Evaluation of an emergency department buprenorphine induction and medication-assisted treatment referral program

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ABSTRACT

Background: Emergency departments are struggling to manage the increasing number of patients seen for opioid use disorders and opioid overdose. With opioid overdose deaths rising at alarming rates, emergency physicians are beginning to induce patients with long-acting opioids such as buprenorphine and referring patients to outpatient medication-assisted treatment facilities. The objective of this study was to describe a pragmatic approach to buprenorphine induction, referral to treatment, and assess follow-up rates.
Methods: Single center, retrospective analysis of emergency department patients undergoing buprenorphine induction and referral to outpatient medication-assisted treatment. Patients were identified by an ongoing log of induced patients, between May 2017 and October 2018. The data is analyzed using descriptive statistics, with means and associated standard deviations, medians and interquartile ranges for continuous variables, and frequencies as percentages for categorical data.
Results: Overall, 219 patients were seen and induced with buprenorphine in the emergency department. Mean age was 35 years old (SD 10.3) and 56% were male. Intravenous opioids were most commonly abused at 75%. Our primary outcome of interest was the percentage of patients enrolled in MAT at 30 days, which occurred in 49.3% of our population. Patients were in moderate withdrawal based on initial COWS scores of 13.1(SD 5.8), and received mean total doses of 7.7 mg (SD 3.3). Median ED length of stay decreased by 40% between May 2017 and October 2018.
Conclusion: Emergency department initiated buprenorphine induction using a structured pragmatic approach is effective at maintaining patients in medication-assisted therapy.

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1. Introduction

The opioid epidemic in the United States (U.S.) has emergency departments (ED) and their providers struggling to identify and manage the overwhelming influx of afflicted patients within our communities [1-3]. With overdose death rates in the U.S. climbing to roughly 70,000 persons in 2017 and ED visits relating to opioid-use disorders climbing at a similar rate, health systems and emergency providers are having to adopt changes in both practices and services they can offer [4].

Historically, clinical management of patients in the ED for opioid withdrawal was to utilize symptomatic based treatments and offer education or referral information to substance use detoxification programs. Detoxification programs, or medication-assisted treatment (MAT) programs have utilized cognitive and psychosocial interventions along with long-acting opioid treatments and have shown to provide relief of withdrawal symptoms, abstinence of other illicit drugs and opioids, reduced mortality, and even reduced rates of HIV and hepatitis C transmission [5-8,11]. These programs traditionally have been the only environment where long-acting opioid therapy is initiated (ie. buprenorphine and methadone), titrated and monitored during the initial phases of detoxification.

Due to the limited availability and resources in most communities, emergency providers are now being asked to coordinate the initiation of MAT services, including induction and prescribing from the ED. Evidence has shown that ED-based initiation and induction with referral to cognitive and psychosocial services is feasible and effective [7,9-11]. In one study, roughly 75% of patients who were induced in the ED with buprenorphine and referred to an addiction treatment facility

were still engaged at 60 days compared to roughly 50% who were offered just information and/or referral [7]. Unfortunately, this process has not been adopted by many emergency departments.

We report a retrospective, observational analysis of our ED-based buprenorphine induction program that began in May 2017, with referral to our institution's own outpatient MAT facility. Outcomes of interest include follow-up or intake at our MAT facility after ED induction, retention rates at 30-days after induction, buprenorphine dosing for induction, ED length of stay (LOS), and other patient demographics to describe our population.

2. Methods

2.1. Setting

This single center, retrospective analysis was conducted at Denver Health Medical Center (DHMC), a vertically integrated, academic public safety-net institution, with 525 inpatient beds and 9 community health centers. Our ED sees roughly 110,000 patients per year. Our outpatient behavioral health and MAT referral center is located on the main campus of DHMC. The designed structure of our program is a Hub-and-Spoke model, where the ED and our MAT center serve as the Hub, and patients are "spoked-out" to our community health clinic providers after a period of adherence and retention at our MAT center. This analysis was approved by our institutional review board and informed consent was waived.

2.2. Selection of patients

Patients were identified for inclusion if they had been induced on buprenorphine between May 2017 and October 2018 in our ED. Patients were identified as potential candidates to be induced on buprenorphine if they had personally expressed interest, or if the provider offered such services and they accepted. Our program developed a guideline for providers to follow to assist in logistics of induction and referral which included a dosing algorithm, Fig. 1, with clinical withdrawal assessments, and templated email communication to be sent to key personnel after each induction with patient specific demographics and ED provided treatment doses. Record of these inductions was documented

and kept in a shared location available to project personnel only. No patients were excluded from analysis.

