

A Resident-Led Intervention to Increase Initiation of Buprenorphine Maintenance for Hospitalized Patients With Opioid Use Disorder

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BACKGROUND: Hospitalized patients with opioid use disorder (OUD) are rarely started on buprenorphine or methadone maintenance despite evidence that these medications reduce all-cause mortality, overdoses, and hospital readmissions.

OBJECTIVE: To assess whether clinician education and a team of residents and hospitalist attendings waived to prescribe buprenorphine increased the rate of starting patients with OUD on buprenorphine maintenance.

DESIGN, SETTING, AND PARTICIPANTS: Quality improvement study conducted at a large, urban, academic hospital in Maryland involving hospitalized patients with OUD on internal medicine resident services.

INTERVENTION: We developed a protocol for initiating buprenorphine maintenance, presented an educational conference, and started the resident-led Buprenorphine Bridge Team of residents and attendings waived to prescribe buprenorphine to bridge patients from discharge to follow-up.

MEASUREMENTS: The percent of eligible inpatients

with OUD initiated on buprenorphine maintenance, 24 weeks before and after the intervention; engagement in treatment after discharge; and resident knowledge and comfort with buprenorphine.

RESULTS: The rate of starting buprenorphine maintenance increased from 10% (30 of 305 eligible patients) to 24% (64 of 270 eligible patients) after the intervention, with interrupted time series analysis showing a significant increase in rate (14.4%; 95% CI, 3.6%-25.3%; $P = .02$). Engagement in treatment after discharge was unchanged (40%-46% engaged 30 days after discharge). Of 156 internal medicine residents, 89 (57%) completed the baseline survey and 66 (42%) completed the follow-up survey. Responses demonstrated improved resident knowledge and comfort with buprenorphine.

CONCLUSION: Internal medicine resident teams were more likely to start patients on buprenorphine maintenance after clinician education and implementation of a Buprenorphine Bridge Team. *Journal of Hospital Medicine* 2021;16:339-344. © 2021 Society of Hospital Medicine

Nearly 48,000 Americans died from overdoses involving opioids in 2018, continuing a national crisis that has led to 446,000 deaths since 1999.¹ Annually, opioids are responsible for more than 500,000 admissions, approximately 1% of all hospitalizations, costing the United States nearly \$15 billion.^{2,3} Among hospitalized patients, chronic opioid use is associated with increased mortality, severe infectious complications, and higher rates of readmission.⁴ Opioid use disorder (OUD) is a chronic, relapsing medical condition with biopsychosocial origins and significant morbidity and mortality.⁵ Opioid agonist therapy

(OAT) with buprenorphine or methadone maintenance, the evidence-based standard of treatment, reduces the mortality rate by half, decreases overdoses and hospital readmissions, and improves retention in care.⁶⁻¹⁰

OAT maintenance refers to using buprenorphine or methadone for long-term treatment of OUD rather than for acute treatment of opioid withdrawal. Despite evidence supporting OAT maintenance, clinicians start medications for only 11% to 15% of hospitalized patients with OUD, depending on practice contexts.^{11,12} Three significant barriers—stigma, insufficient clinician education, and restrictive regulations—prevent clinicians from starting OAT.¹³ Clinicians who do not have the Drug Enforcement Administration (DEA)-issued DATA-2000 waiver (X-waiver) for outpatient prescribing can order buprenorphine for admitted patients but cannot prescribe it at discharge.¹⁴ In hospitals where they exist, addiction medicine consult services offer primary teams guidance on pharmacotherapy, leading to reduced hospital readmissions and increased engagement in outpatient addiction treatment.¹⁵⁻¹⁷ However, in most hospitals around the country, such specialty services do not exist.¹⁸

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In some hospitals without addiction medicine consult services, hospitalists with expertise in OUD have started assisting primary teams in starting OAT, but to our knowledge, no prior studies have described the impact of these interventions on patients or clinician experience with OAT.¹⁹

This quality improvement project aimed to increase the rate at which internal medicine resident teams at Johns Hopkins Hospital (JHH) in Baltimore, Maryland, started hospitalized patients with OUD on buprenorphine maintenance. We hypothesized that resident education and measures to increase the availability of X-waivered physicians would increase the rate of initiating buprenorphine maintenance. We additionally hypothesized that these interventions would increase knowledge about and comfort with buprenorphine across the residency. This represents the first study to examine the effects of clinician education and a team of X-waivered residents and hospitalists who assist in starting buprenorphine maintenance in a hospital without an addiction medicine consult service.

