, lack of knowledge, inadequate prescribing resources, and federal or state regulations.¹⁰

As of January 2023, any clinician with a narcotics license in the US can prescribe buprenorphine. Until then, prescribers were required to complete 8 hours of training and obtain a Drug Addiction Treatment Act (DATA) waiver, or X-waiver, through the Drug Enforcement Agency (DEA).^{11,12} Waivered clinicians were historically limited in the number of patients they could treat.¹³ Despite the X-waiver requirement and associated incentive (federal loan forgiveness) obtaining the waiver did not ensure clinicians would initiate or sustain buprenorphine prescribing.¹⁴ Federal policy created unintended barriers, such as scope of practice restrictions, that reduced treatment access, as highlighted in a 2019 study reporting that only 6% of physicians, 2% of physician assistants (PA), and 3% of nurse practitioners (NP) held X-waivers.¹⁵

In April 2021, X-waiver requirements were relaxed, allowing clinicians to apply for training exceptions to prescribe buprenorphine for fewer than 30 patients.¹⁶ A state-level analysis, of four states, showed modest increases in waived clinicians after training exemption thought effects varied by state; one state experienced a 0.5% decrease.¹⁷ In 2022, the Mainstreaming Addiction Treatment Act (MAT Act), removed restrictions surrounding MOUD.¹⁸ Effective January 2023, the MAT Act eliminated the X-waiver requirement (including patient limits) and introduced a universal training requirement for clinicians treating OUD.¹⁸ The change allowed any clinician with an active DEA registration number that includes schedule III (e.g., Oxycodone, Adderall) authority to prescribe buprenorphine. However, state-specific restrictions (i.e., prior authorizations, patient limits, special state registration) still applied.¹⁹

Impact of the X-waiver Elimination

The MAT Act eliminated the X-waiver in 2023, yet few studies have examined the impact of this regulatory change on prescribing. Two national studies found that while the number of clinicians prescribing buprenorphine increased following the elimination, the number of patients with buprenorphine prescriptions decreased.^{20,21} Additionally, Guy et al. observed a diminishing rate of buprenorphine prescribing nationally the year following previous policies to expand MOUD, which could be due to lower prescribing frequency amongst newly initiated prescribers.²² This suggests that policy change is necessary but may not be sufficient to expand patient access to buprenorphine treatment.

Rural Buprenorphine Treatment & CFIR

National data show persistent rural–urban disparities in buprenorphine treatment.^{23,24} Roughly one-third of rural residents live in counties without buprenorphine access compared with about 2% of urban residents, and many rural counties remain markedly undersupplied.²⁵

Rural communities face barriers across multiple dimensions, including availability barriers (few clinics and providers),²⁶ acceptability barriers (greater stigma and negative clinician attitudes toward OUD and MOUD),²⁷ and accessibility barriers (transportation, cost, and long waitlists).²⁸ Across settings, intervention characteristics, inner-setting dynamics, and individual factors, including stigma, diversion concerns, and limited time or support, shape prescribing, though attitudes often improve with real-world experience.²⁹⁻³²

The Consolidated Framework for Implementation Research (CFIR) is a framework used to identify multidimensional factors influencing intervention implementation.³³ The CFIR has guided understanding of why buprenorphine delivery succeeds or stalls across multiple dimensions within health care settings.³⁴⁻³⁶ CFIR has been applied to emergency department (ED)–based buprenorphine programs. A recent scoping review mapped barriers and facilitators across all five CFIR domains, identifying strategies such as multidisciplinary teams, co-located low-barrier services, and harm-reduction services, while also pointing to challenges related to structural stigma, complex patient needs, and a complex drug supply landscape.³⁷

North Carolina MOUD Access

In 2024, the North Carolina Department of Health and Human Services (NCDHHS) reported roughly 3,025 overdose deaths statewide.³⁸ During the period in which the X-waiver governed buprenorphine prescribing, multiple system-level barriers constrained access to treatment in North Carolina (NC). A 2023 study with NPs highlighted how federal and state regulations, limited institutional support, and persistent stigma toward OUD shaped clinicians' willingness and ability to prescribe buprenorphine.¹⁰ Downstream barriers in the dispensing process were also identified. Although most NC pharmacies carried buprenorphine, restrictive order practices and pharmacists' refusal to dispense created inconsistent access for patients seeking care.³⁹ These challenges illustrate that structural (CFIR domains: outer and inner setting) and attitudinal (CFIR domains: individuals) barriers can become embedded barriers interrupting the treatment continuum during the X-waiver era. Despite the X-waiver removal and implementation of the MAT Act, it is unknown if these concerns continue to influence buprenorphine availability and uptake today in NC.

It is important to specifically focus on rural community access to MOUD, as 80 of the 100 counties within NC are considered rural.⁴⁰ NC rural communities experience higher overdose rates compared with their urban and suburban counterparts.⁴¹ Yet, no studies within NC explored rural MOUD treatment access post MAT Act. Access to MOUD is imperative to reduce overdoses in rural NC communities.

