



Published in final edited form as:

*JAMA Pediatr.* 2018 November 01; 172(11): 1029–1037. doi:10.1001/jamapediatrics.2018.2143.

## Receipt of Recommended Medications and Retention in Care Among Youth with Opioid Use Disorder: A Multistate Study

Scott E. Hadland, MD, MPH, MS<sup>1,2</sup>, Sarah M. Bagley, MD, MSc<sup>1,2,3</sup>, Jonathan Rodean, MPP<sup>4</sup>, Michael Silverstein, MD, MPH<sup>1</sup>, Sharon Levy, MD, MPH<sup>5</sup>, Marc R. Laroche, MD, MPH<sup>2,3</sup>, Jeffrey H. Samet, MD, MA, MPH<sup>2,3</sup>, and Bonnie T. Zima, MD, MPH<sup>6</sup>

<sup>1</sup>Boston University School of Medicine, Division of General Pediatrics, Department of Pediatrics, 88 East Newton Street, Vose Hall Room 322, Boston, MA, 02118

<sup>2</sup>Grayken Center for Addiction, Boston Medical Center, One Boston Medical Center Place, Boston, MA, 02118

<sup>3</sup>Section of General Internal Medicine, Department of Medicine, Boston University School of Medicine, 801 Massachusetts Avenue, Boston, MA, 02118

<sup>4</sup>Children's Hospital Association, 16011 College Boulevard, Lenexa, KS, 66219

<sup>5</sup>Adolescent Substance Use and Addictions Program, Division of Developmental Medicine, Boston Children's Hospital, 300 Longwood Avenue, Boston, MA, 02115

<sup>6</sup>UCLA Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, 10920 Wilshire Boulevard #300, Los Angeles, CA 90024

### Abstract

**Importance:** Retention in care for individuals with opioid use disorder (OUD) is one of the single greatest predictors of reduced mortality. Although clinical trials support use of OUD medications among adolescents and young adults (“youth”), data on timely receipt of buprenorphine, naltrexone, and methadone and its association with retention in care in real-world treatment settings are lacking.

**Objective:** To identify the proportion of youth who receive timely addiction treatment, and to determine whether timely receipt of OUD medications is associated with retention in care.

**Design:** Retrospective cohort.

---

**Send correspondence to:** Scott E. Hadland MD, MPH, MS, Department of Pediatrics, Boston University School of Medicine, Grayken Center for Addiction, Boston Medical Center, 88 East Newton Street, Vose Hall, Room 322, Boston, MA, 02118, **Phone:** 617-414-3681, **Fax:** 617-414-3679, scott.hadland@bmc.org.

Contributors:

Dr. Hadland and Mr. Rodean had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Drs. Hadland and Zima designed the study and wrote the protocol for analysis with additional input from Drs. Bagley, Silverstein, Levy, Laroche and Samet. Mr. Rodean undertook data management and conducted statistical analyses with input from Drs. Hadland and Zima. Dr. Hadland conducted the literature review and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest Statement

The authors have no conflicts of interest to disclose.

**Setting:** Enrollment and complete health insurance claims of 2.4 million Medicaid-enrolled youth from 11 states, January 1, 2014 to December 31, 2015.

**Participants:** Youth of age 13–22 years diagnosed with OUD.

**Exposures:** Receipt of OUD medication (buprenorphine, naltrexone, or methadone) within three months of diagnosis, compared to receipt of behavioral health services alone.

**Main Outcome and Measures:** Retention in care, with attrition defined as 60 days without any treatment-related claims.

**Results:** Among 4,837 youth diagnosed with OUD, 56.9% were female and 76.0% were non-Hispanic white. Median age was 20 years (interquartile range [IQR], 19–22). Overall, 3,654 (75.5%) youth received any treatment within three months. Most received only behavioral health services ( $n=2,515$ ; 52.0%), with fewer receiving OUD medications ( $n=1,139$ ; 23.5%). Only 4.7% (95% confidence interval [CI], 3.1–6.2%) of adolescents <18 years and 24.7% (95% CI, 23.4–26.0%) of young adults 18 years received timely OUD medications. Median retention in care among youth who received timely buprenorphine, naltrexone, or methadone was 123 days (IQR, 33–434), 150 days (IQR, 50–670), and 324 days (IQR, 115–670), respectively, compared to 67 days (IQR, 14–206) among youth who received only behavioral health services. Timely receipt of buprenorphine (adjusted hazard ratio [aHR], 0.58; 95% CI, 0.52–0.64), naltrexone (aHR, 0.54; 95% CI, 0.43–0.69), and methadone (aHR, 0.32; 95% CI, 0.22–0.47) were each independently associated with lower attrition from treatment compared to receiving behavioral health services alone.

**Conclusions and Relevance:** Timely receipt of buprenorphine, naltrexone, or methadone is associated with greater retention in care among youth with OUD. Strategies to address the underutilization of evidence-based medications for youth are urgently needed.