2.3. Treatment algorithm

Currently, there is no existing standard approach to ED based dosing strategies for buprenorphine induction. Large, single doses of 32 mg have been used successfully in the ED setting but our experience suggests that lower doses are typically effective [12]. Therefore, the development of our buprenorphine induction algorithm was based on the Substance Abuse and Mental Health Services Administration's (SAMHSA's) Center for Substance Abuse Treatment guidelines, otherwise known as Treatment Improvement Protocol 40 (TIP 40), which service as a best-practice guideline for the treatment of substance abuse [13]. Clinical assessments were carried out by using the Clinical Opioid Withdrawal Scale (COWS), a validated, symptom based assessment tool [14].

2.4. Data collection

Ongoing data collection was performed by key personnel involved in the ED or MAT center care and follow up. Patient movement throughout the Hub-and-Spoke model was recorded until they were lost to follow up, discharged from the clinic for rule violations, or completed treatment and were spoked out to a referring provider for ongoing outpatient Suboxone© prescribing.

2.5. Statistical analysis

Descriptive statistics were used to analyze all patient variables collected and assessed. Mean (±standard deviation) were used for age, induction buprenorphine dose, initial and last COWS score, and final MAT center dosing. Medians with associated 95% confidence interval was used to express ED length of stay per month. Percentages were used for most commonly abused opioid, provider type, intake at MAT completed, 30-day retention in MAT and take-home naloxone kit provided at discharge. Subgroup analysis were completed to compare ED LOS between the first twelve months (May 2017–April 2018) compared to the last 6 months (May 2018–October 2018), and to compare mean
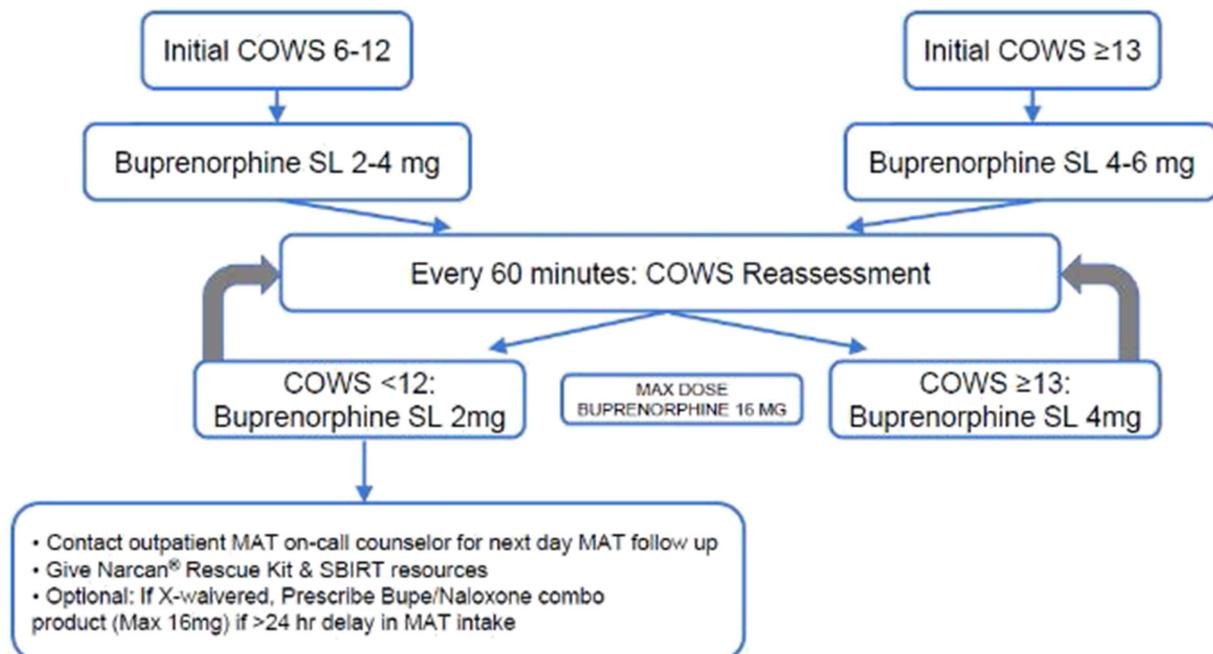

Fig. 1. Caption: Buprenorphine induction process.

buprenorphine doses and change in COWS scores between those two periods. Statistical significance for LOS was assessed using two-tailed *t*-test and a *p*-value of ≤0.05.

