

This work was written as part of one of the author's official duties as an Employee of the United States Government and is therefore a work of the United States Government. In accordance with 17 U.S.C. 105, no copyright protection is available for such works under U.S. Law. Access to this work was provided by the University of Maryland, Baltimore County (UMBC) ScholarWorks@UMBC digital repository on the Maryland Shared Open Access (MD-SOAR) platform.

Please provide feedback

Please support the ScholarWorks@UMBC repository by emailing scholarworks-group@umbc.edu and telling us what having access to this work means to you and why it's important to you. Thank you.



Post-Discharge Treatment Engagement Among Patients with an Opioid-Use Disorder[☆]



Sarah Naeger, Ph.D., M.P.H.^{a,*}, Ryan Mutter, Ph.D.^a, Mir M. Ali, Ph.D.^a,
Tami Mark, Ph.D., MBA^b, Lauren Hughey, M.P.H.^b

^a Substance Abuse and Mental Health Services Administration, 5600 Fishers Lane, Rockville, MD 20857

^b Truven Health Analytics, 7700 Old Georgetown Road, Bethesda, MD 20814

ARTICLE INFO

Article history:

Received 18 March 2016

Received in revised form 30 June 2016

Accepted 13 July 2016

Keywords:

Post-discharge treatment

Opioid-use disorder

Patient

Opioid related hospitalization

ABSTRACT

Introduction: Opioid misuse is a growing public health problem, and estimates show a 150% increase in opioid-related hospital stays over the last two decades. This study examined factors associated with substance use treatment engagement following a hospitalization for opioid use disorder or overdose.

Methods: This study analyzed the Truven Health Analytics MarketScan® Commercial Claims and Encounters (CCAE) database for 2010 through 2014 to study post-hospitalization substance use disorder (SUD) treatment of individuals aged 18–64 who had an inpatient admission for an opioid-use disorder or opioid overdose. Engagement in post-discharge SUD treatment was defined as having at least two unique outpatient visits within 30 days of a hospitalization. Generalized estimating equations (GEEs) with a binomial link were used to determine the factors associated with SUD treatment engagement.

Results: Only 17% of patients engaged in SUD treatment within 30 days of hospital discharge. A behavioral health outpatient visit prior to the SUD admission increased the odds of engaging in SUD treatment by 1.34 (CI: 1.25–1.45), an antidepressant prescription drug fill prior to the SUD admission increased the odds by 1.14 (CI: 1.07–1.21), a benzodiazepine fill prior to the SUD admission increased the odds by 1.14 (CI: 1.07–1.21), a principal diagnosis for an SUD at index admission increased the odds by 2.13 (CI: 1.97–2.30), an alcohol-related disorder diagnosis at index admission increased the odds by 3.13 (CI: 2.87–3.42), and an additional SUD diagnosis at the index admission increased the odds by 2.72 (CI: 2.48–2.98).

Conclusions: We found low rates of SUD treatment engagement following hospitalizations for opioid use disorders and overdoses. Patients with prior engagements with behavioral health providers were more likely to engage in follow-up care; therefore, providers may need to focus additional efforts on patients admitted to the hospital with opioid-use disorders who do not have an existing provider relationship.

Published by Elsevier Inc.

1. Introduction

Misuse of and dependence on opioids are critical public health problems (Macrae, Hyde, & Slavitt, 2015). National estimates from the 2014 National Survey on Drug Use and Health (NSDUH) show that approximately 1.9 million people in the United States had a substance use disorder (SUD) related to prescription opioids and 586,000 people had an SUD related to heroin (Center for Behavioral Health Statistics and Quality, 2015). About 17,000 people die each year from prescription opioid overdoses (American Society for Addiction Medicine, 2015). The opioid epidemic has led to a significant increase in hospitalizations for

poisoning by prescription opioids, sedatives, and tranquilizers (Coben et al., 2010). Opioid-related hospitalizations increased 150% between 1993 and 2012 (Owens, Barrett, Weiss, Washington, & Kronick, 2014). In 2012, the hospitalization rate for opioid misuse was 295.6 stays per 100,000 (Owens et al., 2014).

Research shows that outpatient treatment following a hospitalization is associated with better outcomes, including reduced use of drugs and alcohol, fewer substance use problems, and lower arrest rates (e.g., Gilbert, 1988; McCarty et al., 2014; McKay, 2009; Peterson, Swindle, Phibbs, Recine, & Moos, 1994; Reif et al., 2014), and patients with an SUD who do not receive follow-up services have a much higher risk of being readmitted (Blodgett, Maisel, Fuh, Wilbourne, & Finney, 2014; McCarty et al., 2014; Reif et al., 2014). Outpatient treatment engagement has been shown to be associated with a lower two-year mortality rate among veterans (Harris et al., 2015).

Research has found that among patients who are discharged from an inpatient substance abuse detoxification stay, only half (49.4%) received follow-up mental health or substance abuse treatment within 30 days of

[☆] Disclaimer: The views expressed here are those of the authors and do not necessarily reflect the views of the Substance Abuse and Mental Health Services Administration (SAMHSA) or the U.S. Department of Health and Human Services (DHHS).

* Corresponding author.

E-mail addresses: Sarah.Naeger@samhsa.hhs.gov (S. Naeger), Ryan.mutter@samhsa.hhs.gov (R. Mutter), Mir.ali@samhsa.hhs.gov (M.M. Ali), Tami.mark@truvenhealth.com (T. Mark), lauren.hughey@truvenhealth.com (L. Hughey).

discharge (Mark, Dilonardo, Chalk, & Coffey, 2003). Smith and Mark (2014) found that in the commercially insured population, the annual percentage rate of individuals who received any outpatient treatment for a mental health disorder or SUD within 30 days of a related inpatient stay has increased steadily. In 2012, 66.1% of commercially insured patients with an inpatient stay related to substance abuse had at least one outpatient visit within 30 days of discharge (Smith & Mark, 2014). Nevertheless, a substantial percentage of patients are not receiving follow-up outpatient care even though multiple clinical guidelines recommend that patients with an SUD receive continuing care after an intensive inpatient treatment episode (American Psychiatric Association, 1995; Blodgett et al., 2014).