## Keywords

buprenorphine; naltrexone; methadone; adolescent; young adult; opioid-related disorders

## INTRODUCTION

As the US confronts the opioid crisis, morbidity and mortality for adolescents and young adults (collectively, “youth”) continues to rise. Overdose deaths, hospitalizations for nonfatal overdose, and diagnoses of opioid use disorder (OUD) among youth have increased sharply since the early 2000s.<sup>1–4</sup> Multiple major professional organizations and government bodies recommend providing youth of any age effective treatment as early as possible, including use of OUD medications buprenorphine, naltrexone, or methadone.<sup>5–8</sup> Despite these evidence-based recommendations, youth are only one-tenth as likely as adults to receive medication,<sup>1,9</sup> likely owing to poor availability of pediatric prescribers, provider discomfort with medications, and stigma surrounding medication treatment.<sup>10,11</sup> Even when youth receive medications, it is often only after providers have first exhausted other non-pharmacologic treatment options, such as behavioral health services.<sup>1,9,11</sup>

Ensuring timely treatment with OUD medications may be especially important in light of data showing that adults who receive medications are more likely to be retained in addiction

treatment.<sup>12–14</sup> Since living with addiction can be a lifelong process that involves cycles of relapse and recovery, maximizing retention in care is a central strategy in the pursuit of decreased mortality among individuals with OUD.<sup>15,16</sup> In longitudinal cohort studies of adults who have initiated OUD treatment, all-cause mortality when an individual is in treatment is less than half that observed after discontinuing treatment.<sup>15</sup> Since attrition from OUD treatment is greater for youth than it is for adults, strategies to prevent youth from leaving care are urgently needed.<sup>17–20</sup> Small randomized controlled trials (RCTs) show that, under experimental conditions, youth who receive medication treatment are more likely to be retained in treatment up to 12 weeks.<sup>20–22</sup> However, we know of no large studies with follow-up beyond this timeframe, or studies that have used data from real-world treatment settings.

Using an 11-state sample of Medicaid-enrolled youth with OUD, we sought to identify: (1) the frequency with which youth who present to care for OUD receive timely addiction treatment, including behavioral health services and/or OUD medications; and (2) the association between timely receipt of OUD medications and subsequent retention in care. We hypothesized that timely receipt of buprenorphine, naltrexone, or methadone would predict longer retention in addiction treatment.

## METHODS

### Study Design and Sample

A retrospective cohort study was conducted using the 2014–2015 Truven-IBM Watson Health MarketScan Medicaid Database. These data included 2,490,114 youth of age 13 to 22 years with at least six months of continuous enrollment and all associated inpatient, outpatient, emergency department, behavioral health, and retail prescription drug claims between January 1, 2014 and December 31, 2015. Data were collected from 11 de-identified states representing all census regions of the US. The study was not considered human subjects research by the Boston University School of Medicine Institutional Review Board.

To generate the study sample, the following eligibility criteria were applied to identify all youth initiating a new episode of care for OUD: (i) primary or secondary diagnosis of OUD using *International Classification of Diseases, Ninth Revision (ICD-9)* codes 304.0x (“Opioid type dependence”) and 304.7x (“Combinations of opioid type drug with any other drug dependence”) in at least one inpatient or emergency department claim or two outpatient claims;<sup>1,23</sup> (ii) prior to diagnosis, a 60-day period without another OUD diagnosis or receipt of buprenorphine, methadone, or naltrexone;<sup>1,23,24</sup> and (iii) at least three months of enrollment data after diagnosis (eFigure 1).<sup>1,23</sup> We defined the date of the first observed OUD diagnosis as the start of the episode of care. Data from the first observed episode of care for OUD were included in analyses; any subsequent episodes of care were excluded.

### Variables

Timely addiction treatment was defined as receipt of (i) behavioral health services and/or (ii) OUD medication (buprenorphine, naltrexone, or methadone) within three months of diagnosis. The three-month window was selected based on prior research;<sup>1,23</sup> sensitivity

analyses also examined receipt of addiction treatment within one, two, six, nine, and 12 months of diagnosis. Behavioral health services were identified using claims for individual outpatient, group outpatient, intensive outpatient, partial hospitalization, residential, and inpatient treatment based on Current Procedural Terminology (CPT) and Healthcare Common Procedure Coding System (HCPCS) codes (eTable 1).<sup>25,26</sup> Receipt of each of the three OUD medications was identified as follows: buprenorphine, using pharmacy claims that included a National Drug Code (NDC) for sublingual buprenorphine or buprenorphine/naloxone;<sup>1,23</sup> methadone, using HCPCS code H0020 (“Methadone administration and/or service”);<sup>27,28</sup> and naltrexone, using pharmacy claims that included an NDC for oral or long-acting injectable naltrexone and using HCPCS code J2315 (“Naltrexone, depot form”) (eTable 2).<sup>1</sup>

Retention in care was defined as time from receipt of first addiction treatment (either behavioral health services or OUD medication) to time of treatment discontinuation. An individual was considered to have discontinued treatment if at least 60 days passed without a claim for behavioral health services or OUD medication. The date of treatment discontinuation was defined as the last date of any qualifying claim. Youth were censored if they disenrolled from their insurance plan.