There have been no studies on the impact of the MAT Act in NC. The purpose of this study is to characterize buprenorphine prescribing among clinicians in a NC health system that serves 25 rural counties in eastern NC.⁴² The study will provide information on how buprenorphine prescribing behaviors changed within a health system after the MAT Act and explore barriers and clinicians' attitudes toward buprenorphine prescribing. We hypothesize that buprenorphine prescription increased following

the implementation of the MAT Act. Findings will guide the development and implementation strategies to enhance buprenorphine access and support utilization of MOUD treatment in rural areas.

METHODS AND PROCEDURES

Study Design and Participants

This cross-sectional study used a convergent mixed-methods design. East Carolina University (ECU) Health System serves 29 counties in eastern NC, 25 of which are rural and medically underserved.^{40,43,44} ECU Health has a substantial rural footprint and a mission to advance rural health.⁴⁵ The system includes nine hospitals, more than 105 clinics, and over 1,200 physicians and advanced practice providers across multiple specialties.⁴⁶ It was selected as the study setting because it is the fifth-largest NC health system and provides care to a large, predominantly rural patient population.⁴⁷

Eligible participants were ECU Health clinicians practicing as medical doctors (MDs), doctors of osteopathic medicine (DOs), physician assistants (PAs), or nurse practitioners (NPs). Clinicians working exclusively in administrative medicine or specialties unlikely to provide MOUD such as pediatrics/neonatology, anesthesiology, dermatology, ophthalmology, physical medicine, plastic surgery, pathology, and radiology were excluded. This study was approved by the ECU Institutional Review Board (UMCIRB 24-001094).

Procedures

Participant recruitment occurred in two phases. In phase one, clinicians were identified using the North Carolina Medical Board (NCMB) Roster, which provides a full listing of clinicians practicing in NC. A new roster report is run monthly, providing the most up-to-date list of licensees. The roster was obtained in December 2024. Clinicians practicing within ECU Health were identified from the NCMB Roster. It was thoroughly sorted to exclude specialties listed above. Duplicate entries were removed. The roster was separated into two separate lists for PAs (n=81) and MDs (n=438). Provider emails were obtained through ECU Health database.

Due to NPs not being included in the NCMB roster, phase two focused on NP recruitment. An advanced practice provider leader within ECU Health system emailed NPs and PAs (n=459) working within ECU health. Due to using a mixed-discipline email group, we were unable to determine discipline-specific recruitment numbers for NPs and PAs in Phase 2.

An adapted Dillman Method was used for email recruitment timing.⁴⁸ A total of three emails were sent in the early morning (430-6 am). Recruitment emails contained a URL and QR code, directing participants to a Qualtrics portal with study information. Informed consent was required before participants could answer survey questions; those who declined were redirected and could not proceed. At survey completion, participants could enter a drawing to win one of 55 \$15 Amazon gift cards. Participation was voluntary and anonymous and for research purpose only; data were securely stored on ECU's restricted-access OneDrive.

Measures

The CFIR informed *a priori* implementation barriers and facilitators for measurement.⁴⁹ Measures focused on three domains: Outer Setting, Inner Setting, and Individuals. These domains were chosen due to alignment with survey measures. Items were adapted from publicly available CFIR constructs and tailored for OUD treatment (**Table 2**). The Outer Setting captured external factors influencing buprenorphine prescribing, including policies, community resources, and system- or patient-level barriers. The Inner Setting assessed organizational infrastructure, culture, and processes shaping implementation within the ECU Health system. The Individuals domain reflected clinician or patients' attributes (personal beliefs, knowledge, confidence, and motivations) that influence buprenorphine prescribing.⁵⁰

Outcome variables addressed in the 27-item survey include infrastructure, practice context, attitudes toward buprenorphine prescription, buprenorphine prescription prevalence, methadone prescribing practices, and personal and employment demographics (**Table 1**).

