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Successful Engagement in Buprenorphine Treatment among Hospitalized Patients with Opioid Use Disorder and Trauma

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Abstract

Background: The opioid epidemic continues to cause significant morbidity and mortality. Although there are effective medications for opioid use disorder (OUD), a minority of patients receive these treatments. OUD is common among patients hospitalized for traumatic injury and hospitalization could be an opportunity to initiate medications and link to ongoing buprenorphine care.

Methods: This retrospective cohort study based on electronic health record review included patients who were: (1) hospitalized between January 1, 2018 and June 30, 2019, (2) age ≥18 years, (3) seen by an Addiction Medicine Consult Service, and (4) initiated on buprenorphine with plans for continuation post-discharge. Descriptive statistics identified differences between trauma and non-trauma groups and regression analysis identified predictors of 30 day buprenorphine follow up.

Results: Of 197 eligible patients, 60 (30.5%) were hospitalized for traumatic injuries. Compared to non-trauma patients, trauma patients were younger, more likely to be employed, more likely to report using cannabis and tobacco, less likely to have recently injected drugs, and hospitalized longer. Among patients with follow-up data available (n=147), 63.2% of trauma patients were seen within 30 days, compared to 48.2% of non-trauma patients (p=0.16). There were no significant

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Conflict of Interest

None of the authors have any conflict to declare

differences between the two groups with regards to urine drug test results or acute care utilization in the follow-up period.

Conclusions—Among hospitalized patients with OUD who initiate buprenorphine, those who were hospitalized for trauma were at least as likely to link to out-patient treatment. Trauma admissions represent an important opportunity for diagnosing and linking patients with OUD to buprenorphine treatment.

Keywords

opioid use disorder; trauma; buprenorphine

1. Introduction

Opioid use continues to cause significant morbidity and mortality. In 2018, opioids were involved in approximately 70% of all drug overdose deaths in the US and an estimated 2.0 million Americans aged 12 and older had an opioid use disorder (Wilson, 2020; Lipari, 2018). Medications, including buprenorphine, methadone and injectable naltrexone, are the standard of care for treatment of opioid use disorder (OUD) (Bart, 2012). However there continues to be a large gap between the number of patients who receive these medications and the number who would benefit (Lipari, 2018).

There are multiple factors that contribute to the treatment gap including stigma, lack of training and education for providers, and logistical barriers to accessing care (National Academies of Sciences, Engineering, and Medicine, 2019).We know that patients with substance use disorders (SUD) frequently utilize the healthcare system (Lewer et al., 2019), and the healthcare system could better utilize those encounters to engage patients. Specifically, SUDs are common among patients admitted to the hospital, with particularly high rates among patients hospitalized for trauma (Reece, 2008; Soderstrom, 2001).

There is a growing body of literature that supports identifying OUD in acute care settings and initiating medications for OUD (D'Onofrio et al 2017, Liebschutz 2014 et al. 2014, Wakeman et al 2017). Studies examining linkage to outpatient buprenorphine treatment from both the ED (D'Onofrio et al., 2017) and inpatient settings(Liebschutz et al., 2014; Wakeman et al., 2017) have demonstrated improved outcomes including decreased illicit opioid use and improved retention in treatment when buprenorphine is started in the acute care settings compared to treatment as usual (generally a referral or a future appointment). There is uncertainty regarding whether patients hospitalized due to trauma specifically, who are not treatment-seeking and are often experiencing moderate-severe acute pain, can be successfully engaged during hospitalization. Level 1 trauma centers are required to provide screening, brief intervention by trained staff, and a referral to treatment for alcohol use among patients hospitalized due to trauma (American College of Surgeons 2014), and screening for non-alcohol substance use is increasing. Despite this, there continues to be a lack of treatment initiation and we are not aware of any studies looking at initiating medications for the treatment of OUD specifically among patients hospitalized after a traumatic injury.

We conducted a retrospective cohort study to address the research question around initiating buprenorphine for adults with OUD during a trauma admission. Our primary aim was to compare a cohort of trauma and non-trauma hospitalized patients with OUD, determine the rate of successful outpatient buprenorphine linkage, and to define predictors of successful linkage to care. Secondary descriptors include urine toxicology results for patients who did link to outpatient care as well as frequency of hospital readmissions and ED visits.

2. Materials and Methods

This pragmatic, retrospective cohort study draws from the electronic medical records of patients hospitalized at Harborview Medical Center (HMC), a Level-1 trauma center serving a 5-state region (Washington, Wyoming, Alaska, Montana, and Idaho). An Addiction Medicine Consult Service is available to all hospitalized patients. Patients meeting the following criteria were included in the study sample: (1) hospitalized at HMC between January 1, 2018 to June 30, 2019, (2) age ≥18 years, (3) received consultation from the Addiction Medicine Consult Service, and (4) initiated buprenorphine for treatment of OUD with plans for continuation post-discharge. Patients with an existing buprenorphine prescription at the time of admission were excluded.