Factors associated with receiving follow-up care following an SUD detoxification hospitalization include being female, being in a behavioral health carve-out plan, and having lower cost-sharing requirements for an outpatient substance abuse visit (Mark et al., 2003). Harris, McKellar, Moos, Schaefer, and Cronkite (2006) examined the factors associated with months of engagement in continuing care following discharge from a residential SUD treatment program. They found that being African American, having more SUD and psychiatric symptoms, having more resources for recovery, and perceiving the treatment staff as being supportive were associated with longer engagement in continuing care. The authors also found that prior engagement with a behavioral health provider before the intensive treatment episode had a positive association with continuing care engagement (Harris et al., 2006). In their study of veterans, Timko, Gupta, Schultz, and Harris (2016) found that being black, female, younger, homeless, having fewer comorbidities, and having had prior addiction treatment were characteristics associated with follow up and transition to addiction treatment after detoxification. Building on prior research, the goal of this study was to explicitly study factors that were associated with postdischarge treatment engagement for patients hospitalized for an opioid use disorder or overdose.

2. Methods

2.1. Study sample

The study design was a retrospective analysis of the Truven Health Analytics MarketScan Commercial Claims and Encounters (CCAЕ) database for the years 2010 through 2014. This de-identified database includes insurance claims from approximately 50 million employees and dependents covered by large, self-insured employers and regional health plans annually. The MarketScan database captures all billed services, including prescription drugs, outpatient services, and inpatient services. Services for mental health disorders and SUDs that are carved out to separate management companies also are captured in the database. The MarketScan CCAЕ patient identifiers are encrypted, and the data are compliant with the Health Insurance Portability and Accountability Act of 1996 (HIPAA). Because this was a retrospective study using encrypted data, institutional review board (IRB) approval was not necessary for this study.

This study analyzed individuals aged 18–64 who had an inpatient admission for opioid use disorder or overdose between January 1, 2010 and September 30, 2014. We included only those patients who had at least 90 days of continuous enrollment before the inpatient admission and 30 days of continuous enrollment after being discharged to ensure that there was sufficient time before and after the inpatient admission to identify health care utilization patterns. If an individual had more than one inpatient admission that met the inclusion criteria in the four year study period, we selected the first admission as the index admission.

We used a broad definition to identify inpatient admissions for opioid use disorder or overdose. We included hospitalizations with one or more International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes (Centers for Disease Control

and Prevention, 2014) representing opioid abuse, dependence, poisoning, or adverse effects (304.0x, 304.7x, 305.5x, 965.0x, E850.0–E850.2, E935.0, E935.1, E935.2) in any diagnosis field (i.e., not just the principal diagnosis). We excluded hospitalizations with diagnoses of suicide and self-inflicted poisoning (E950.0–E950.5) or assault by poisoning (E962.0).

2.2. Dependent and independent measures

Currently, there is no endorsed, 30-day follow-up-after-discharge measure for SUDs specific to opioid use disorders. However, the National Committee for Quality Assurance (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS) tracks the rate of outpatient follow up within 7 or 30 days of an inpatient psychiatric discharge. The most comparable HEDIS measure for SUDs is *engagement*, which requires two outpatient SUD visits within 30 days of initiation of treatment (NCQA, 2015). We modeled our study outcome after the HEDIS engagement measure: our dependent variable was a binary variable that indicated whether the patient did or did not engage in SUD outpatient treatment after being discharged from the hospital as measured by having at least two unique outpatient visits within 30 days of discharge. To qualify as an SUD outpatient treatment visit, the engagement measures' specifications required a combination of current procedural terminology (CPT) psychiatric procedure codes and SUD ICD-9-CM diagnosis codes.

We identified the health care utilization services that patients received in the 90-day window before the index admission. These services included inpatient stays with a principal diagnosis of a physical health condition or a behavioral health condition (excluding opioid use disorders or overdoses); emergency department (ED) visits with a first-listed diagnosis for a physical health condition or a behavioral health condition; outpatient visits for a physical health condition or a behavioral health condition based on the first diagnosis on the claim; and an antidepressant, antipsychotic, benzodiazepine, or any opioid prescription fill prior to hospitalization.

Additional covariates from the index admission included the patient's age, secondary psychiatric or SUD diagnoses, secondary comorbid physical health conditions, and length of stay. In order to identify which secondary physical health conditions to control for in our model we used the MarketScan Treatment Pathways tool, which is a Web-based interface for the MarketScan data, to identify our patient sample. After defining the cohort in Treatment Pathways, we generated descriptive summaries of the most common physical health diagnoses on the index admission. Once identified, we used the multilevel Clinical Classifications Software (CCS) for ICD-9-CM from the Agency for Healthcare Research and Quality's (AHRQ) Healthcare Cost and Utilization Project (HCUP) to categorize the most frequent physical health comorbidities coded on the index admissions. We generated a binary variable indicating which patients had a principal diagnosis of an SUD on their index admission. We also included binary indicators that identified patients with a diagnosis code for an opioid overdose, or who were admitted from an ED, those who were discharged against medical advice, and those who received detoxification or rehabilitation services during their index admission.