Domain / Variable	Description	Question Type	Items / Response Options	Source
Infrastructure	Organizational capacity to deliver MOUD	Two Quantitative Items; One Qualitative Item	1. Resources needed to administer buprenorphine (Likert: Strongly Agree–Strongly Disagree) 2. PDMP use (Before determining any medication; Before prescribing narcotic; Before treating OUD; After prescribing; Seldom; Not familiar). Qualitative response option of Other – please list. 3. Identify sources for OUD treatment guidance (qualitative response).	Integrating Medications for Addiction Treatment (IMAT) index Chokron Garneau et al., 2021
Practice Context	Clinical environment and patient population	Three Quantitative Items	1. % of patient using opioid analgesics for chronic pain 2. What proportion of patients does the clinician directly prescribe (0%–100%) 3. Primary population includes SUD (Yes/No/Not assessed)	Damschroder et al., 2022b; McCracken et al., 2012; Wertheimer et al., 2021
Clinician Attitudes Toward Buprenorphine Prescribing	Perceptions influencing prescribing	Two Quantitative Items; One Mixed-Method Item	1. Importance of prescribing buprenorphine (Likert: Strongly Agree–Strongly Disagree) 2. Influence of X-waiver on prescribing (Don't know; No effect; Minor effect; Major effect) 3. Previous MOUD training (Fellowship; CE training; Mentoring; UNC ECHO; None); Qualitative response option of Other – please list.	Chokron Garneau et al., 2021; Damschroder et al., 2022b
Buprenorphine Prescribing Practices	Current and historical prescribing behaviors	Six Quantitative Items	1. Clinic volume (<100 – >1000) 2. History of prescribing buprenorphine (Yes/No) 3–4. Patients prescribed buprenorphine before vs. after X-waiver elimination (0; 1–3; 4–8; >8) 5. Comfort prescribing buprenorphine (Needs training; Difficult to discuss; Strongly against) 6. Comfort teaching peers about MOUD (Comfortable; Needs training; Not comfortable; Difficult to discuss)	Jones et al., 2023; Jones & McCance-Katz, 2019; Meyerson et al., 2019; Perez et al., 2004; The Physician's Foundation, 2012
Methadone Practices	Willingness to prescribe methadone	Two Quantitative Items	1. Likelihood of prescribing methadone 2. Likelihood if regulations allowed office-based prescribing (0–10 scale: 0 = very unlikely, 10 = very likely)	Damschroder et al., 2022b; Jones & McCance-Katz, 2019
Barriers to MOUD Treatment	Barriers hindering MOUD accessibility	One Mixed-Method Item	1. Select barriers hindering MOUD accessibility (Table 4).	Speight et al., 2023
	Barrier elaboration	One Qualitative Item	2. Suggested changes to improve buprenorphine access.	Damschroder et al., 2022
Demographics	Participant characteristics	Four Quantitative Items	Race/ethnicity; Gender; Age	U.S. Census Bureau, 2020
Employment Characteristics	Professional background	Four Quantitative Items	Degree; Years in practice; Specialty; County of practice	The Physician's Foundation, 2012

Table 1. Summary of Survey Outcome Variables and Measurement Items.

Data AnalysisQuantitative Data

Quantitative data were analyzed by examining the distribution of responses for each answer choice provided in a frequency table for each item (**Table 1**). Descriptive statistical analyses were performed using Statistical Package for the Social Sciences (SPSS v.30).

Qualitative Data

Qualitative data were collected through free response items embedded within a quantitative survey. Data were analyzed using a deductive and inductive approach. Responses were coded based on *a priori* CFIR domains.⁵⁰ Constructs from the outer setting, inner setting, and individual domains were utilized to assess factors such as local attitudes and conditions, partnerships and connections, incentive systems, access to knowledge and information, available resources, and characteristics of innovation deliverers and participants, such as compatibility and motivation (**Table 2**). A related stigma construct was developed and incorporated into the coding framework.

Domain	Construct	Exemplar Quote
Outer Setting	Financing	"Lack of insurance coverage"
	Local Attitudes	"Remove the stigma/judgement from healthcare professionals and media"
	Local Conditions	"Rural location"
	Partnerships and Connections	"I would have counselors, LCSW, support groups, a way to do drug testing and two extra nurses"
Inner Setting	Incentive Systems	"Incentivize providers for identifying and treating patients with substance abuse issues"
	Access to Knowledge and Information	"Increase non-biased education to health care providers about SUD"
	Available Resources	"More providers/clinics and easier communication between EHR so we can follow treatment plans"
Individual	Innovation Deliverers	"More education for providers"
	Innovation Recipients	"Patient cooperation and willingness to try buprenorphine"
	Compatibility	"A special clinic of providers that can specialize in MAT"
	Motivation	"More providers willing to prescribe/manage"
Stigma	Stigma Prevalence	"The stigma"
	Reducing Stigma	"Remove the stigma/judgement from healthcare professionals and media"

Table 2. Buprenorphine prescribing practices by Consolidated Framework for Implementation Research (CFIR).

Convergence of Data

We integrated findings using a convergent mixed-methods approach.⁵¹ After separately analyzing the data, we compared results through a structured side-by-side examination to identify areas of convergence, expansion, and divergence. Quantitative indicators were aligned with qualitative themes describing contextual barriers and facilitators concerning prescribing practices following the X-waiver elimination.

RESULTS

Data collection for Phase 1 occurred from February - April 2025 (**Figure 1**) and for Phase 2 June - July 2025. Email invitations were distributed to 519 clinicians in Phase 1 and 459 clinicians in Phase 2, yielding a sampling frame of 978 clinicians. A total of 50 surveys were completed, 32 in Phase 1 and 18 in Phase 2, resulting in an overall response rate of 5.1%.