METHODS

Setting

This study took place from July 2018 to June 2019 at JHH, a large, academic, urban hospital in Baltimore. Prior to the intervention, internal medicine residents at JHH commonly used short courses of buprenorphine to treat withdrawal, but they did not have access to hospital-specific resources to assist with starting maintenance OAT. During the study period, JHH had a Substance Use Disorders team staffed by peer recovery specialists that could be consulted by hospitalists and residents to provide psychosocial support and link admitted patients to treatment after discharge. There were no providers on the team to guide pharmacotherapy or to write discharge buprenorphine prescriptions. The Osler Medical Residency Training Program at JHH has 140 internal medicine residents and 16 combined medicine-pediatrics residents. All residents receive 1 hour of formal education about opioid use disorder annually. In addition, 28 of those 156 residents, those in the Urban Health Primary Care track, spend 1 month on an Addiction Medicine rotation in which they complete the 8-hour training required to receive the X-waiver. Those residents are encouraged to apply for the X-waiver once they obtain a medical license subsidized by a Health Resources & Services Administration (HRSA) grant. Four internal medicine attending physicians on teaching services and one resident had X-waivers prior to the intervention.

Intervention

In November 2018, we administered a survey to residents to identify barriers to starting buprenorphine maintenance and to measure knowledge and confidence with using buprenorphine for OUD (Appendix Figure 1 and Figure 2). We focused on buprenorphine because providers at JHH were familiar with this medication and because Baltimore has widespread access to buprenorphine, with more than 490 local buprenorphine providers.²⁰ Five residents piloted the survey and provided feedback. We then administered the survey to all internal medicine and medicine-pediatrics residents. Based on the results,

we developed a targeted educational conference and also created the Buprenorphine Bridge Team (BBT).

In January 2019, we presented the educational conference for residents devoted to the use of buprenorphine for OUD and introduced the BBT. The conference started with a patient testimonial and included peer recovery specialists, pharmacists, nurses, and social workers. We summarized the evidence for buprenorphine and offered a practical guide to start treatment in a one-page protocol. This protocol included guidance on selecting patients, shared decision-making around OUD treatment, avoiding precipitated withdrawal, dosing buprenorphine, and establishing follow-up (Appendix Figure 3). We asked for input on this protocol from nursing leadership, social work teams, and peer recovery specialists. Dosing was adapted from the Guidelines from the American Society of Addiction Medicine, with expert input from physicians from the Addiction Medicine Consult service at Johns Hopkins Bayview Medical Center, also in Baltimore.⁵ We instructed residents to obtain discharge buprenorphine prescriptions from an X-waivered physician on their team or from the newly established BBT. We asked resident teams to set up a postdischarge appointment for patients with an X-waivered provider, either in a community practice or at the JHH After Care Clinic, a transitional care clinic for discharged patients.²¹

The BBT is a resident-led group of X-waivered JHH residents and hospitalists who volunteer to write discharge buprenorphine prescriptions for patients. The BBT serves to ensure primary teams have access to an X-waivered prescriber. It is not a consult service. We asked primary teams to contact the BBT after initiating buprenorphine and after securing a follow-up appointment. In response to each request, a member of the BBT reviews the patient chart, confirms the follow-up plan, writes a prescription for buprenorphine along with intranasal naloxone, and leaves a brief note. During the 6-month postintervention period, the team consisted of three residents and three hospitalist attendings. Each week, two members (residents or attendings) staffed the team Monday to Friday, 8 AM to 5 PM. Most weeks were staffed by two residents. One resident provided services after hours and during weekends. Resident team members ensured that the buprenorphine plan was discussed with the primary team's attending. For dosing questions beyond the BBT's scope of knowledge, a member of the BBT relayed questions to physicians from the Addiction Medicine Consult team at Johns Hopkins Bayview Medical Center.