2.3. Statistical approach

We used descriptive statistics to describe patient demographics, mental health diagnosis at index admission, and the types of services these patients received during the 90-day period prior to hospitalization. We used generalized estimating equations (GEEs) with a binomial link to measure the association between engagement in postdischarge SUD treatment and the independent variables (Ziegler, 2011). A binomial GEE model was necessary to control for patient clustering within health plans. The final adjusted model also included fixed effects for the year of the index hospitalization to account for changes in the rate of hospitalizations for opioid use disorder over time (Owens et al.,

2014). We also included a fixed effect for employee relationship (i.e., employee, spouse, or child). Employee relationship was included to control for differences in treatment-seeking behavior among employees, spouses, and their dependents. Individuals working full time may have less time for health care appointments and may also be more hesitant to seek substance use treatment due to concerns of their employer discovering their substance use.

Unadjusted and adjusted odds ratios and confidence intervals are reported. Finally, as a last step in the analysis we conducted a sensitivity check in which we ran the final adjusted model on a sample that excluded patients whose inpatient record included a diagnostic code for an opioid overdose. The results of this model were not significantly different from results of the model on the full sample (opioid use disorder and opioid overdoses), so only the findings from the full sample are presented.

Table 1
Patient, hospitalization, and prehospitalization characteristics by use of postdischarge substance use disorder treatments for patients with an inpatient admission for an opioid use disorder (N = 36,719).

Characteristic	Total sample		Postdischarge SUD treatment engagement			
	N	%	Received		Did not receive	
			N	%	N	%
All patients	36,719	100	6227	100	30,492	100
Sex: Male	21,264	57.9	3951	63.4	17,313	56.8
Age, years						
18–34	21,238	57.8	4063	65.2	17,175	56.3
35–44	5251	14.3	877	14.1	4374	14.3
45–54	5885	16.0	841	13.5	5044	16.5
55–64	4345	11.8	446	7.2	3899	12.8
SUD principal diagnosis	18,904	51.5	4485	72.0	14,419	47.3
Left hospital against medical advice	1010	2.8	83	1.3	927	3.0
Opioid overdose	4401	12.0	219	3.5	4182	13.7
Co-occurring mental health diagnoses at index admission						
Schizophrenia and psychotic disorders	916	2.5	103	1.7	813	2.7
Mood disorders	11,737	32.0	1818	29.2	9919	32.5
Anxiety disorders	4400	12.0	741	11.9	3659	12.0
Other mental health disorders	2035	5.5	321	5.2	1714	5.6
Co-occurring SUD diagnoses at index admission						
Alcohol-related disorders	6495	17.7	2276	36.6	4219	13.8
Other SUDs	20,449	55.7	4710	75.6	15,739	51.6
Co-occurring physical health diagnoses at index admission						
Nervous system disorders	4000	10.9	299	4.8	3701	12.1
Lower respiratory disease	2145	5.8	154	2.5	1991	6.5
Connective tissue disease	1898	5.2	165	2.7	1733	5.7
Suicide and intentional self-inflicted injury	2570	7.0	336	5.4	2234	7.3
Nonspecific chest pain	1520	4.1	130	2.1	1390	4.6
Gastrointestinal disorders	1266	3.4	119	1.9	1147	3.8
Respiratory infections	1052	2.9	74	1.2	978	3.2
Spondylosis, intervertebral disc disorders, and other back problems	2932	8.0	335	5.4	2597	8.5
Upper gastrointestinal disorders	1455	4.0	139	2.2	1316	4.3
Other injuries and conditions due to external causes	1009	2.7	91	1.5	918	3.0
Abdominal pain	1509	4.1	103	1.7	1406	4.6
Viral Infection	731	2.0	89	1.4	642	2.1
Admitted from an ED visit	12,582	34.3	1412	22.7	11,170	36.6
Receipt of inpatient detoxification/rehabilitation	1674	4.6	403	6.5	1271	4.2
Health care use in 90-day window prior to hospitalization						
Previous physical health inpatient stay	3184	8.7	376	6.0	2808	9.2
Previous behavioral health inpatient stay	2125	5.8	539	8.7	1586	5.2
Previous behavioral health outpatient visit	12,568	34.2	2619	42.1	9949	32.6
Previous physical health outpatient visit	29,014	79.0	4779	76.7	24,235	79.5
Previous behavioral health ED visit	3545	9.7	759	12.2	2786	9.1
Previous physical health ED visit	11,792	32.1	1920	30.8	9872	32.4
Prescription fills in 90-day window prior to hospitalization						
Antidepressant	14,296	38.9	2493	40.0	11,803	38.7
Antipsychotic	3833	10.4	692	11.1	3141	10.3
Benzodiazepine	10,090	27.5	1663	26.7	8427	27.6
Buprenorphine	4069	11.1	722	11.6	3347	11.0
Any opioid-related medication	16,870	45.9	2388	38.3	14,482	47.5
Year of index hospitalization						
2010	6740	18.4	923	14.8	5817	19.1
2011	8335	22.7	1358	21.8	6977	22.9
2012	8496	23.1	1433	23.0	7063	23.2
2013	8227	22.4	1549	24.9	6678	21.9
2014	4921	13.4	964	15.5	3957	13.0
Employee relationship						
Employee	11,490	31.3	1963	31.5	9527	31.2
Spouse	9581	26.1	1219	19.6	8362	27.4
Child	15,648	42.6	3045	48.9	12,603	41.3

Abbreviation: ED, emergency department; SUD, substance use disorder.

Source: Truven Health MarketScan Commercial Claims and Encounters Database, 2010–2014.

Table 2
Unadjusted odds ratios associated with engagement in postdischarge SUD treatment.