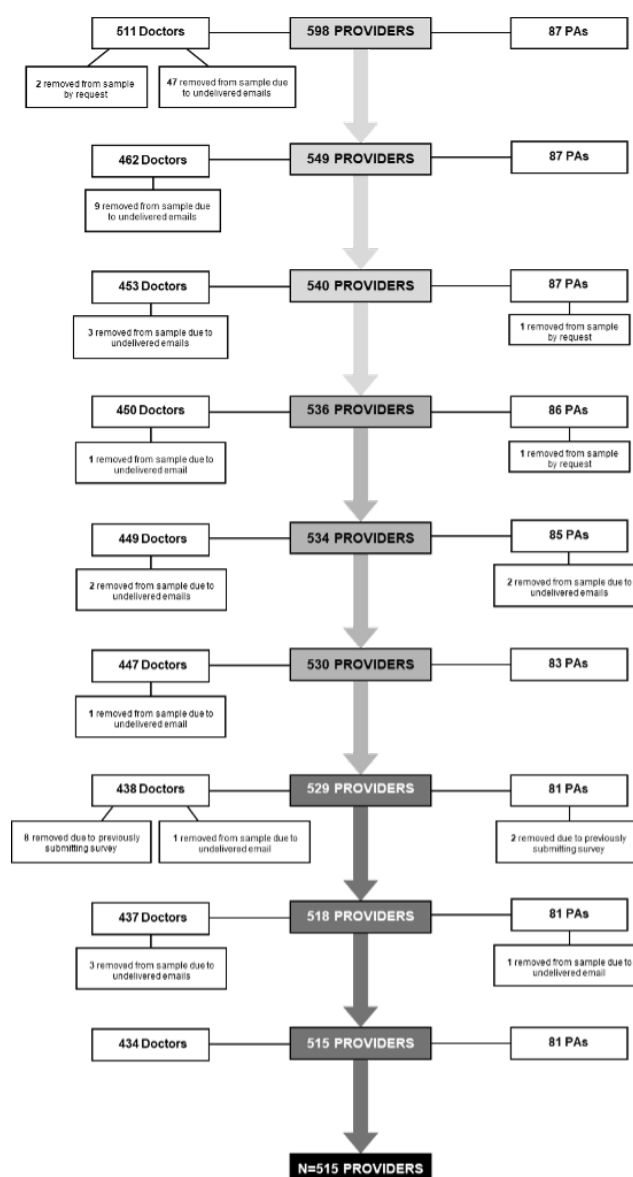


Figure 1. Sample for Phase 1 Recruitment.

Respondents included 24 MDs (48%), 1 DO, (2%), 10 PAs (20%), and 15 NPs (30%). Most practiced in Pitt County (80%), as the primary ECU Health Center is in Pitt County. The sample was relatively evenly split between male (48%) and female (52%) (Table 3).

Sample Characteristic	Full Sample	
	<i>n</i> = 50	Percentage
Professional Title		
Medical Doctor (MD)	24	48%
Doctor of Osteopathic Medicine (DO)	1	2%
Physician Assistant (PA)	10	20%
Nurse Practitioner (NP)	15	30%
Specialty		

Primary/General Care (Family Medicine, Internal Medicine)	9	18%
Woman & Infant Health (OBGYN, Neonatology)	6	12%
Behavioral & Supportive Care (Addiction Medication, Palliative Care)	12	24%
Surgical & Acute Care (Surgery, Emergency Department)	14	28%
Specialty Care (Neurology, Oncology, Cardiology)	9	18%
Practicing County		
Pitt	40	80%
Wilson	1	2%
Edgecombe	2	4%
Duplin	1	2%
Hertford	1	2%
Halifax	2	4%
Chowan	1	2%
Dare	1	2%
No response	1	2%
Age		
20-29	2	4%
30-39	15	30%
40-49	7	14%
50-59	8	16%
60-69	6	12%
No response		
Gender		
Male	23	46%
Female	26	52%
No response	1	2%
Race		
Asian (Chinese, Indian, Filipino, Vietnamese, Korean, Japanese)	3	6%
Black or African American	2	4%
White	39	79%
Other	4	8%
No response	2	4%
Ethnicity		
Hispanic, Latino, or Spanish origin	3	6%
Not Hispanic, Latino, or Spanish origin	43	86%
Prefer not to say	3	6%
No response	1	2%

Table 3. Clinician Demographics.

Survey participants (N=50) indicated prior to the MAT Act, 42% (N=21) prescribed buprenorphine compared with 28% (N=14) after. Among Phase 1 respondents (N=32), 72% (N=23) reported no change in prescribing habits following the MAT Act, 12% (N=4) reported increasing their buprenorphine prescribing, and 16% (N=5) reported being unsure whether their habits had changed. In Phase 2 (N=18), when asked how many patients they currently manage on buprenorphine for OUD, 17% (N=3)

reported treating 0 patients (typically referring to specialty treatment), 11% (N=2) managed 1-3 patients, 5% (N=1) managed more than 8 patients, and 67% (N=12) did not answer due to skip logic within the survey.