In May 2019, 5 months after the education session and implementation of the BBT, we administered a follow-up survey.

Outcomes

The primary outcome was the percent of inpatients eligible to start OAT who were discharged on buprenorphine maintenance. We obtained data from the electronic medical record. The denominator consisted of patients with OUD not on buprenorphine or methadone maintenance on admission. We identified patients with OUD by an opioid-related *International Classification of Diseases, Tenth Revision (ICD-10)* diagnosis code or by a standing or as-needed order for buprenorphine

or methadone during hospitalization.²² We reviewed admission and discharge documentation to identify patients with OUD who were not in active treatment with buprenorphine or methadone maintenance.

As a secondary outcome, we measured engagement in OUD treatment after discharge by calculating the proportion of patients started on buprenorphine who filled a buprenorphine prescription within 30 days after discharge. We chose 30 days based on the National Committee for Quality Assurance's Healthcare Effectiveness Data and Information Set (HEDIS) measure for engagement of treatment for alcohol and other drugs.²³ We obtained the data from the Chesapeake Regional Information System for our Patients (CRISP) Prescription Drug Monitoring Program, which monitors all prescriptions for controlled substances dispensed in Maryland and five neighboring states. As a balancing measure, we counted patients newly started on methadone maintenance for OUD before and after the intervention. Additional secondary process outcomes included frequency of BBT requests, the volume of buprenorphine prescriptions written by the team, and time required to complete a BBT request.

Clinician-level outcomes, measured with electronically administered pre- and postintervention surveys to residents, included knowledge about and comfort with buprenorphine. Of the 16 questions in the pre- and postimplementation surveys, we analyzed the 6 questions concerning knowledge and comfort that remained identical in the pre- and postintervention surveys and used 5-point Likert scale responses. As an incentive, we randomly distributed three \$50 gift cards to survey completers.

Analysis

We used an interrupted time series analysis to evaluate the association between the intervention bundle and a change in the rate that medical teams started patients with OUD on buprenorphine maintenance. This approach allowed us to control for preintervention trends. To evaluate the impact of our interventions, our pre- and postintervention periods include the same residents during the 2018-2019 academic year. Both periods consisted of twelve 2-week intervals (preintervention: July 26, 2019, to January 9, 2019; postintervention: January 10, 2019, to June 26, 2019).

To evaluate for changes in engagement in OUD treatment after discharge, we used two-sample *t* tests. To evaluate for changes in resident-reported comfort and knowledge with initiating buprenorphine maintenance, we used Wilcoxon rank sum tests for survey data and Wilcoxon signed rank tests for paired data. All analyses employed two-sided *P* values with statistical significance evaluated at the .05 alpha level. We analyzed data using R version 3.6.3 (Foundation for Statistical Computing). The Institutional Review Board at JHH reviewed and approved the study protocol as a quality improvement project (IRB00193365).

RESULTS

During the 24-week preintervention period, internal medicine resident teams started 30 out of 305 eligible patients (10%) on

buprenorphine maintenance vs 64 out of 270 eligible patients (24%) during the 24-week postintervention period. Our interrupted time series analysis showed a significant increase in the percent of eligible patients started on buprenorphine maintenance (expected number of patients started postintervention, 27; actual, 64; absolute increase in percent, 14.4%; 95% CI, 3.6%-25.3%; *P* = .017) (Figure). There was no significant trend during the preintervention period and no significant trend during the postintervention period.

Before the intervention, 13 of the 30 patients (40%) newly started on buprenorphine maintenance during their admission filled a follow-up buprenorphine prescription within 30 days of discharge. After the intervention, 31 of 64 patients (46%) filled a buprenorphine prescription within 30 days (*P* = .612). Two patients were started on methadone maintenance, one prior to and one after the intervention.

During the 6-month postintervention period, the BBT received 75 requests and wrote 70 prescriptions for buprenorphine. The median time required to complete a BBT request was 15 minutes (minimum, 5 minutes; maximum, 60 minutes).