2.1. Demographic and clinical characteristics

Patient information was abstracted from the electronic medical record and managed using REDCap v.9.8.2 software (Nashville, TN) by two trained research assistants, with quality assurance conducted on each patient record. Data extraction included demographic characteristics (e.g., age, race/ethnicity, housing and marital status), substance use history (e.g., methamphetamine, heroin, cannabis), illicit prescription drug and buprenorphine use, history of medications for OUD prior to admission, reason for admission (trauma or non-trauma), linkage to outpatient care and hospital readmission within 30- and 90-days. Substance use history was obtained from the addiction consult notes, which generally includes a narrative with this information. Medication for OUD history included any prescribed treatments (with no specified time frame) using buprenorphine or methadone that terminated prior to admission. Trauma admissions were defined as injuries caused by moving collisions (e.g., motor vehicle, bicycle), intentional and unintentional falls, violence (e.g., firearm injury, assault), and other (e.g., burns, self-inflicted wounds).

2.2. Linkage to outpatient care and secondary outcomes

The outcome of interest was successful linkage to outpatient OUD care, defined as completing a clinic visit for buprenorphine treatment within 30-days of discharge. Secondary outcomes included urine toxicology at follow up, and acute care utilization (hospital readmission or ED visit) within 90 days.

2.3. Statistical Analysis

Differences between trauma and non-trauma admissions were assessed using the chi-square and Fisher's exact test, with t-test used to assess continuous variables. For patients who received a referral for follow-up care at HMC, we conducted a multivariable logistic

regression to identify factors associated with linkage to care within 30-days post-discharge, controlling for sex, housing status (homeless vs. not homeless), and race/ethnicity.

Statistical testing was performed using RStudio, version 1.2.5019 (RStudio, Inc.), and the level of significance was set at P < .05. All study procedures were approved by the University of Washington Institutional Review Board.

3. Results

Of 197 patients meeting inclusion criteria, 60 (30.5%) were hospitalized for traumatic injuries, which included motor vehicle crashes (40.0%), acts of violence (25.0%), falls (23.3%), and other trauma-related injuries (11.7%). Compared to non-trauma patients, trauma patients were younger (38.8 vs. 43.8 years; p<0.05), more likely to be employed (26.7% vs. 8.0%, p<0.05), more likely to report using cannabis (43.3% vs. 19.7%; p<0.001) and tobacco products (61.7% vs. 43.5%, p<0.05), less likely to have a history of injecting drugs (70.0% v. 81.8%, p<0.05), less likely to have a history of methadone treatment (21.7% v. 43.1%, p<0.05), more likely to have a longer average duration of stay in the hospital (13 days vs. 9 days, p<0.05) and were more likely to be referred to a clinic outside HMC (36.7% v. 20.4%, p<0.05) (Table 1). Among the subset of patients who were discharged with plans to follow-up at HMC (n=147), 63.2% of trauma patients completed their 30-day follow-up, compared to 48.2% of non-trauma patients (p=0.16, Table 2). There were no significant differences between the two groups with regards to urine drug tests or acute care utilization.

In an unadjusted logistic regression analysis, a one-year increase in age (OR=1.04, 95% Cl: 1.01 – 1.07) and having history of buprenorphine treatment (OR=1.97, 95% Cl: 0.99 – 3.92) had a higher likelihood of completing the 30-day follow-up appointment, while patients with a history of injecting drugs (OR=0.40, 95% Cl: 0.16 – 0.99) were less likely to complete a 30-day follow-up appointment(Table 2). More patients hospitalized for a trauma-related event completed a follow-up appointment for buprenorphine within 30-days (OR=1.84, 95% Cl: 0.86 – 3.93) though this was not statistically significant (p=0.10). In the adjusted regression analysis, age (aOR=1.05, 95% Cl: 1.01 −1.08), history of buprenorphine treatment (aOR=2.89, 95% Cl: 1.15 – 6.43) and history of injected drugs (aOR=0.26, 95% Cl: 0.08.−0.83) remain significant at the 0.05 significance level, controlling for sex, race/ethnicity and housing status. Experiencing a trauma-related hospital admission was not a statistically significant predictor of follow up (aOR=1.95; 95% CI: 0.75 – 5.11).

4. Discussion

Nearly a third of the patients who were initiated on buprenorphine by the addiction consult service in this 18-month period were patients hospitalized for trauma. Almost two thirds of the patients hospitalized due to trauma who we were able to track after discharge successfully linked to outpatient buprenorphine treatment. The successful linkage in our study is comparable to reports from other studies of linkage among hospitalized patients with OUD (Liebschutz et al., 2014; Wakeman et al., 2017), and in our logistic regression model, more patients with traumatic injuries kept a follow-up appointment after discharge, although this difference was not statistically significant. However even a “null” finding of no

significant difference between trauma and non-trauma groups could be seen as a favorable outcome given the pre-conception that trauma patients might be less likely to do well with a partial agonist in the setting of acute pain.