Characteristic	Unadjusted odds ratio	95% Confidence intervals	
		Lower	Upper
Sex: Female	0.76	0.72	0.80
Age, years			
18–34	Reference		
35–44	0.98	0.91	1.06
45–54	0.79	0.73	0.85
55–64	0.53	0.48	0.58
SUD principal diagnosis	2.87	2.70	3.05
Left hospital against medical advice	0.43	0.34	0.54
Opioid overdose	0.23	0.20	0.26
Secondary mental health diagnoses at index admission			
Schizophrenia and psychotic disorders	0.61	0.50	0.76
Mood disorders	0.86	0.81	0.91
Anxiety disorders	0.99	0.91	1.08
Other mental health disorders	0.91	0.81	1.03
Secondary SUD diagnoses at index admission			
Alcohol-related disorders	3.59	3.38	3.81
Other SUDs	2.91	2.74	3.10
Secondary physical health at index admission			
Nervous system disorders	0.37	0.32	0.41
Lower respiratory disease	0.36	0.31	0.43
Connective tissue disease	0.45	0.38	0.53
Suicide and intentional self-inflicted injury	0.72	0.64	0.81
Nonspecific chest pain	0.45	0.37	0.54
Gastrointestinal disorders	0.50	0.41	0.60
Respiratory infections	0.36	0.29	0.46
Spondylosis, intervertebral disc disorders, and other back problems	0.61	0.54	0.69
Upper gastrointestinal disorders	0.51	0.42	0.60
Other injuries and conditions due to external causes	0.48	0.38	0.59
Abdominal pain	0.35	0.28	0.43
Viral infection	0.67	0.54	0.84
Admitted from an ED visit	0.51	0.48	0.54
Average length of stay for index admission	1.02	1.02	1.02
Inpatient detoxification/rehabilitation	1.59	1.42	1.79
Health care use in 90-day window prior to hospitalization			
Previous physical health inpatient stay	0.63	0.57	0.71
Previous behavioral health inpatient stay	1.73	1.56	1.91
Previous behavioral health outpatient visit	1.50	1.42	1.58
Previous physical health outpatient visit	0.85	0.80	0.91
Previous behavioral health ED visit	1.38	1.27	1.50
Previous physical health ED visit	0.93	0.88	0.99
Prescription fills in 90-day window prior to hospitalization			
Antidepressant	1.06	1.00	1.12
Antipsychotic	1.09	1.00	1.19
Benzodiazepine	0.95	0.90	1.01
Buprenorphine	1.06	0.98	1.16
Any opioid-related medication	0.69	0.65	0.73
Year of index hospitalization			
2010	Reference		
2011	0.94	0.88	1.00
2012	0.99	0.93	1.06
2013	1.18	1.11	1.26
2014	1.23	1.14	1.33
Employee relationship			
Employee	Reference		
Spouse	0.64	0.60	0.69
Child	1.36	1.29	1.43

Abbreviation: ED, emergency department; SUD, substance use disorder.

Note: "GEE LOGIT Models (Clustering on Client); DV = SUD Engagement".

Source: Truven Health MarketScan Commercial Claims and Encounters Database, 2010–2014.

3. Results

3.1. Characteristics of the patient sample

There were 36,719 individuals with an inpatient admission who met the criteria for inclusion in this study (Table 1). More than half of patients were male (57.9%); 57.8% were between the ages of 18 and 34 years. Less than one fifth of those admitted for an opioid condition (6227, or 17.0%) engaged in SUD treatment within 30 days of being discharged from the hospital.

In the 90 days prior to hospitalization, 5.8% of the patients had a behavioral health inpatient stay, 8.7% had had a physical health inpatient stay, 34.2% had a behavioral health outpatient visit, and 79.0% had a physical health outpatient visit.

3.2. Characteristics of patients who did and did not engage in SUD treatment postdischarge

As Table 1 shows, the most substantial difference between those who did and did not engage in SUD treatment within 30 days after

Table 3
Adjusted odds ratios associated with engagement in postdischarge SUD treatment (N = 36,719).

Characteristic	Adjusted odds ratio	95% Confidence intervals	
		Lower	Upper
Sex: Female	0.94	0.88	1.00
Age, years			
18–34	Reference		
35–44	1.00	0.90	1.11
45–54	0.94	0.84	1.04
55–64	0.79	0.68	0.91
SUD principal diagnosis	2.13	1.97	2.30
Left hospital against medical advice	0.37	0.29	0.48
Opioid overdose	0.70	0.57	0.85
Secondary mental health diagnoses at index admission			
Schizophrenia and psychotic disorders	0.84	0.65	1.09
Mood disorders	1.09	1.01	1.16
Anxiety disorders	1.02	0.93	1.11
Other mental health disorders	0.84	0.65	1.09
Secondary SUD diagnoses at index admission (reference group = no SUD diagnosis on index admission)			
Alcohol-related disorders	3.13	2.87	3.42
Other SUDs	2.72	2.48	2.98
Secondary physical health at index admission			
Nervous system disorders	0.78	0.68	0.88
Lower respiratory disease	1.04	0.88	1.21
Connective tissue disease	0.84	0.71	1.00
Suicide and intentional self-inflicted injury	1.00	0.88	1.14
Nonspecific chest pain	0.88	0.73	1.06
Gastrointestinal disorders	0.87	0.73	1.03
Respiratory infections	0.74	0.60	0.92
Spondylosis, intervertebral disc disorders, and other back problems	0.91	0.80	1.04
Upper gastrointestinal disorders	0.83	0.68	1.01
Other injuries and conditions due to external causes	0.96	0.76	1.22
Abdominal pain	0.73	0.57	0.94
Viral Infection	0.88	0.67	1.16
Admitted from an emergency department visit	0.74	0.67	0.82
Average length of stay for index admission	1.00	1.00	1.01
Inpatient detoxification/rehabilitation	1.00	0.88	1.13
Health care use in 90-day window prior to hospitalization			
Previous physical health inpatient stay	0.91	0.80	1.03
Previous behavioral health inpatient stay	1.20	1.06	1.35
Previous behavioral health outpatient visit	1.34	1.25	1.45
Previous physical health outpatient visit	1.04	0.96	1.11
Previous behavioral health ED visit	0.92	0.82	1.03
Previous physical health ED visit	1.06	0.99	1.14
Prescription fills in 90-day window prior to hospitalization			
Antidepressant	1.14	1.07	1.21
Antipsychotic	0.97	0.88	1.06
Benzodiazepine	1.14	1.07	1.21
Buprenorphine	0.86	0.79	0.94
Any opioid-related medication	0.87	0.80	0.95
Year of index hospitalization			
2010	Reference		
2011	1.17	1.06	1.28
2012	1.19	1.08	1.30
2013	1.32	1.18	1.48
2014	1.34	1.19	1.51
Employee relationship			
Employee	Reference		
Spouse	0.81	0.74	0.89
Child	0.93	0.84	1.03