Of 156 internal medicine and medicine-pediatrics residents, 89 residents (57%) completed the baseline survey and 66 residents (42%) completed the follow-up survey. Forty residents completed both surveys. After the intervention, residents were significantly more likely to feel comfortable dosing buprenorphine (*P* < .0001) and counseling patients about its use (*P* = .0237) and were more likely to report ease of establishing follow-up (*P* < .0001). Self-reported knowledge about preventing precipitated withdrawal increased significantly (*P* = .0191), as did knowledge about the effectiveness of buprenorphine (*P* = .0003) independent of formal drug counseling (*P* = .0066) (Table). Paired survey data also found statistically significant results for all questions except those about preventing precipitated withdrawal and efficacy. For the latter, respondents who completed both surveys were more knowledgeable before the intervention than the overall group that completed the baseline survey (Appendix Table).

DISCUSSION

This study shows how a resident-led quality improvement project comprising clinician education and implementation of a novel BBT was associated with an increased rate of starting buprenorphine maintenance in hospitalized patients with OUD and improved resident knowledge about and comfort with buprenorphine. To our knowledge, this is the first study demonstrating how education and a team of X-waivered generalists can help primary teams initiate and discharge patients on buprenorphine maintenance in a hospital without an addiction medicine consult service.

Prior to the intervention, resident internal medicine teams at JHH started 10% of hospitalized patients with OUD on buprenorphine maintenance, consistent with prior studies showing rates of 11% to 15% for initiating OAT for hospitalized patients.^{11,12} After the intervention, the rate of initiating buprenorphine maintenance more than doubled, rising to 24% of eligible patients. Resident internal medicine teams at JHH