Sociodemographic covariates included: age of diagnosis, sex, race/ethnicity, and Medicaid eligibility (disability or income). Clinical covariates included (at the time of diagnosis or during the preceding three months): pregnancy, depression, anxiety disorder, attention deficit hyperactivity disorder (ADHD), alcohol use disorder, other substance use disorder, acute pain condition, or chronic pain condition based on ICD-9 diagnosis codes (eTable 3).<sup>29–32</sup> Covariates were selected based on their established association with OUD and potential influences on treatment and retention in care.<sup>1,5,6,9,33</sup>

### Statistical Analysis

Sociodemographic and clinical characteristics associated with receipt of any timely addiction treatment were identified using multivariable logistic regression. Among youth who received timely addiction treatment, a subsequent model examined characteristics associated with receipt of OUD medication (with or without behavioral health services) compared to receipt of behavioral health services alone. Multivariable models included all sociodemographic and clinical covariates. Characteristics of youth receiving each of the three OUD medications were compared using chi-square tests or Fisher’s exact test.

The Kaplan-Meier method was then used to measure retention in care among youth who received timely OUD medications as compared to youth who received only behavioral health services. Since the exposure of interest (timely receipt of OUD medication) was a subset of the outcome (ongoing receipt of behavioral health services and/or OUD medication), a separate Kaplan-Meier curve examined the outcome of retention in behavioral health services alone. Multivariable Cox proportional hazards regression was then used to identify the association of receiving timely OUD medications with retention in care. Some youth had an initial claim for addiction treatment but did not receive any subsequent services, which resulted in violation of the proportional hazards assumption of Cox regression.<sup>34</sup> The analysis was therefore limited to youth who had at least one

subsequent claim after their initial claim; potential differences in sociodemographic and clinical characteristics between youth with and without subsequent claims were identified using multivariable logistic regression. Models examined retention in care in relation to the initial OUD medication used (buprenorphine, naltrexone, methadone, or none), and were adjusted for receipt of higher levels of behavioral health care (intensive outpatient treatment, partial hospitalization, residential care, or inpatient care),<sup>25</sup> as well as all sociodemographic and clinical characteristics.

Analyses were conducted using SAS Version 9.4 (SAS Institute Inc., Cary, NC). All statistical tests were two-sided and considered significant at  $p < 0.05$ .

## RESULTS

### Sample

The data included 2,483,250 Medicaid-enrolled youth of age 13–22 years, among whom 4,837 (0.2%) initiated a new episode of care for OUD and thus met sample inclusion criteria. Median age of diagnosis was 20 (interquartile range [IQR], 19–21) years. Youth were 56.9% female and 76.0% non-Hispanic white. Females comprised 40.6% ( $n=67$ ) of 13- to 15-year-olds with OUD, 41.4% ( $n=233$ ) of 16- and 17-year-olds with OUD, 55.8% ( $n=1,030$ ) of 18- to 20-year-olds with OUD; and 62.8% ( $n=1,422$ ) of 21- and 22-year-olds with OUD. Overall, 28.0% ( $n=773$ ) of all females were pregnant at the time of OUD diagnosis or in the preceding three months.

### Timely Addiction Treatment

Overall, 3,654 (75.5%) youth received any timely addiction treatment (Table 1). The percentage receiving any treatment did not differ significantly between adolescents <18 years (76.1%; 95% confidence interval [CI], 73.0%–79.2%) and young adults ≥18 years (73.7%; 95% CI, 72.4%–75.1%). The majority of the 3,654 youth receiving timely addiction treatment received behavioral health services ( $n=3,238$ ; 88.6%), either alone or in combination with OUD medications. Of youth receiving any behavioral health services, 872 (26.9%) received intensive outpatient treatment or partial hospitalization, and 1,664 (51.4%) received residential or inpatient care. The remaining 702 (21.7%) received outpatient care only.

Only a minority of youth received timely buprenorphine, naltrexone, or methadone ( $n=1,139$ ; 23.5%) (Table 2). Overall, 4.7% (95% CI, 3.1–6.2%) of adolescents received OUD medications as compared to 24.7% (95% CI, 23.4–26.0%) of young adults. Most of the 1,139 youth who received medication also received concurrent behavioral health services ( $n=723$ ; 63.5%). Most youth who received an OUD medication received it within one month of diagnosis (eTable 4).

Of the 1,139 youth who received timely OUD medications, 936 (82.1%) received buprenorphine, 135 (11.9%) received naltrexone, and 68 (6.0%) received methadone (eTable 5). Adolescents were more likely to receive naltrexone than young adults (35.3% vs. 11.1%;  $p < 0.001$  for group difference). No adolescents received methadone.

## Retention in Care

The 3,654 youth who received any treatment contributed 13,185 person-months of follow-up. Overall, 2,575 (70.5%) youth discontinued treatment (crude incidence density, 19.5 discontinuing events per 100 person-months). Youth who received timely OUD medications were more likely to be retained in any addiction treatment and more likely to be retained in behavioral health services (Figure 1).