Abbreviation: ED, emergency department; SUD, substance use disorder.

Note: "GEE LOGIT Models (Clustering on Client); DV = SUD Engagement".

Source: Truven Health MarketScan® Commercial Claims and Encounters Database, 2010–2014.

discharge was the percentage of patients who had an SUD principal diagnosis when hospitalized. Specifically, 72.0% of those who engaged in postdischarge SUD treatment had an SUD-related principal diagnosis compared with 47.3% of those who did not. A lower percentage of patients who engaged in postdischarge SUD treatment had been admitted from an ED (22.7%) compared with 36.6% of the patients who did not engage in postdischarge SUD treatment. However, a higher percentage of patients who engaged in postdischarge SUD treatment had received a behavioral health outpatient visit prior to hospitalization (42.1%) compared with 32.6% of the patients who did not engage in postdischarge SUD treatment.

3.3. Unadjusted odds ratios associated with engagement in postdischarge SUD treatment

The unadjusted analyses indicated that having an SUD principal diagnosis (odds ratio [OR]: 2.87, confidence interval [CI]: 2.70–3.05), a secondary diagnosis for an alcohol-related disorder (OR: 3.59, CI: 3.38–3.81), or a secondary SUD diagnosis on admission (OR: 2.91, CI: 2.74–3.10) were significantly associated with higher odds of postdischarge SUD treatment engagement (Table 2). Inpatient detoxification or rehabilitation during hospitalization (OR: 1.59, CI: 1.42–1.79)

significantly increased the odds of engaging in postdischarge SUD treatment in the unadjusted model.

Previous behavioral health care up to 90 days prior to hospitalization involving an inpatient stay (OR: 1.73; CI: 1.56–1.91), an outpatient visit (OR: 1.50, CI: 1.42–1.58), or a behavioral health ED visit (OR: 1.38, CI: 1.27–1.50) was significantly associated with higher odds of postdischarge SUD treatment engagement. Patients who received prescription fills for an antidepressant (OR: 1.06, CI: 1.00–1.12), or an antipsychotic (OR: 1.09, CI: 1.00–1.19) prior to hospitalization also had higher odds of engaging in postdischarge SUD treatment.

Being admitted for an opioid overdose (OR: 0.23, CI: 0.20–0.26) was significantly associated with lower odds of postdischarge SUD treatment engagement in the unadjusted models compared to patients who were not admitted for an opioid overdose. Women (OR: 0.76, CI: 0.72–0.80), patients between 55 and 64 years of age (OR: 0.53, CI: 0.48–0.58), patients who were discharged against medical advice (OR: 0.43, CI: 0.34–0.54), or patients who were admitted from an ED (OR: 0.51, CI: 0.48–0.54) had significantly lower odds of engaging in postdischarge substance use treatment. A co-occurring diagnosis of schizophrenia or a psychotic disorder also was associated with significantly lower odds of receiving postdischarge SUD treatment (OR: 0.61, CI: 0.50–0.76). All of the physical health comorbidities; previous physical health inpatient, outpatient, or ED visits up to 90 days prior to hospitalization; or a prior prescription opioid fill were associated with lower odds of engaging in postdischarge substance use treatment.

3.4. Adjusted odds ratios associated with engagement in postdischarge SUD treatment

Table 3 shows the results of the adjusted analyses that contained all of the variables listed in the table. Prior health care involving a behavioral health outpatient visit (OR: 1.34 CI: 1.25–1.45), an antidepressant fill (OR: 1.14, CI: 1.07–1.21), or a benzodiazepine fill (OR: 1.14, CI: 1.07–1.21) were all significantly associated with higher odds of postdischarge SUD treatment engagement. As in the unadjusted models, a principal diagnosis for an SUD (OR: 2.13, CI: 1.97–2.30), a secondary diagnosis for an alcohol-related disorder at the index admission (OR: 3.13; CI: 2.87–3.42), or a secondary diagnosis for another SUD (OR: 2.72, CI: 2.48–2.98) were also significantly associated with postdischarge treatment engagement.

Other factors that remained significant in the adjusted models, reflecting decreased odds of postdischarge SUD treatment engagement, included being aged 55–64 years (OR: 0.79, CI: 0.68–0.91), leaving against medical advice (OR: 0.37, CI: 0.29–0.48), being admitted from an ED (OR: 0.74, CI: 0.67–0.82), or being admitted for an opioid overdose (OR: 0.70, CI: 0.57–0.85). Fewer prior health care treatments remained significant; however, buprenorphine fills (OR: 0.86, CI: 0.79–0.94), and prescription opioid fills (OR: 0.87, CI: 0.80–0.95) were associated with significantly lower odds of postdischarge treatment engagement.