Participants identified multilevel determinants shaping buprenorphine prescribing. Barriers and facilitators spanned the outer setting, inner setting, and individual levels (Figure 2). These preliminary findings suggest that prescribing is influenced by intersecting structural, organizational, and individual factors, emphasizing the need for multilevel implementation strategies to expand MOUD in rural health systems.

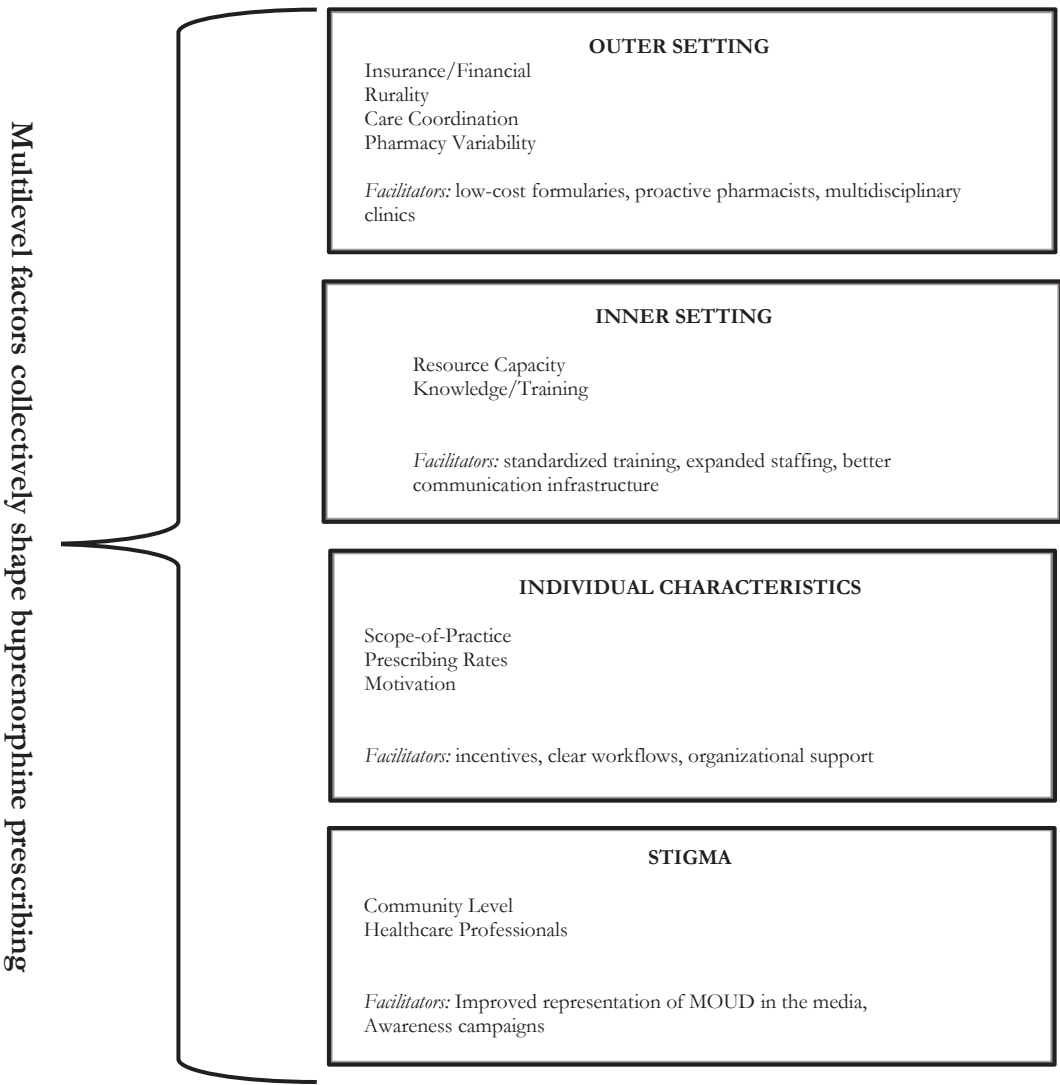


Figure 2. Multilevel Determinants of Buprenorphine Prescribing in a Rural Health System.

Outer Setting

Participants identified several community-level factors outside of ECU Health System that influenced their ability to prescribe buprenorphine. To assess perceived system-level constraints, respondents indicated current barriers and facilitators they believed to affect buprenorphine prescribing (Table 4). Every respondent indicated at least one barrier influencing MOUD treatment.