Reports among trauma patients are that up to 97% of patients report pain at the time of discharge, with the majority reporting moderate to severe pain (Archer et al., 2012). This may be seen as a barrier to starting buprenorphine. However it also could be framed as an opportunity. We know that acute pain can be a trigger for illicit opioid use (Alford et al., 2006). If we are able to engage patients in medications for OUD during their hospitalization, we may be able to reduce the risk of returning to use once they leave the hospital. Prolonged hospital stays also allow providers to consider a novel way of transitioning patients on to buprenorphine that does not require the patient to discontinue all full agonists and enter withdrawal before their first dose, which is typically required in a traditional buprenorphine program. Microdosing is a technique for transitioning from full agonist opioids to buprenorphine in which the patient receives a very low dose of buprenorphine and then over a period of days the dose is gradually increased to a therapeutic level. At that point, the full agonist can be stopped without a need for taper (Terasaki et al., 2019). The addiction medicine consult team in our hospital has been utilizing this technique for select patients since May 2019. Appropriate patients were those on full agonist opioids with a desire or need to change to buprenorphine, and with a known length of stay of at least a week, to provide time for the transition.

Patients with OUD who are hospitalized after a trauma may be highly motivated to stop using opioids as hospitalization has been suggested as a “reachable moment” (Pollini et al. 2006). In our cohort, patients hospitalized due to trauma were younger and significantly less likely to have had prior experience with methadone, potentially signaling that they are earlier in the course of addiction. Addiction medicine consultation in this group of non-treatment seeking patients may be an opportunity for early intervention. The overall average length of stay at Harborview Medical Center is just over 9 days, which is similar to our non-trauma group but longer than national hospital average of 5.5 days in 2019 (OECD 2020). We found that trauma patients had longer hospital stays, which may have facilitated engagement and time for discharge planning, perhaps leading to smoother transitions to outpatient care. Patients hospitalized due to trauma with severe injuries often have surgical follow up visits, which may also have increased the chances of keeping their outpatient buprenorphine visits. Forty six percent of our sample was unhoused, with no significant difference between trauma and non-trauma groups. We did adjust for housing status in our regression analysis as unstable housing could be a confounder of successful follow up.

Limitations of our study include the retrospective, pragmatic study design, using real-world data, although we attempted to adjust for potential confounders. We were unable to determine the outcomes of 24.9% of patients who were referred outside of HMC. The small sample size limited our ability to detect associations using a 0.05 significance-level. Information on substance use was gathered from clinical notes and the low percentage of documented alcohol use demonstrates this limitation as we know that the true percentage is likely significantly higher, especially among trauma related admissions where prevalence estimates have ranged from 25%−60% (Macleod 2011). . However, we also want to keep in

mind that this is not a typical trauma population; it is a group of patients with OUD who are admitted for trauma. The prevalence of unhealthy alcohol use among this specific population could make an interesting future research question. Lastly, the fact that this study was conducted at a single site with relatively low racial and ethnic diversity and with the resources of an Addiction Medicine consult service, may limit generalizability.

This study suggests that among hospitalized patients with OUD who are initiated on buprenorphine, those who were hospitalized for trauma are no less likely to successfully link to outpatient buprenorphine treatment. Substance use consultation is becoming more common in the hospital setting and our results justify robust collaborations between addiction medicine specialists and surgical teams. Given the high prevalence of OUD among patients hospitalized for trauma (and the potential to successfully link with ongoing care, we believe these findings support screening and offering medications for OUD to this patient population, as well as continued collaboration between surgical and addiction services.

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Highlights

- Nearly 1/3 of patients started on buprenorphine in the hospital were admitted for traumatic injuries
- 75% of patients had known follow up, of which 50% successfully linked to outpatient buprenorphine treatment
- Trauma patients were as likely as non-trauma patients to link to outpatient buprenorphine treatment

Table 1:

(a) Baseline characteristics of 197 patients admitted to Harborview Medical Center and initiated on buprenorphine by the Addiction Consult Service and (b) follow-up characteristics of 148 patients referred to Harborview Medical Center for follow up according to trauma status.