Median retention in care among youth who received only behavioral health services was shorter (67 days; IQR, 14–206) than among youth who received timely buprenorphine (123 days; IQR, 33–434), naltrexone (150 days; IQR, 50–670), or methadone (324 days; IQR, 115–670). Similarly, median duration of behavioral health services among youth who did not receive timely OUD medications was shorter (65 days; IQR, 13–204) than among youth who received timely buprenorphine (108 days; IQR, 34–290), naltrexone (152 days; IQR, 55–670), or methadone (217 days; IQR, 41–354).

Of the 3,654 youth who received any timely addiction treatment, 3,247 (88.9%) met criteria for inclusion in the Cox regression analysis of retention in care (i.e., had at least one subsequent claim for behavioral health services or an OUD medication); the remaining 407 (11.1%) youth were excluded to satisfy the proportional hazards assumption of Cox regression. Included youth were more likely than excluded youth to be pregnant (aOR, 1.55; 95% CI, 1.10–2.18); have received intensive outpatient treatment, partial hospitalization, residential, or inpatient behavioral health services (aOR, 2.39; 95% CI, 1.86–3.08); have received buprenorphine (aOR, 1.35; 95% CI, 1.04–1.74); or have received methadone (aOR, 5.22; 95% CI, 1.26–21.5). Of included youth, 97 (2.9%) youth had claims for detoxification services. Of the 3,238 youth who had an initial behavioral health claim, 2,885 (89.1%) had a subsequent claim.

Compared to youth who received only behavioral health services, youth who received timely buprenorphine, naltrexone, and methadone were 42% (95% CI, 36–48%), 46% (95% CI, 31–57%), and 68% (95% CI, 53–78%) less likely, respectively, to discontinue addiction treatment, and were 27% (95% CI, 18–36%), 43% (95% CI, 27–56%), and 53% (95% CI, 32–67%) less likely, respectively, to discontinue behavioral health services (Table 3).

## DISCUSSION

In this multistate study of addiction treatment and retention in care, we found that three-quarters of youth diagnosed with OUD received timely treatment within three months. However, most treatment included behavioral health services only, and fewer than one in four received timely buprenorphine, naltrexone, or methadone. A marked difference was observed by age, with only 4.7% of adolescents receiving an OUD medication, compared to 24.7% of young adults. Receipt of each of the three OUD medications was independently associated with enhanced retention. Youth receiving buprenorphine, naltrexone, and methadone were 42%, 46%, and 68% less likely, respectively, to discontinue treatment during the follow-up period compared to youth who received only behavioral health services.

Retention in care is critical to successful addiction treatment and is increasingly being adopted as a quality measure.<sup>26,35–40</sup> In treatment protocols and clinical trials, eliminating or reducing substance use has traditionally been the primary endpoint.<sup>41</sup> However, the rise in overdose mortality and the recognition that addiction is a chronic, relapsing condition have prompted clinicians, researchers, and policymakers to increasingly focus on retention in care.<sup>6,41</sup> Even when patients do not reduce their substance use, individuals engaged and retained in care can receive harm reduction services and treatment of comorbid medical and psychiatric conditions.<sup>42–44</sup> The advantage of this approach is supported by a recent large meta-analysis, which found that among adults, remaining in treatment is associated with substantially reduced all-cause and overdose mortality.<sup>15</sup>

Our findings reveal a critical gap in quality of care for youth, with only a minority who come to medical attention receiving the evidence-based OUD medications recommended by multiple national treatment guidelines.<sup>5–8</sup> Furthermore, this poor deployment of timely OUD medication may place youth at risk for early treatment discontinuation. Our results build on the findings of the only three RCTs of OUD medications among youth conducted to date. These RCTs showed improved treatment outcomes – including short-term enhanced retention in care – among youth who received buprenorphine under experimental conditions.<sup>20–22</sup> We found that not only buprenorphine, but also naltrexone and methadone, when provided in real-world treatment settings, are associated with enhanced retention in care compared to behavioral health services alone. Since clinical follow-up in youth RCTs to date has only ranged from 28 days to 12 weeks,<sup>20,21</sup> our results also suggest that OUD medications may contribute to enhanced retention in care persisting well beyond the timeframes previously studied.

Strategies to enhance access to OUD medications for youth are urgently needed.<sup>1,9,45</sup> Our study sample included only youth who presented to medical attention, a group comprising only a minority of the true population of youth with OUD.<sup>6</sup> Youth encounter substantial barriers to accessing OUD medications, including insufficient pediatric prescribers, poor familiarity with medications among providers, systemic barriers to accessing methadone, and stigma surrounding medication use.<sup>1,9–11</sup> At many treatment programs, youth may be denied OUD medications due to their younger age, or paradoxically if they are receiving an OUD medication prescribed elsewhere, use of medications may preclude entry into treatment.<sup>11</sup> As of January 2018, the Substance Abuse and Mental Health Services Administration Treatment Locator lists 1,765 addiction treatment programs for adolescents or young adults, among which only 37% prescribe OUD medications – and of the remaining programs, 43% deny admission to youth receiving medications prescribed elsewhere.<sup>46</sup> Our findings suggest that the practice of limiting access to OUD medications for youth may be detrimental for addiction treatment programs, since receipt of medication is associated with enhanced retention in care.