Barrier	Prevalence by Discipline				Prevalence Total
	MD N = 24	DO N = 1	PA N = 10	NP N = 15	
Rural location	16 (32%)	0 (0%)	8 (16%)	8 (16%)	32 (64%)
Stigma	13 (26%)	0 (0%)	6 (12%)	9 (18%)	28 (56%)
Lack of providers willing to utilize MOUD treatment	19 (38%)	1 (2%)	5 (10%)	10 (20%)	35 (70%)
Patient transportation	10 (20%)	0 (0%)	6 (12%)	5 (10%)	21 (42%)
Patient MOUD education	8 (16%)	0 (0%)	5 (10%)	3 (6%)	16 (32%)
Lack of insurance coverage	11 (22%)	0 (0%)	5 (10%)	9 (18%)	25 (50%)
Job instability	5 (10%)	0 (0%)	4 (8%)	3 (6%)	12 (24%)
Patient motivation	13 (26%)	0 (0%)	6 (12%)	8 (16%)	27 (54%)
Pharmacies not offering buprenorphine or other MOUD treatment	8 (16%)	0 (0%)	4 (8%)	1 (2%)	13 (26%)
Lack of long-term recovery support	12 (24%)	0 (0%)	5 (10%)	9 (18%)	26 (52%)
Other	2 (4%)	0 (0%)	1 (2%)	3 (6%)	6 (12%)

Table 4. Barriers to Buprenorphine Prescribing.

Insurance/Financial

Participants emphasized that financial instability and insurance related barriers limit access to buprenorphine, noting that gaps in insurance coverage and high out of pocket costs restrict treatment. Several suggested that access would improve if buprenorphine were included in low-cost retail plans, with one proposing it be made “*available on the \$4 formulary*,” to reduce patient burden. Others stressed the need for broader no cost options and fewer insurance approval requirements, and one respondent highlighted the need for “*lower cost, [and] less insurance approval process*,” which reflects how administrative hurdles worsen financial strain. Participants linked these challenges to patients’ overall “*financial security*,” describing limited resources that affect appointment attendance, prescription adherence, and navigation of insurance systems.

Rurality

Participants emphasized that rurality, including limited local treatment options, long travel distances, and unreliable transportation, remained a primary barrier to consistent MOUD access. These constraints were often described in terms of “*patient transportation*,” with one participant noting that if additional services were available locally, “*access to care and ability to follow up would be a non-issue*.” Several highlighted how job instability and broader community level socioeconomic strain further undermined patients’ ability to initiate and sustain treatment.

Limited Services

Several participants identified restricted long-term recovery support as a barrier, noting limited external programs offering sustained counseling, case management, or group-based recovery services. The absence of accessible psychiatric services in eastern NC further constrained integrated care. In contrast, participants emphasized the critical role of strengthened partnerships in facilitating buprenorphine treatment. Clinicians described the value of increased outpatient support and follow up options, including access to multidisciplinary clinics that provide counseling, nursing support, drug screening, and care coordination. One respondent explained that an ideal service environment would include “*counselors, LCSWs, support groups, a way to do drug testing, and two extra nurses*,” underscoring the need for robust cross-disciplinary collaboration. Participants identified implementation facilitators that could mitigate structural challenges, including more outpatient and multidisciplinary support, development of specialized MOUD clinics, and expanded referral pathways to ensure timely follow up and ongoing recovery support.

Pharmacy Variability

Respondents described challenges collaborating with pharmacies that do not consistently stock buprenorphine, noting that inconsistent availability disrupted continuity of care and created uncertainty for patients attempting to fill prescriptions. As one clinician explained, there is a need for “*more proactive pharmacists*.” At the same time, pharmacy partnerships emerged as important facilitators. Several clinicians emphasized the value of “*buprenorphine availability from pharmacy*,” and highlighted how proactive pharmacists who routinely stock buprenorphine and demonstrate reduced stigma in their interactions strengthened patient access and treatment continuity.

Inner Setting

Participants identified several ECU Health System determinants that influenced buprenorphine prescribing, noting that organizational resources, workflow structures, and training capacity shaped clinicians' ability to deliver MOUD.

Resource Capacity

Clinicians were asked whether they had sufficient resources to implement and administer buprenorphine. Responses (N=50) were mixed: 12% (N=6) strongly agreed, 24% (N=12) agreed, 26% (N=13) were neutral, 20% (N=10) disagreed, and 18% (N=9) strongly disagreed. This variability may reflect uneven access to essential resources.

Participants referenced limited time and staffing as barriers, noting that these constraints hindered engagement with patients seen infrequently. One clinician noted, *"too little time to follow patients whom I see once or twice a year,"* highlighting how staffing shortages and time constraints may affect MOUD feasibility. Another clinician emphasized the need for, *"more providers/clinics and easier communication between EHR [electronic health record] so we can follow treatment plans,"* suggesting that increased staffing and improved cross-clinic communication are essential for continuity of care. Participants suggested, *"having treatment facilities not require experienced providers in MOUD, but [are] willing to hire and train,"* to expand treatment capacity. Additionally, participants highlighted the role of incentives, recommending, *"incentivize providers for identifying and treating patients with substance use issues"* to increase provider willingness to utilize MOUD.

Knowledge/Training

Limited awareness appeared in clinicians' knowledge of the X-waiver elimination. In Phase 1 (N=32), only 18.7% (N=6) reported adequate or superior knowledge, while 56.3% (N=18) described minimal or basic knowledge, and 25% (N=8) indicated no familiarity or knowledge. Phase 2 (N=18) clinicians similarly reported how the X-waiver elimination affected their management of patients, 11% (N=2) indicating minor effect, 50% (N=9) indicating no effect, and 39% (N=7) indicating no knowledge of the X-waiver elimination.