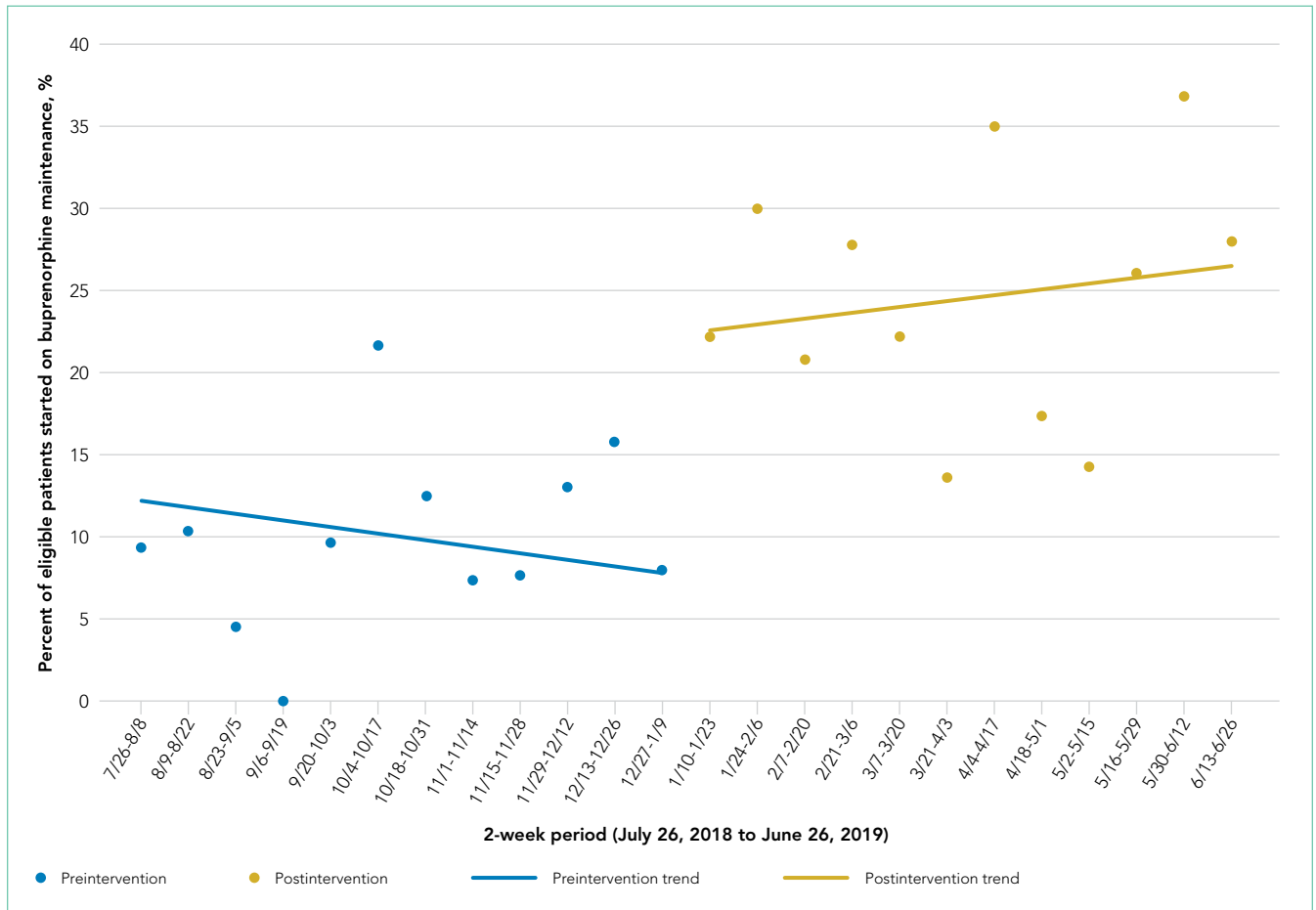


FIG. Eligible Patients Initiated on Buprenorphine by 2-Week Period

started buprenorphine maintenance for 37 more patients over the 24-week postintervention period than would have been predicted prior to the intervention, or an additional three patients every 2 weeks.

Between 40% and 46% of hospitalized patients newly started on buprenorphine maintenance filled an outpatient buprenorphine prescription within 30 days of discharge. We are not aware of comparative data for 30-day follow-up for hospitalized patients newly started on buprenorphine maintenance. Data from other contexts show 5% to 10% of veterans were engaged in addiction treatment 30 days after initiation from inpatient or outpatient encounters. An analysis of an academic medical center in Oregon found engagement with an addiction medicine consult service increased after hospital engagement for patients with any substance use disorder from 23% to 39% using the 34-day HEDIS measure for engagement.^{17,24,25}

The BBT required approximately 15 minutes per request and wrote an average of three prescriptions per week, demonstrating the feasibility of this approach and the high demand for this service. One strength of our approach is that residents gained experience starting buprenorphine independently using the aforementioned protocol instead of deferring to a

full consult service. It is likely that this resident engagement in initiating longitudinal OUD care contributed to the success of this initiative, as did existing resident familiarity with using buprenorphine for opioid withdrawal.

This approach to resident education—promoting direct, first-person experience with medications in a clinical context—aligns with recommendations from a recent review about substance use disorder education for health professionals.²⁶ Our interventions increased resident knowledge and comfort with buprenorphine, consistent with prior studies showing increased resident confidence in management of substance use disorders after curricular innovations.^{24,25}

A few contextual features were essential for this project’s viability. Maryland allows American medical graduates to obtain a medical license after 1 year of postgraduate training. This allowed three residents to obtain X-waivers. These residents had access to HRSA funding to subsidize the expenses of applying for state licensure and DEA registration. BBT members volunteered their time while working on other services. Last, we were able to take advantage of buprenorphine-providing clinics in Baltimore, including the JHH After Care Clinic, to accept patients for follow-up appointments after discharge.

TABLE. Resident Surveys About Buprenorphine for Opioid Use Disorder Before and After a Quality Improvement Intervention

	Before (N = 89)	After (N = 66)	P value
Demographics, no. (%)			
PGY-1	33 (38)	24 (37)	.928
Urban Health Primary Care Track	21 (24)	18 (28)	.607
Knowledge and comfort agreement*			
	Median (IQR)		
1. I know when and how to start buprenorphine to prevent precipitated withdrawal.	3 (2-4)	4 (3-4)	.0191
2. I feel comfortable dosing buprenorphine.	3 (2-4)	4 (3-4)	<.0001
3. It is easy to set up follow-up for an inpatient new to buprenorphine maintenance.	1 (1-2)	3 (2-3)	<.0001
4. I feel comfortable counseling patients about buprenorphine for either withdrawal management or maintenance therapy.	3 (2-4)	3 (2-4)	.0237
5. Buprenorphine maintenance is effective for reducing mortality in patients with opioid use disorder.	4 (4-5)	5 (5-5)	.0003
6. Formal drug counseling is needed for buprenorphine maintenance treatment to be effective.	3 (2-4)	3 (2-3)	.0066