4. Discussion

This study found that only 17% of privately insured patients who had an opioid-related hospitalization engaged in postdischarge SUD services within 30 days of their discharge. The engagement rate is lower than what has been previously reported; however, our definition of *treatment engagement* was stricter (i.e., two outpatient SUD visits rather than 1 within 30 days of discharge) (Mark et al., 2003; Smith & Mark, 2014). The NQA-endorsed measure of follow-up after discharge from the ED for mental health or alcohol or other drug dependence is one outpatient visit. The effect of using alternate definitions of treatment engagement can be a topic for future research. In our sample, we found that only 9208 (25.1%) had at least one outpatient visit for substance use, which again, is lower than other reported measures of postdischarge outpatient treatment. It should also be noted that our

sample included patients admitted for both opioid use disorders and opioid overdoses. Patients hospitalized for an opioid overdose may require a different level or type of postdischarge care which may account for differences in observed rates of postdischarge services. However, our findings do suggest that many patients who are hospitalized for opioid use disorders or overdoses are receiving limited follow-up services after discharge.

4.1. Targeting individuals at risk for not receiving treatment postdischarge

Patients had higher odds of engaging in postdischarge SUD treatment if they had a history of behavioral health outpatient visits prior to their hospitalization. This finding could be due to several factors. Patients without a behavioral health provider may face challenges in rapidly identifying an outpatient provider who is qualified to treat opioid use disorders or who is in their insurance network. Additionally, patients who have received behavioral health care prior to their hospital admission may have been able to do so because their cost sharing for outpatient services is low, thus making them more likely to obtain such treatment after they are discharged (Mark et al., 2003). Engagement with a behavioral health provider prior to the hospitalization also may be an indicator of the patient's motivation for SUD treatment, thus making the patient more likely to engage in treatment after a hospitalization. Future research should focus on understanding the nature of the association between having a behavioral health provider and postdischarge treatment engagement in order to inform the development of effective interventions.

Also of note, of the 12,568 patients that had a behavioral health outpatient visit in the 90 days prior to the hospitalization, a majority of these patients ($n = 7214$) had outpatient visits with a first-listed diagnosis for a mental health disorder rather than an SUD. This suggests that many of these patients may have been engaging in the behavioral health system for something other than their opioid use disorder prior to their index hospitalization. Given the significance of behavioral health outpatient visits prior to their hospitalization in this study, more research is needed to understand the type of behavioral health outpatient care that high-risk patients are willing to engage in or have access to prior to an event like a hospitalization.

Patients admitted with a principal diagnosis of SUD or who had a secondary diagnosis for alcohol dependence or an additional SUD on their index admission were also more likely to engage in postdischarge SUD treatment. Since we did not restrict our sample to patients with a principal diagnosis of opioid use disorder, the patients without a principal SUD diagnosis may be seeking inpatient care for physical and mental health co-morbidities or other acute conditions (Stein, 1999). The inclusion of an opioid abuse or dependence diagnosis code may be necessary to ensure appropriate clinical care (i.e. patients who disclose an opioid use disorder prior to receiving anesthesia for surgical care). These patients may not be actively seeking treatment for their opioid use disorder and their physicians may not, subsequently, be attempting to engage them in SUD treatment after discharge. However, while these patients may not be actively seeking treatment, these hospitalizations still represent a missed opportunity to intervene. Shanahan, Beers, Brigandi, and Samet (2010) developed an intervention, the Transitional Opioid Program, which used hospitalizations as a “reachable moment” to identify and link opioid-dependent patients to addiction treatment services. The Transitional Opioid Program identified “at-risk hospitalized, out-of-treatment opioid-dependent drug users” and then offered a range of treatment options at varying leveling of intensity. The success of this program indicates that patients with an opioid use disorder not actively seeking treatment can still be engaged in services with properly designed interventions.

Opioid overdose was another factor with a substantial negative effect on engaging in appropriate behavioral health care after hospitalization. Patients who had an opioid overdose had lower odds of engaging in postdischarge SUD treatment within 30 days. Some of the patients

admitted for an opioid overdose may not meet criteria for an opioid use disorder and this may account for their decreased odds of postdischarge treatment engagement. These patients may not be seeking treatment for intentional opioid misuse and therefore, the postdischarge care they require may be fundamentally different than those of patients hospitalized for an opioid use disorder. More research is needed on the risk of re-hospitalization for patients hospitalized for acute opioid overdoses and the types of follow-up services from which they may benefit.

Two additional factors that had a negative effect on the odds of SUD treatment after hospitalization were being admitted through an ED and leaving the hospital against medical advice. Similar to patients admitted for an opioid overdose, these patients may not be cases of intentional misuse and may not require the same degree of follow-up services as patients admitted for an opioid use disorder. Patients admitted through an ED visit and leaving against medical advice may also be less connected to the health care system and may, therefore, be less likely to engage in treatment following an opioid related hospitalization.

4.2. Improving postdischarge engagement in SUD treatment

Postdischarge planning is a clear point of intervention that needs to be addressed. Past research shows that targeted interventions designed to improve the transition from a hospital to outpatient care can significantly reduce readmissions (Coleman, Parry, Chalmers, & Min, 2006; Jack et al., 2009; Naylor et al., 2004). For example, Schaefer, Cronkite, and Hu (2011) found that discharge plans that included treatment referrals and scheduling of follow-up appointments prior to discharge significantly increased the amount of time patients spent in follow-up treatment. Discharge planning for patients without a previous behavioral health provider should focus on connecting patients with outpatient providers. Patients also may benefit from motivational interviewing, transportation services to and from treatment appointments, and case management to coordinate social services needs, such as housing (e.g., Swanson, Pantalon, & Cohen, 1999). Garner, Godley, Funk, Lee, and Garnick (2010) found that assigning clinicians the responsibility for initiating services was associated with greater postdischarge use of services by adolescents following residential treatment for dependence on a substance.