(a) Baseline Characteristics	**Trauma (n=60)**	**Non-Trauma (n=137)**	**Total (n=197)**	**P-value**
Mean Age (SD)	38.8 (14.0)	43.8 (12.3)	42.3 (13.0)	**0.018**
Male	42 (70.0%)	88 (64.2%)	130 (66.0%)	0.533
Race/Ethnicity				0.533
White	46 (76.7%)	102 (74.5%)	148 (75.1%)	
African American/Black	3 (7.7%)	14 (12.6%)	17 (11.3%)	
Hispanic/Latino	3 (7.7%)	11 (9.9%)	14 (9.3%)	
Other[1]	4 (10.3%)	8 (7.2%)	12 (8.0%)	
Employment status[2]				**0.003**
Employed	16 (26.7%)	11 (8.0%)	27 (13.7%)	
Unemployed	35 (58.3%)	83 (60.6%)	118 (59.9%)	
Disabled	8 (13.3%)	35 (25.5%)	43 (21.8%)	
Retired	1 (1.7%)	6 (4.4%)	7 (3.6%)	
Housing status: Unhoused[3]	27 (45.0%)	65 (47.4%)	92 (46.7%)	0.756
History of opioid prescription[4]	6 (10.0%)	9 (6.6%)	15 (7.6%)	0.398
History of illicit prescription use				
Buprenorphine	13 (21.7%)	33 (24.1%)	46 (23.4%)	0.852
Opioids[5]	6 (10.0%)	9 (6.6%)	15 (7.6%)	0.397
Current drug use				
Heroin[4]	51 (85.0%)	120 (87.6%)	171 (86.8%)	0.818
Methamphetamine	40 (66.7%)	73 (53.3%)	113 (57.4%)	0.112
Cocaine	7 (11.7%)	17 (12.4%)	24 (12.2%)	1.00
Benzodiazepine	9 (15.0%)	23 (16.8%)	32 (16.2%)	0.918
Cannabis	26 (43.3%)	27 (19.7%)	53 (26.9%)	**0.001**
Tobacco	37 (61.7%)	62 (45.3%)	99 (50.3%)	**0.049**
Alcohol	5 (8.3%)	20 (14.6%)	25 (12.7%)	0.326
History of Injection drug use[3]	42 (70.0%)	112 (81.8%)	154 (78.2%)	**0.036**
History of treatment[6]	30 (50.0%)	89 (65.0%)	119 (60.4%)	0.116
Buprenorphine[7]	22 (36.7%)	53 (38.7%)	75 (38.1%)	1.00
Methadone[8]	13 (21.7%)	59 (43.1%)	72 (36.5%)	**0.008**
Hospitalization duration,	13.0	9.00	10.0	**0.018**
median days [IQR]	[6.0, 25.5]	[4.0, 20.0]	[4.0, 22.00]	
Referral outside of clinic	22 (36.7%)	28 (20.4%)	49 (24.9%)	**0.026**
(b) Follow-up Characteristics of Patients Referred to HMC	**Trauma (n=38)**	**Non-Trauma (n=110)**	**Total (n=148)**	**P-value**
Completed 30-day follow-up	24 (63.2%)	53 (48.2%)	77 (52.0%)	0.160

(a) Baseline Characteristics	Trauma (n=60)	Non-Trauma (n=137)	Total (n=197)	P-value
Toxicology results (follow-up)[9]				
Buprenorphine[10]	19 (50.0%)	47 (42.7%)	66 (44.6%)	0.629
Non-prescribed opioids[11]	8 (21.1%)	24 (21.8%)	32 (21.6%)	0.603
Readmission Results[4]				
Hospital readmission <90 days	15 (39.5%)	58 (52.7%)	73 (49.3%)	0.222
Presentation to ED <90 days	11 (28.9%)	37 (33.6%)	48 (32.4%)	0.740

Bold p-values represent statistically significant differences at the 0.05 level

[1] Includes Asian, Native Hawaiian or Pacific Islander, American Indian and Alaska Native, and Multiracial

[2] Unknown/Missing (n=2);

[3] Unknown/Missing (n=3);

[4] Unknown/Missing (n=1);

[5] Unknown/Missing (n=4);

[6] Unknown/Missing (n=8);

[7] Unknown/Missing (n=9);

[8] Unknown/Missing (n=12);

[9] Toxicology lab results established via urine samples among participants completing 30-day follow-up (n=77)

[10] Lab results were inconclusive or undetermined (n=6);

[11] Lab results were inconclusive or undetermined (n=7);

ED=Emergency Department

Table 2:

Crude and adjusted odds ratios of successful 30 day follow up among patients referred within HMC (n=148).

Characteristic	OR (95% CI)	p-value	aOR (95% CI)[a]	p-value
Trauma status	1.84 (0.86 - 3.93)	0.100	1.95 (0.75 – 5.11)	0.172
Age	1.04 (1.01 – 1.07)	0.005	1.05 (1.01 - 1.08)	0.008
History of buprenorphine treatment	1.97 (0.99 - 3.92)	0.054	2.89 (1.15 – 6.43)	0.009
History of injection drug use	0.40 (0.16 – 0.99)	0.046	0.26 (0.08 - 0.83)	0.022

[a]Adjusted for sex, race/ethnicity and housing status