Several clinicians noted variability in how often they checked the Prescription Drug Monitoring Program (PDMP). Clinicians from Phase 1 (N=32) were asked if they check the PDMP before initiating medications for patients. While 90.6% (N=29) answered yes or most of the time, 9.4% (N=3) answered no or were unfamiliar. Similarly, clinicians from Phase 2 (N=18) were asked how they currently use the PDMP, with 72.2% (N=13) explaining they check it before prescribing a narcotic, determining a medication, or treating a patient with OUD. The remaining 27.8% (N=5) reported they never check or are unfamiliar with the system.

Participants were asked what training they had received in the last 5 years regarding managing patients on buprenorphine (N=50); 32% (N=16) reported no training, while the remaining 68% (N=34) indicated participation in one or more methods which included: addiction medicine fellowship, continuing education training, mentoring from a colleague, and the UNC ECHO program. Participants reported obtaining information from medical articles, Eat Sleep Console, MAT Training in PA/NP education, SAMHSA, and online. Several participants emphasized the need for unbiased and widespread education for primary care providers, contributing to increased knowledge and awareness.

Individual Characteristics

To assess individual level determinants, clinicians identified attributes of clinicians or patients involved in prescribing, supporting, or receiving buprenorphine treatment. Participants (N=50) noted that patient cooperation (N=27) and provider willingness (N=35) potentially influence engagement with MOUD.

Scope-of-Practice

Participants were asked whether prescribing buprenorphine to manage patients with OUD was within their scope of practice (N = 18). Just over half, 55.6% (N=10), agreed, 5.6% (N=1) were neutral, and 38.8% (N=7) disagreed. Respondents who did not prescribe buprenorphine (N=29) provided reasons such as a *"no experience,"* and needed *"widespread training to all primary care physicians."* Clinicians highlighted the importance of increasing confidence and competency in outpatient settings, explaining that *"more prescribers comfortable with using it [buprenorphine] outpatient to follow up inpatient treatment"* would strengthen continuity of care.

Prescribing Rates

Participants were asked whether they had managed patients on buprenorphine for OUD between 2015 and 2022 and whether they were currently managing such patients. Overall, 42% (N=21) had previously managed patients on buprenorphine, while 58% (N=29) had not. Currently, 72% (N=36) reported they do not prescribe buprenorphine, whereas 28% (N=14) do. Several respondents emphasized the need for *"more providers willing to prescribe and manage,"* suggesting a gap in MOUD prescribing capacity in eastern NC.

Motivation

Participants identified patient-level factors, including education, motivation, and engagement, as key influences on MOUD treatment. One clinician noted *“patient cooperation and willingness to try buprenorphine.”* as a necessary improvement needed to increase patient access to MOUD. Incentive systems and organizational support were cited as strategies to encourage clinician participation, while ease of control and supportive infrastructure were highlighted as factors that enhance clinicians’ motivation to prescribe and manage buprenorphine, addressing the ongoing challenge of a *“lack of providers willing to utilize MOUD treatment.”*

Stigma

Multiple participants described stigma as a key barrier to buprenorphine implementation. Some clinicians described broader community-level needs, including improving general education and health literacy to reduce misunderstanding and stigma surrounding MOUD. While others noted healthcare provider stigma was affecting care shown by one clinician calling for *“decreased stigma and more proactive pharmacists,”* explaining that restrictive or judgmental dispensing practices reinforce community barriers to MOUD uptake. Others emphasized the need to *“remove the stigma, judgment from healthcare professionals and media,”* illustrating how regional narratives about addiction and treatment can shape acceptance of buprenorphine and hinder normalization of MOUD in routine care.

DISCUSSION

Preliminary findings show that integrating MOUD into routine care requires addressing multilevel barriers. Critical gaps in infrastructure, education, and systemic support continue to limit buprenorphine prescribing among participants in rural NC. While preliminary findings indicate a decrease in buprenorphine prescribing following the X-waiver elimination, this trend may be attributed to persistent barriers within the outer setting, inner setting, and individual CFIR domains.

Outer Setting

Our initial findings reinforce and extend evidence on financial, geographic, and structural barriers shaping MOUD access. Consistent with prior work, financial constraints and uneven insurance coverage restricted affordability, particularly for extended-release formulations that often require prior authorization.^{52,53} These results align with calls for policies that broaden reimbursement and reduce administrative hurdles.⁵⁴

Rurality limited MOUD access through geographic isolation and resource shortage.^{55,56} Geographic isolation and limited resources reinforced the critical role of PAs and NPs in rural MOUD delivery and the need for ongoing support.^{57,58} Collaborative relationships between clinics, pharmacies, and behavioral health providers remain essential, and integrating MOUD into pharmacy practice may help address gaps identified by participants.