Other studies have also found that specific treatment modalities for other related SUDs provided in conjunction with discharge planning can also improve postdischarge engagement. Liebschutz et al. (2014) conducted a study to determine whether treatment with buprenorphine during an inpatient stay along with linkage to office-based buprenorphine opioid agonist therapy (OAT) after discharge would increase and sustain SUD treatment engagement. Patients in the treatment group received buprenorphine treatment and postdischarge treatment linkage, while patients in the control arm received a standard detoxification protocol. Patients in the buprenorphine treatment arm were significantly more likely to enter office-based buprenorphine OAT after discharge and reported lower rates of illicit opioid use in the six month postdischarge window (Liebschutz et al., 2014). D'Onofrio et al. (2015) conducted a randomized trial of the efficacy of screening and treatment referral; screening, brief intervention, facilitated treatment referral; and screening, brief intervention, and ED-initiated buprenorphine treatment with referral for 10 weeks of buprenorphine follow-up of patients seeking care in the ED. Patients in the buprenorphine treatment arm reported significantly higher levels of SUD treatment engagement and lower self-reported levels of illicit opioid use. Both of these studies indicate that early initiation of buprenorphine treatment may be an important component of interventions designed to improve SUD treatment engagement for patients with opioid abuse or dependence.

4.3. Strengths and limitations

Several study limitations should be acknowledged. First, given the nature of administrative claims data, we were unable to include information about psychosocial measures, such as motivation for treatment

and family support, which are important factors in predicting which patients are more likely to engage in postdischarge SUD treatment (Harris et al., 2006; Schaefer, Ingudomnukul, Harris, & Cronkite, 2005). Although the importance of the psychosocial measures should not be understated, there are several advantages to relying on information that can be derived from claims data. The information included in this study can be collected through patient intake forms and be made available to case managers for discharge planning without any additional data collection efforts. Second, since our outcome was defined as outpatient care, we did not explicitly examine other potential services, such as re-hospitalization or residential services, which patients could also receive in the 30 day postdischarge period. For example, in our sample 19% (n = 1186) of the patients who engaged in SUD treatment had an opioid related re-hospitalization within 30 days of discharge and 13.3% of patients (n = 4060) who did not engage in SUD treatment were also re-hospitalized. The higher rate of re-hospitalizations in the SUD treatment engagement group may be an indication of severity, which is typically difficult to measure in claims data. Future research on postdischarge treatment engagement should incorporate measures of disease severity as well as the full continuum of follow-up services that patients receive in the post-discharge period.

Two comments on the generalizability of these results should be noted. First, the study assessed behavioral health service utilization in a commercially insured population; therefore, interpretations about how utilization rates and access to behavioral health services would influence SUD treatment engagement in a Medicaid population should be made with caution. Second, we limited our study to patients hospitalized for opioid use disorders and overdoses. It is likely that the associations we observed in this study will generalize to patients hospitalized with other SUDs, but this is yet to be determined.

4.4. Conclusions

In summary, we found low rates of substance use treatment engagement following hospitalizations for opioid use disorder and overdoses. Encouraging successful transitions from inpatient care to less intensive outpatient care is a key component of integrated substance use care. Previous research has shown that patients who receive follow-up services after an inpatient stay are at lower risk of being re-admitted and generally have more positive treatment outcomes. We found that patients who had a behavioral health provider prior to the hospitalization are more likely to engage in follow-up care. Future research should focus on developing interventions that successfully link patients with an SUD to appropriate outpatient providers. The findings from this study and future studies can inform the treatment services that will sustain long-term recovery of patients with SUD.

References

- American Psychiatric Association (1995). Practice guidelines for the treatment of patients with substance use disorders: Alcohol, cocaine, opioids. *American Journal of Psychiatry*, 152(11 Suppl), 1–59.
- American Society of Addiction Medicine (2015). Opioid addiction disease: 2015 facts & figures. Retrieved from <http://www.asam.org/docs/default-source/advocacy/opioid-addiction-disease-facts-figures.pdf>
- Blodgett, J.C., Maisel, N.C., Fuh, I.L., Wilbourne, P.L., & Finney, J.W. (2014). How effective is continuing care for substance use disorders? A meta-analytic review. *Journal of Substance Abuse Treatment*, 46(2), 87–97.
- Center for Behavioral Health Statistics and Quality (2015). Behavioral health trends in the United States: Results from the 2014 National Survey on drug use and health (HHS publication no. SMA 15-4927, NSDUH series H-50). Retrieved from <http://www.samhsa.gov/data>
- Centers for Disease Control and Prevention (2014). *International classification of diseases, ninth revision, clinical modification (ICD-9-CM)*. Atlanta, GA: Author.
- Coben, J.H., Davis, S.M., Furbee, P.M., Sikora, R.D., Tillotson, R.D., & Bossarte, R.M. (2010). Hospitalizations for poisoning by prescription opioids, sedatives, and tranquilizers. *American Journal of Preventive Medicine*, 38(5), 517–524.
- Coleman, E.A., Parry, C., Chalmers, S., & Min, S.J. (2006). The care transitions intervention: Results of a randomized controlled trial. *Archives of Internal Medicine*, 166(17), 1822–1828.