*Agreement was rated as 1 = strongly disagree to 5 = strongly agree on a 5-point Likert scale. Abbreviations: IQR, interquartile range; PGY, postgraduate year.

Limitations

The BBT required motivated clinicians willing to volunteer for additional clinical responsibilities during inpatient rotations and supportive faculty and residency leadership. Attending physicians, nurse practitioners, or physician assistants could staff a similar BBT in hospitals without residents or in hospitals where residents cannot obtain DEA registration. Crucially, other hospitals may not have access to practices with X-waivered physicians for outpatient follow-up. A recent study found X-waivered primary care physicians were less likely to be affiliated with hospital health systems. Other studies have shown limitations in access to buprenorphine at the county level based on geography and racial/ethnic segregation.²⁷⁻²⁹

Most patients hospitalized with OUD did not have ICD-10 codes associated with OUD. We addressed this by assuming patients had OUD if buprenorphine or methadone was ordered during their hospitalization, even if the medication was never administered. This may have overcounted patients prescribed these medications for indications other than OUD, and it may have undercounted patients with OUD for whom buprenorphine or methadone were never considered. The opioid withdrawal order set at JHH automatically offers an option to use buprenorphine to treat withdrawal. Patients with OUD for whom buprenorphine or methadone were never ordered likely did not experience withdrawal or were in withdrawal so mild that it escaped the attention of the team, which limits the generalizability of our intervention.

We identified several limitations to the internal validity of our study. First, we used a before-and-after study design without a control group. We could not ethically withhold access to evidence-based, mortality-reducing medications from patients. Without a control group, we cannot rule out the possibility that underlying temporal trends made residents more likely to start

buprenorphine maintenance independent of our intervention. We attempted to control for unmeasured confounders by using an interrupted time series analysis to control for preintervention trends, comparing the same group of residents before and after our interventions, and selecting an intervention period during which residents were given only educational sessions and materials provided by our team. Our results may be biased by clustered data because certain residents may have been more likely to initiate buprenorphine, but these effects are likely marginal because resident schedules are balanced between outpatient and inpatient rotations during each 6-month period.

Finally, this project focused on buprenorphine, not on other medications for OUD, including methadone or naltrexone, or nonpharmacologic treatments for OUD.

Sustainability and Next Steps

Since the start of the BBT in January 2019, five additional PGY-2 residents obtained their medical licenses and X-waivers. These residents, with the support of two attending hospitalists, led the BBT and coordinated education sessions that were incorporated into the curriculum during the 2019-2020 academic year. These educational sessions will continue indefinitely. In 2020, JHH started an Addiction Medicine Consult Service staffed by physicians, NPs, and a pharmacist. The BBT continues to operate in conjunction with this service.

We found substantial variability in the rate of buprenorphine maintenance initiation despite our interventions. This is an area for future improvement. In a free-response prompt in our follow-up survey, residents requested additional education sessions and an order set to assist with initiation of buprenorphine. To address these gaps, three educational sessions were added, one of which included education on starting methadone maintenance therapy. We also added a

new order set for starting buprenorphine maintenance. We hypothesize that these interventions will improve consistency.

In order for a similar program to be disseminated to other institutions, educational initiatives and a team of dedicated X-waivered prescribers are key. Materials to assist with this process are available in the Appendix.

CONCLUSION

This study shows how a resident-led intervention comprising clinician education and a team of X-waivered generalists was associated with improved treatment of OUD for hospitalized patients. We encourage residents and all clinicians at other hospitals without addiction medicine consult services to design, implement, and study similar interventions that directly increase the use of buprenorphine or methadone maintenance to treat OUD.

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