3. Results

3.1. Population

Two-hundred and nineteen patients were included in the analysis based on our ongoing log from provider communication sent to study personnel. Over the course of our analysis period, significant increases in buprenorphine inductions occurred over time as seen in Fig. 2. Baseline characteristics are in Table 1. Overall, the majority of patients who underwent buprenorphine induction were white, male, and previous or current IV opioid users (75%) as this population likely reflects national trends in opioid users as described previously [2]. Our advanced practice providers (APP), physician assistants or nurse practitioners, completed the majority of inductions at 58%.

3.2. Outcomes/follow-up

As is indicated in Table 2, the rate of our primary outcomes of interest, MAT intake and retention at 30 days following ED induction, was 74% and 49.3% respectively. Regarding severity of initial withdrawal, the mean initial COWS score indicates moderate level of withdrawal initially. The mean cumulative buprenorphine dose used for induction shows most patients received two to three doses of 2–6 mg of buprenorphine per dose. Last recorded mean COWS score before discharge was 3.6 (SD 2.6), indicating most patients did not have complete resolution of their withdrawal symptoms but were much improved from baseline. The 30-day mean buprenorphine MAT dose was significantly higher than the induction dose and 14% of those retained in MAT at 30 days were transitioned to methadone. Of those who had recorded reasons for leaving or being discharged from our MAT clinic, lack of attendance was the most common reason followed by transportation issues, all of which were expected given the patient population's often challenging social circumstances.

Length of stay for patients undergoing ED initiated buprenorphine induction has the potential to affect throughput metrics for emergency departments so analysis of patient length of stay is pertinent as to not

Table 1
Baseline characteristics

Baseline characteristics	No. (%) of Patients
Total number of patients	219
Male	123 (56.2)
Age, mean (SD), yrs	35 (10.3)
Race	
White	189 (86)
Black	14 (6)
Other	16 (8)
Most commonly abused opioid	
IV Opioid	165 (75)
Oxycodone, oral	23 (10.5)
Hydrocodone, oral	4 (1.8)
Other	27 (12.3)
APP induction	127 (58)
Attending/Resident physician	92 (42)

disrupt typical patient flow. Length of stay analysis on a monthly basis for those undergoing induction in the ED was roughly 8.4 h initially, then decreased to just over 5 h by October 2018, as is seen in Fig. 3. This shows an absolute 40% reduction in ED length of stay for these patients from program initiation. However, assessing the comparison between the first 1 year compared to the last 6 months, ED LOS was not statistically different (May 2017–April 2018 LOS: 6.8 h vs May–October 2018: 6.2 h), $p = 0.28$. The mean change in COWS score between the two periods were also not significant (9.6 vs 10.3 respectively; $p = 0.42$) but the total buprenorphine induction doses in the ED were (7 vs 8.2 respectively, $p < 0.05$), as described in Table 2.