Critically, we observed differences by race in access to OUD medications. In one recent study of youth with private health insurance, black youth were 42% less likely to receive buprenorphine or naltrexone for OUD compared to white youth,<sup>1</sup> which is consistent with our finding that black youth were 59% less likely to receive OUD medications. Importantly, we did not observe any differences in retention in care according to race after controlling for

receipt of medications. Therefore, amidst national efforts to expand access to evidence-based treatment, it is crucial that policymakers address the national treatment gap in a way that improves, rather than exacerbates, the disparities that we observed.

There are several limitations to this study. First, due to the observational nature of our study, we are unable to conclusively determine whether the enhanced retention in care we observed was due to the OUD medications themselves, or to the clinical systems in which they were provided. For example, methadone is typically administered in a setting with strict rules and regulations that may promote greater adherence for patients who receive such treatment.<sup>47</sup> Similarly, provision of evidence-based medications such as buprenorphine or naltrexone could be more common in treatment centers with higher quality standards.<sup>38,39</sup> Second, we found that behavioral health services alone were associated with poorer retention in care than OUD medication treatment, but the behavioral health services we included were diverse. Although we adjusted for level of care, we cannot exclude the possibility that some behavioral health services may have been highly effective but were categorized with less effective behavioral health services.

Third, although we adjusted for sociodemographic and clinical characteristics of youth, we cannot exclude the potential influence of unmeasured confounders. In particular, given the administrative nature of the data, we were unable to adjust for OUD disease severity, and youth with more severe OUD may have been more likely to receive medication as well as added resources to maximize retention. Fourth, we were unable to identify buprenorphine used in detoxification settings, which, when rapidly tapered, may be associated with poorer retention in care compared to longer term buprenorphine maintenance treatment.<sup>20</sup> Since only 2.9% of youth received detoxification services in the study sample, this potential limitation is unlikely to have had a substantial impact on the effect sizes we observed.

To our knowledge, this is the first large study to examine receipt of each of the three evidence-based OUD medications among youth. We are also unaware of other large studies that have examined retention in care in relation to timely OUD medication treatment for youth. The finding that medications were provided to only approximately one in four youth presenting for care overall – including only one in 21 adolescents – highlights a crucial potential opportunity to improve OUD care and enhance retention in treatment. As overdose deaths mount among US youth, it is vital that clinicians, researchers and policymakers ensure that access to evidence-based OUD medications for young people remains a national priority.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgements

We would like to thank Dr. Jason Vassy, MD, MPH, SM for his review of the manuscript.

Role of Funding Source



Dr. Hadland was supported by the Thrasher Research Fund Early Career Award, the Academic Pediatric Association Young Investigator Award, and L40 DA042434 (NIH/NIDA). Dr. Bagley was supported by K23 DA044324 (NIH/NIDA). Dr. Silverstein was supported by K24 HD081057 (NIH/NICHD). Dr. Larochelle was supported by K23 DA042168 (NIH/NIDA). Dr. Samet was supported by R25 DA13582 (NIH/NIDA). Funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