- D'Onofrio, G., O'Connor, P.G., Pantalon, M.V., Chawarski, M.C., Busch, S.H., Owens, P.H., & Fiellin, D.A. (2015). Emergency department-initiated buprenorphine/naloxone treatment for opioid dependence: A randomized clinical trial. *JAMA*, 313(16), 1636–1644.
- Garner, B.R., Godley, M.D., Funk, R.R., Lee, M.T., & Garnick, D.W. (2010). The Washington circle continuity of care performance measure: Predictive validity with adolescents discharged from residential treatment. *Journal of Substance Abuse Treatment*, 38(1), 3–11.
- Gilbert, F.S. (1988). The effect of type of aftercare follow-up on treatment outcome among alcoholics. *Journal of Studies on Alcohol*, 49(2), 149–159.
- Harris, A.H., Gupta, S., Bowe, T., Ellerbe, L.S., Phelps, T.E., Rubinsky, A.D., & Trafton, J. (2015). Predictive validity of two process-of-care quality measures for residential substance use disorder treatment. *Addiction Science & Clinical Practice*, 10(1), 1.
- Harris, A.H., McKellar, J.D., Moos, R.H., Schaefer, J.A., & Cronkite, R.C. (2006). Predictors of engagement in continuing care following residential substance use disorder treatment. *Drug and Alcohol Dependence*, 84(1), 93–101.
- Jack, B.W., Chetty, V.K., Anthony, D., Greenwald, J.L., Sanchez, G.M., Johnson, A.E., & Culpepper, L. (2009). A reengineered hospital discharge program to decrease re-hospitalization: A randomized trial. *Annals of Internal Medicine*, 150(3), 178–187.
- Liebschutz, J.M., Crooks, D., Herman, D., Anderson, B., Tsui, J., Meshesha, L.Z., & Stein, M. (2014). Buprenorphine treatment for hospitalized, opioid-dependent patients: A randomized clinical trial. *JAMA Internal Medicine*, 174(8), 1369–1376.
- Macrae, J., Hyde, P., & Slavitt, A. (2015). *HHS launches multi-pronged effort to combat opioid abuse*. Washington, DC: U.S. Department of Health and Human Services Retrieved from <http://www.hhs.gov/blog/2015/07/27/hhs-launches-multi-pronged-effort-combat-opioid-abuse.html>.
- Mark, T.L., Dilonardo, J.D., Chalk, M., & Coffey, R. (2003). Factors associated with the receipt of treatment following detoxification. *Journal of Substance Abuse Treatment*, 24(4), 299–304.
- McCarty, D., Braude, L., Lyman, D.R., Dougherty, R.H., Daniels, A.S., Ghose, S.S., & Delphin-Rittmon, M.E. (2014). Substance abuse intensive outpatient programs: Assessing the evidence. *Psychiatric Services*, 65(6), 718–726.
- McKay, J.R. (2009). Continuing care research: What we have learned and where we are going? *Journal of Substance Abuse Treatment*, 36(2), 131–145.
- National Committee for Quality Assurance (2015). *NCQA healthcare effectiveness data and information set (HEDIS)*.
- Naylor, M.D., Brooten, D.A., Campbell, R.L., Maislin, G., McCauley, K.M., & Schwartz, J.S. (2004). Transitional care of older adults hospitalized with heart failure: A randomized, controlled trial. *Journal of the American Geriatric Society*, 52(5), 675–684.
- Owens, P.L., Barrett, M.L., Weiss, A.J., Washington, R.E., & Kronick, R. (2014). Hospital inpatient utilization related to opioid overuse among adults, 1993–2012. *HCUP statistical brief #177*. Rockville, MD: Agency for Healthcare Research and Quality Retrieved from <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb177-Hospitalizations-for-Opioid-Overuse.pdf>.
- Peterson, K.A., Swindle, R.W., Phibbs, C.S., Recine, B., & Moos, R.H. (1994). Determinants of re-admission following inpatient substance abuse treatment: A National Study of VA programs. *Medical Care*, 32(6), 535–550.
- Reif, S., George, P., Braude, L., Dougherty, R.H., Daniels, A.S., Ghose, S.S., & Delphin-Rittmon, M.E. (2014). Residential treatment for individuals with substance use disorders: Assessing the evidence. *Psychiatric Services*, 65(3), 301–312.
- Schaefer, J.A., Cronkite, R.C., & Hu, K.U. (2011). Differential relationships between continuity of care practices, engagement in continuing care, and abstinence among subgroups of patients with substance use and psychiatric disorders. *Journal of Studies on Alcohol and Drugs*, 72(4), 611–621.
- Schaefer, J.A., Ingudomnukul, E., Harris, A.H., & Cronkite, R.C. (2005). Continuity of care practices and substance use disorder patient's engagement in continuing outpatient care. *Medical Care*, 43(12), 1234–1242.
- Shanahan, C.W., Beers, D., Alford, D.P., Brigandi, E., & Samet, J.H. (2010). A transitional opioid program to engage hospitalized drug users. *Journal of General Internal Medicine*, 25(8), 803–808.
- Smith, M.W., & Mark, T.L. (2014). Follow-up encounters within 30 days of a substance-abuse-related inpatient discharge. *Psychiatric Services*, 65(9), 1080.
- Stein, M.D. (1999). Medical consequences of substance abuse. *Psychiatric Clinics of North America*, 22(2), 351–370.
- Swanson, A.J., Pantalon, M.V., & Cohen, K.R. (1999). Motivational interviewing and treatment adherence among psychiatric and dually diagnosed patients. *The Journal of Nervous and Mental Disease*, 187(10), 630–635.
- Timko, C., Gupta, S., Schultz, N., & Harris, A.H. (2016). Veterans' service utilization patterns after alcohol and opioid detoxification in VHA care. *Psychiatric Services*.
- Ziegler, A. (2011). *Generalized estimating equations*. New York, NY: Springer.