4. Discussion

Throughout the assessment time period, we saw 807 patients with a primary diagnosis code associated with opioid withdrawal, abuse, or dependence. This represents 0.48% of the total patients seen over that time, with 219 (27%) of those patients induced with buprenorphine in the emergency department. Given the challenging social circumstances that this demographic of patients with opioid use disorder often face, we were able to effectively develop a process for ED initiated buprenorphine induction and MAT referral from our facility. We identified a rate of retention, 49%, that is lower than the landmark study by
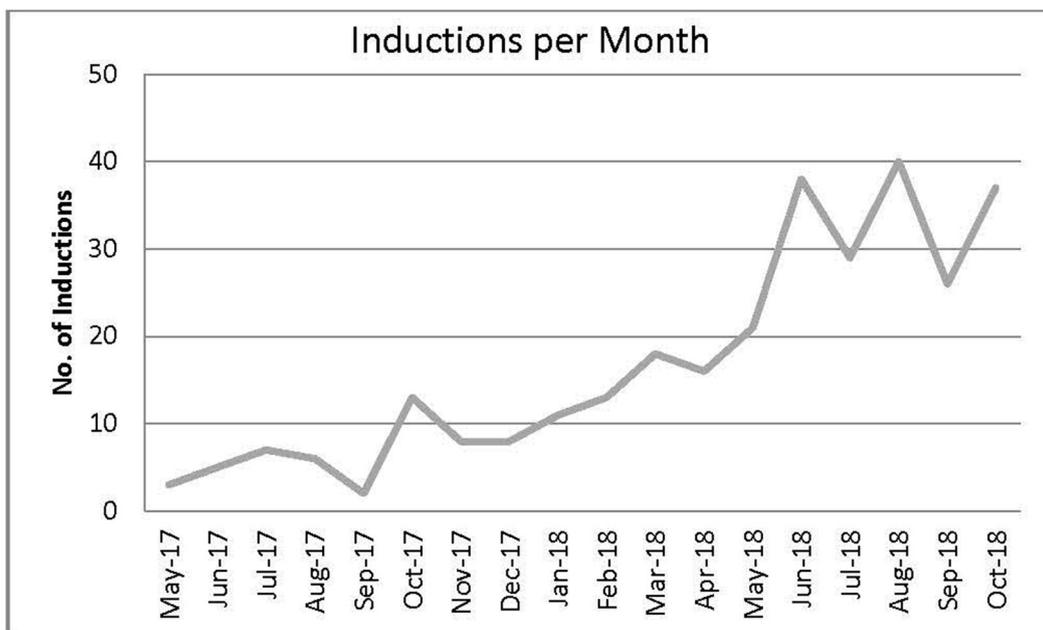

Fig. 2. Caption: Number of emergency department initiated inductions per month.

Table 2
Outcomes of interest

Outcomes	No. (%) of Patients	Mean (SD) or Median (95%CI)
Enrolled in MAT at 30 days	108 (49.3)	
Total Discharged from MAT	111 (50.7)	
Most common reason for discharge		
Lack of attendance	22 (20)	
Relocated/incarceration	15 (14)	
Lack of transportation or clinic hours	7 (6)	
Arrived at MAT intake within 72 h of induction	162 (74)	
Initial COWS score, mean (SD)		13.1 (5.8)
Last COWS score, mean (SD)		3.6 (2.6)
Change in COWS score, mean(SD)		9.6 (7.1)¶
May 2017–April 2018: $n = 100$		10.3 (5.7)¶
May 2018–October 2018: $n = 119$		
Buprenorphine Induction dose, mean (SD)		7.7 (3.3)
May 2017–April 2018: n = 100		7 (3.1)¥
May 2018–October 2018: n = 119		8.2 (3.3)¥
MAT buprenorphine dose, mean (SD)		12.3 (5.6)
Transitioned to MAT Methadone	31 (14)	
ED Length of Stay, median, (95% confidence interval)		388 (362–414)
Naloxone rescue kit provided at discharge	117 (53)	

¶ = $p = 0.42$.
¥ = $p < 0.05$.

D'Onofrio et al., but which likely mimics a more pragmatic approach to ED initiated buprenorphine induction process and referral to an MAT treatment center. Our use of APP's, including Physician Assistants and Nurse Practitioners, has not been reported in the literature previously but are a large group of practitioners who can be trained to manage buprenorphine induction patients in the ED. Since the induction process may require several hours of scheduled assessments, an APP may be a more cost effective and resource sparing approach to ED induction. This would thereby allow Attending and Resident physicians to focus on more urgent matters or critically ill patients within the department.

Additional findings that could likely represent areas of further investigation or quality improvement of our current processes included observation that our ED initiated mean doses of buprenorphine were much lower than the outpatient MAT doses. Also, with 14% of those patients being transitioned to methadone, this could represent that many of these patients could have been under treated in the ED with lower doses, and most left with continued objective signs of opioid withdrawal based on the final COWS scores. Intake and retention rates could likely be impacted by this as undertreating withdrawal symptoms in the ED may lead to the perception that our healthcare system did not adequately treat their withdrawal, thereby losing those patients to follow up due to relapse. We did identify an increase in the mean total dose over time, possibly related to an increase in familiarity and experience over the time period. Unfortunately, this increase in dosing did not lead to any difference in a change in COWS score or ED LOS. Consensus recommendations suggest that dosing of 8 to 16 mg has shown the greatest reduction in withdrawal symptoms in the ED but this is mostly based off of anecdotal evidence [11,12]. The development of a buprenorphine induction order-set or pathway within our electronic medical record system may also improve and standardize care. This would provide consistency in dosing strategies and on-going timely assessments which may improve throughput.