Inner Setting

Inner setting determinants within the ECU Health System shaped buprenorphine prescribing through limited resource capacity and substantial variation in clinician knowledge. Participants reported restricted time, staffing shortages, and insufficient infrastructure, all of which reduced their ability to deliver MOUD. These findings mirror research showing that inadequate staffing and limited clinical time hinder prescribing and underscore the need for integrated workflows and follow-up systems to support sustained MOUD care.⁵⁹ Responses highlighted gaps in knowledge and training. Many clinicians reported no recent buprenorphine training, consistent with evidence that education improves confidence and intention to prescribe, and that insufficient training weakens the effects of policy changes such as the removal of the X-waiver requirement.⁶⁰ Several clinicians noted unfamiliarity of the X-waiver altogether. In Phase 1 (N=32), 25% (N=8) of clinicians reported no knowledge of the X-waiver, and in Phase 2 (N=18), 39% (N=7) reported no awareness of its elimination. Given that buprenorphine is an evidence-based treatment for OUD, this degree of unfamiliarity is alarming. Lack of knowledge about MOUD authorization reflects a critical clinical gap that may directly impede treatment access.

Differences across clinician types further highlight variability in implementation readiness. In Phase 1 (N=32), which primarily included MDs and DOs, fewer than 10% indicated they never check or were unfamiliar with the PDMP. In contrast, nearly 30% of PAs and NPs in Phase 2 (N=18) reported never checking the PDMP or being unfamiliar with the system. This discrepancy highlights a likely practice and knowledge gap between physicians and advanced practice clinicians, indicating the need for targeted PDMP and MOUD policy education. Participants identified incentive structures as a potential mechanism to normalize MOUD prescribing, aligning with evidence that incentives strengthen clinician engagement and support adoption of MOUD within health systems.⁶¹ Collectively, preliminary data point to the importance of strengthening institutional infrastructure, expanding protected time for MOUD activities, implementing targeted training and policy education, and incorporating incentive models to meaningfully enhance clinician readiness and improve MOUD implementation.

Individual Level

Contrary to our hypothesis, buprenorphine prescribing did not increase following X-waiver elimination, suggesting that policy shifts alone are insufficient. Participants described workflow challenges, limited training, and role misalignment. Literature similarly shows that clinicians benefit from targeted training, mentorship, and organizational support to integrate MOUD into routine practice.^{62,63} Participants noted that patient motivation influences treatment uptake, consistent with research showing that education, social support, and reduced stigma enhance MOUD engagement.⁶⁴⁻⁶⁶ Initial findings underscore the need for strategies addressing both clinician and patient-level determinants.

Stigma

Stigma remained a central barrier across community, provider, and system levels. Participants described misunderstanding of MOUD, limited health literacy, and negative regional narratives, aligning with literature showing that stigma reduces both prescribing and patient engagement.^{67,68} Provider-level stigma, including judgmental dispensing and negative assumptions, further limited access, reinforcing evidence that stigma within healthcare settings undermines treatment retention.⁶⁹ These findings highlight the need for stigma reduction and recovery-oriented messaging to normalize MOUD as standard, evidence-based care.

Limitations

Although the overall response rate was low (5.1%), it aligns with rates commonly reported in clinician email-based surveys.^{70,71} A 2022 study examining barriers and facilitators of clinicians prescribing buprenorphine received a higher response rate (20%), likely because clinicians were surveyed after completing a buprenorphine X-waiver training course.⁶⁹

Our study is limited by its cross-sectional design, response rate, single region setting, and reliance on self-report, which limit generalizability and introduces response bias. Given the overall low response rate, participants who responded may be particularly interested in substance use treatment or rural health initiatives, highlighting selection bias. Future work is needed and should include testing a multicomponent implementation strategy, including training, workflow integration, pharmacy partnerships, incentives, and patient-level outcomes.

CONCLUSIONS

In this regional sample of clinicians from NC, willingness and ability to prescribe buprenorphine were shaped by interlocking factors across the outer setting, inner setting, individual domains of CFIR, and stigma. Data suggests improving implementation requires a system-level, not prescriber-by-prescriber approach. Preliminary findings suggest that policy authorization alone may not be enough to ensure equitable, routine access to MOUD treatment. A coordinated, multilevel strategy may support a shift from episodic prescribing to reliable, patient-centered treatment for OUD.

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PRESS SUMMARY

Expanding access to buprenorphine, a medication that helps treat opioid use disorder, is critical to reducing overdose deaths. In 2023, the Mainstreaming Addiction Treatment Act removed a major barrier that had previously limited which clinicians could prescribe this medication. This study examined whether that policy change increased prescribing in a rural North Carolina health system. Despite the removal of this restriction, prescribing did not increase and, in some cases, declined. Clinicians reported that their ability to prescribe buprenorphine was influenced not only by policy, but also by workplace support, available resources, and community-level challenges. These findings highlight that policy change alone is not enough. Targeted support at multiple levels is needed to expand access to this life-saving treatment and better address the opioid crisis.