## REFERENCES

1. Hadland SE, Wharam JF, Schuster MA, Zhang F, Samet JH, Larochelle MR. Trends in Receipt of Buprenorphine and Naltrexone for Opioid Use Disorder Among Adolescents and Young Adults, 2001–2014. *JAMA Pediatr* 2017;171(8):747–755. 10.1001/jamapediatrics.2017.0745. [PubMed: 28628701]
2. Gaither JR, Leventhal JM, Ryan SA, Camenga DR. National trends in hospitalizations for opioid poisonings among children and adolescents, 1997 to 2012. *JAMA Pediatr* 2016;170(12):1195–1201. 10.1001/jamapediatrics.2016.2154. [PubMed: 27802492]
3. Curtin SC, Tejada-Vera B, Warner M. Drug Overdose Deaths Among Adolescents Aged 15–19 in the United States: 1999–2015. NCHS Data Brief, No 282 Hyattsville, MD; 2017.
4. Zibbell JE, Iqbal K, Patel RC, et al. Increases in hepatitis C virus infection related to injection drug use among persons aged 30 years - Kentucky, Tennessee, Virginia, and West Virginia, 2006–2012. *MMWR Morb Mortal Wkly Rep* 2015;64(17):453–458. [PubMed: 25950251]
5. Committee on Substance Use and Prevention. Medication-assisted treatment of adolescents with opioid use disorders. *Pediatrics* 2016;138(3):e20161893 10.1542/peds.2016-1893. [PubMed: 27550978]
6. U.S. Department of Health and Human Services (HHS) Office of the Surgeon General. Facing Addiction in America: The Surgeon General's Report on Alcohol, Drugs, and Health Washington, DC; 2016.
7. Center for Substance Abuse Treatment. Guidelines for the Use of Buprenorphine in the Treatment of Opioid Addiction. Treatment Improvement Protocol (TIP) Series, No. 40 Rockville, MD: Substance Abuse and Mental Health Services Administration; 2004.
8. Kampman K, Jarvis M. American Society of Addiction Medicine (ASAM) National Practice Guideline for the Use of Medications in the Treatment of Addiction Involving Opioid Use. *J Addict Med* 2015;9(5):358–367. 10.1097/ADM.000000000000166. [PubMed: 26406300]
9. Feder KA, Krawczyk N, Saloner B. Medication-Assisted Treatment for Adolescents in Specialty Treatment for Opioid Use Disorder. *J Adolesc Heal* 2017;60(6):747–750. 10.1016/j.jadohealth.2016.12.023.
10. Rosenblatt RA, Andrilla CHA, Catlin M, Larson EH. Geographic and Specialty Distribution of US Physicians Trained to Treat Opioid Use Disorder. *Ann Fam Med* 2015;13(1):23–26. 10.1370/afm.1735. [PubMed: 25583888]
11. Bagley SM, Hadland SE, Carney BL, Saitz R. Addressing Stigma in Medication Treatment of Adolescents With Opioid Use Disorder. *J Addict Med* 2017;11(6):415–416. 10.1097/ADM.0000000000000348. [PubMed: 28767537]
12. Thomas CP, Fullerton CA, Kim M, et al. Medication-assisted treatment with buprenorphine: assessing the evidence. *Psychiatr Serv* 2014;65(2):158–170. 10.1176/appi.ps.201300256. [PubMed: 24247147]
13. Krupitsky E, Nunes E V, Ling W, Illeperuma A, Gastfriend DR, Silverman BL. Injectable extended-release naltrexone for opioid dependence: a double-blind, placebo-controlled, multicentre randomised trial. *Lancet* 2011;377(9776):1506–1513. 10.1016/S0140-6736(11)60358-9. [PubMed: 21529928]
14. Bell J, Trinh L, Butler B, Randall D, Rubin G. Comparing retention in treatment and mortality in people after initial entry to methadone and buprenorphine treatment. *Addiction* 2009;104(7):1193–1200. 10.1111/j.1360-0443.2009.02627.x. [PubMed: 19563562]
15. Sordo L, Barrio G, Bravo MJ, et al. Mortality risk during and after opioid substitution treatment: systematic review and meta-analysis of cohort studies. *BMJ* 2017;357:j1550. [PubMed: 28446428]

16. Dupouy J, Palmaro A, Fatséas M, et al. Mortality Associated With Time in and Out of Buprenorphine Treatment in French Office-Based General Practice: A 7-Year Cohort Study. *Ann Fam Med* 2017;15(4):355–358. 10.1370/afm.2098. [PubMed: 28694272]
17. Schuman-Olivier Z, Weiss RD, Hoepfner BB, Borodovsky J, Albanese MJ. Emerging adult age status predicts poor buprenorphine treatment retention. *J Subst Abuse Treat* 2016;47(3):202–212. 10.1016/j.jsat.2014.04.006.
18. Weinstein ZM, Kim HW, Cheng DM, et al. Long-term retention in Office Based Opioid Treatment with buprenorphine. *J Subst Abuse Treat* 2017;74:65–70. 10.1016/j.jsat.2016.12.010. [PubMed: 28132702]
19. Dreifuss JA, Griffin ML, Frost K, et al. Patient characteristics associated with buprenorphine/naloxone treatment outcome for prescription opioid dependence: Results from a multisite study. *Drug Alcohol Depend* 2013;131(1–2):112–118. 10.1016/j.drugalcdep.2012.12.010. [PubMed: 23333292]
20. Marsch LA, Moore SK, Borodovsky JT, et al. A randomized controlled trial of buprenorphine taper duration among opioid-dependent adolescents and young adults. *Addiction* 2016;111(8):1406–1415. 10.1111/add.13363. [PubMed: 26918564]
21. Woody GE, Poole SA, Subramaniam G, et al. Extended vs short-term buprenorphine-naloxone for treatment of opioid-addicted youth: a randomized trial. *JAMA* 2008;300(17):2003–2011. 10.1001/jama.2008.574. [PubMed: 18984887]
22. Marsch LA, Bickel WK, Badger GJ, et al. Comparison of pharmacological treatments for opioid-dependent adolescents: a randomized controlled trial. *Arch Gen Psychiatry* 2005;62(10):1157–1164. 10.1001/archpsyc.62.10.1157. [PubMed: 16203961]
23. Stein BD, Gordon AJ, Sorbero M, Dick AW, Schuster J, Farmer C. The impact of buprenorphine on treatment of opioid dependence in a Medicaid population: recent service utilization trends in the use of buprenorphine and methadone. *Drug Alcohol Depend* 2012;123(1–3):72–78. 10.1016/j.drugalcdep.2011.10.016. [PubMed: 22093488]
24. Garnick DW, Lee MT, O'Brien PL, et al. The Washington circle engagement performance measures' association with adolescent treatment outcomes. *Drug Alcohol Depend* 2012;124(3):250–258. 10.1016/j.drugalcdep.2012.01.011. [PubMed: 22364777]
25. American Society of Addiction Medicine. The ASAM Criteria: Treatment Criteria for Addictive, Substance-Related, and Co-Occurring Conditions 3rd ed. (Mee-Lee D, ed.). Chevy Chase, MD: American Society of Addiction Medicine; 2013.
26. Harris AHS, Ellerbe L, Phelps TE, et al. Examining the Specification Validity of the HEDIS Quality Measures for Substance Use Disorders. *J Subst Abuse Treat* 2015;53:16–21. 10.1016/j.jsat.2015.01.002. [PubMed: 25736624]
27. Mohlman MK, Tanzman B, Finison K, Pinette M, Jones C. Impact of Medication-Assisted Treatment for Opioid Addiction on Medicaid Expenditures and Health Services Utilization Rates in Vermont. *J Subst Abuse Treat* 2016;67:9–14. 10.1016/j.jsat.2016.05.002. [PubMed: 27296656]
28. Frazier W, Cochran G, Lo-Ciganic W- H, et al. Medication-Assisted Treatment and Opioid Use Before and After Overdose in Pennsylvania Medicaid. *JAMA* 2017;318(8):750–752. 10.1001/jama.2017.7818. [PubMed: 28829862]
29. Agency for Healthcare Research and Quality. Clinical Classifications Software (CCS) for ICD-9-CM <https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#overview>. Published 2017. Accessed August 17, 2017.
30. Bardach NS, Coker TR, Zima BT, et al. Common and costly hospitalizations for pediatric mental health disorders. *Pediatrics* 2014;133(4):602–609. 10.1542/peds.2013-3165. [PubMed: 24639270]
31. Centers for Disease Control and Prevention. Prescription Drug Overdose Data & Statistics [https://www.cdc.gov/drugoverdose/pdf/pdo\\_guide\\_to\\_icd-9-cm\\_and\\_icd-10\\_codes-a.pdf](https://www.cdc.gov/drugoverdose/pdf/pdo_guide_to_icd-9-cm_and_icd-10_codes-a.pdf). Published 2013. Accessed August 17, 2017.
32. Pletcher MJ, Kertesz SG, Kohn MA, Gonzales R. Trends in Opioid Prescribing by Race/Ethnicity for Patients Seeking Care in US Emergency Departments. *JAMA* 2008;299(1):431–438. 10.1001/jama.2007.64.