Limitations of our analysis include the retrospective nature of our analysis which limits our ability to gather and analyze more data variables that could lead to more efficient practices surrounding our current process. Our single center design is reflective of the pragmatic nature of current buprenorphine induction throughout the country as evidenced by the lack of published experience. This lack of generalizability should caution other centers from directly adopting our processes as we have made minor changes continuously since program inception. Also, our lack of identification or recruitment of patients willing to be induced is a major barrier to the success of such programs. Our rate of induction for all patients seen with an opioid use disorder was extremely low (0.48%), and reflects a significant area of improvement. The lack of follow up of many of these patients also limits the ability to assess reasons for not maintaining MAT center follow up and retention. This likely represents the most significant barrier to better understand ways to improve processes and how to identify and target potential candidates for induction in the ED.

Throughout our practice and process implementation, several challenges were identified that most centers would also likely encounter. Initially, providers were hesitant to provide buprenorphine induction due to lack of DATA 2000 X-waiver training and would require patients to wait in the ED in withdrawal until an x-waivered provider could see the patient. After extensive education on the Code of Federal Regulations, Part 1306.07, otherwise known as the "3-day rule", the majority of providers became comfortable with providing buprenorphine
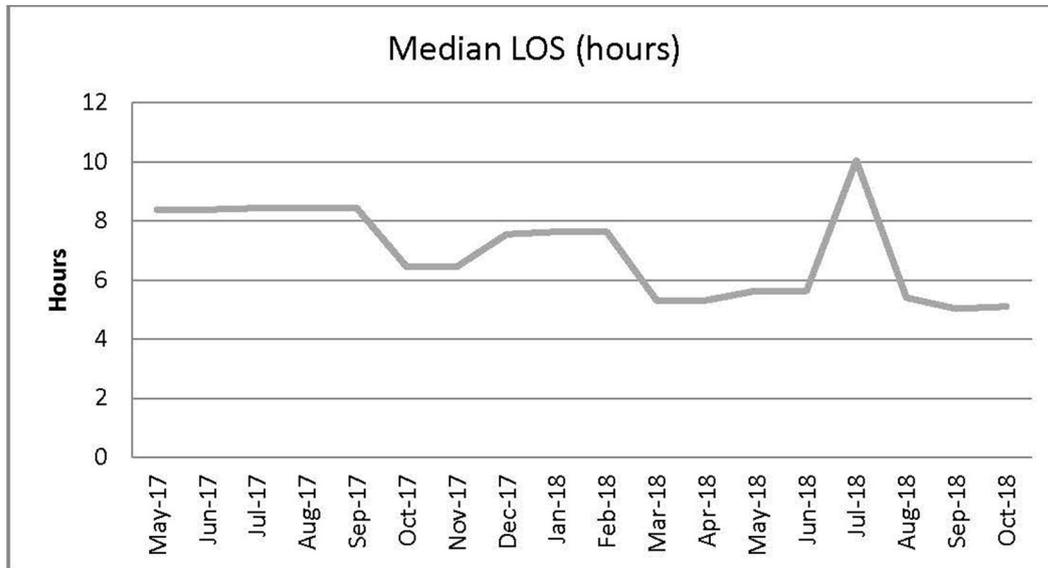

Fig. 3. Caption: Median emergency department length of stay per month.

induction regardless of their x-waiver status. Also, our initial approach to assessment of lab variables, most notably waiting for resulted urine drug screen and liver function tests, delayed initiation of buprenorphine which prolonged our LOS. We subsequently changed that practice as these labs were being collected mostly for our MAT colleagues. Additionally, our dosing approach of providing 2-4 mg to those in moderate withdrawal was likely inadequate and required several additional doses and reassessments. This could have led to an under treatment effect leaving some patients and providers feeling as though we were unsuccessful in managing the patients opioid withdrawal state.

In summary, a pragmatic approach to ED initiated buprenorphine induction and referral to treatment is effective and allows for a significant number of patients to manage their opioid addiction and maintain enrollment in MAT services. Additional variables are needed to more accurately identify ways to identify and improve processes to better serve this patient population.

Source of support

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