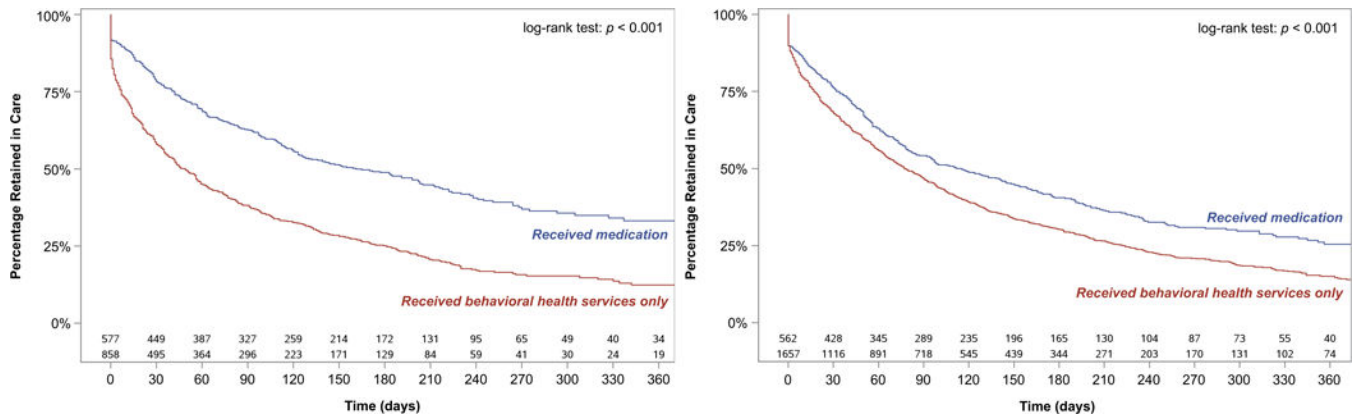
33. Grant BF, Saha TD, Ruan WJ, et al. Epidemiology of DSM-5 Drug Use Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions-III. *JAMA psychiatry* 2016;73(1):39–47. 10.1001/jamapsychiatry.2015.2132. [PubMed: 26580136]
34. Kleinbaum DG, Klein M. Evaluating the proportional hazards assumption. In: *Survival Analysis* New York, NY: Springer; 2012:161–200.
35. Harris AHS, Humphreys K, Bowe T, Tiet Q, Finney JW. Does meeting the HEDIS substance abuse treatment engagement criterion predict patient outcomes? *J Behav Health Serv Res* 2010;37(1):25–39. 10.1007/s11414-008-9142-2. [PubMed: 18770044]
36. Watkins KE, Ober AJ, Lamp K, et al. Collaborative Care for Opioid and Alcohol Use Disorders in Primary Care. *JAMA Intern Med* 8 2017 10.1001/jamainternmed.2017.3947.
37. Chou R, Korthuis PT, Weimer M, et al. Medication-Assisted Treatment Models of Care for Opioid Use Disorder in Primary Care Settings. Technical Brief No. 28. (Prepared by the Pacific Northwest Evidence-Based Practice Center under Contract No. 290–2015-00009-I.) AHRQ Publication No. 16(17)-EHC0 Rockville, MD: Agency for Healthcare Research and Quality; 2016.
38. Carroll KM, Weiss RD. The Role of Behavioral Interventions in Buprenorphine Maintenance Treatment: A Review. *Am J Psychiatry* 2017;174(8):738–747. 10.1176/appi.ajp.2016.16070792. [PubMed: 27978771]
39. American Society for Addiction Medicine. The ASAM Performance Measures For the Addiction Specialist Physician Chevy Chase, MD: American Society for Addiction Medicine; 2014.
40. New York State Department of Health. Medicaid Redesign Team (MRT) Behavioral Health Reform Work Group Final Recommendations [https://www.health.ny.gov/health\\_care/medicaid/redesign/docs/mrt\\_behavioral\\_health\\_reform\\_recommend.pdf](https://www.health.ny.gov/health_care/medicaid/redesign/docs/mrt_behavioral_health_reform_recommend.pdf). Published 2011. Accessed December 27, 2017.
41. Uchtenhagen A Commentary on Metrebian et al (2015): What is addiction treatment research about? Some comments on the secondary outcomes of the Randomized Injectable Opioid Treatment Trial. *Addiction* 2015;110(3):491–493. 10.1111/add.12821. [PubMed: 25678293]
42. Alford DP, LaBelle CT, Kretsch N, et al. Collaborative care of opioid-addicted patients in primary care using buprenorphine: five-year experience. *Arch Intern Med* 2011;171(5):425–431. 10.1001/archinternmed.2010.541. [PubMed: 21403039]
43. LaBelle CT, Han SC, Bergeron A, Samet JH. Office-based opioid treatment with buprenorphine (OBOT-B): Statewide implementation of the Massachusetts collaborative care model in community health centers. *J Subst Abuse Treat* 2016;60:6–13. 10.1016/j.jsat.2015.06.010. [PubMed: 26233698]
44. Wakeman SE. Another Senseless Death - The Case for Supervised Injection Facilities. *N Engl J Med* 2017;376(11):1011–1013. 10.1056/NEJMp1613651. [PubMed: 28296603]
45. Saloner B, Feder KA, Krawczyk N. Closing the Medication-Assisted Treatment Gap for Youth With Opioid Use Disorder. *JAMA Pediatr* 2017;171(8):729–731. 10.1001/jamapediatrics.2017.1269. [PubMed: 28628699]
46. SAMHSA Behavioral Health Treatment Services Locator. Substance Abuse and Mental Health Services Administration.
47. Wachino V, Hyde PS. Coverage of Behavioral Health Services for Youth with Substance Use Disorders <https://www.medicaid.gov/federal-policy-guidance/downloads/cib-01-26-2015.pdf>. Accessed December 1, 2017.

**KEY POINTS**

**Question:** What percentage of youth receive timely medications for opioid use disorder (OUD), and are youth who receive timely medications more likely to remain in care?

**Findings:** In this multistate cohort of 4,837 youth with OUD, one in 21 adolescents <18 years and one in four young adults 18–22 years received medication within three months of diagnosis. Youth who received buprenorphine, naltrexone, or methadone were 42%, 46%, and 68% less likely, respectively, to discontinue treatment.

**Meaning:** Pharmacotherapy, a critical evidence-based intervention to address OUD, is underutilized in youth. Youth who receive timely medications are more likely to remain in care.



**Figure 1:** Retention in care according to timely receipt of OUD medication (buprenorphine, naltrexone, or methadone) within 3 months of diagnosis among youth (A) receiving any addiction treatment, and (B) behavioral health services.

**Table 1.**

Receipt of addiction treatment<sup>a</sup> within 3 months of diagnosis among 4,837 Medicaid-enrolled youth with OUD.

Characteristic	Received Any Timely Treatment <sup>a</sup> (N = 3,654)		
	Total, N	N (%)	Adjusted <sup>b</sup> OR (95% CI)
Age of diagnosis			
21–22 years	2,263	1,550 (68.5)	Reference
18–20 years	1,846	1,479 (80.1)	1.09 (0.94 – 1.26)
16–17 years	563	432 (76.7)	1.24 (0.97 – 1.58)
13–15 years	165	122 (74.0)	<b>0.68 (0.47 – 0.98)</b>
Sex			
Male	2,085	1,590 (76.3)	Reference
Female	2,752	2,064 (75.0)	1.02 (0.87 – 1.18)
Race/ethnicity			
White non-Hispanic	3,677	2,876 (78.2)	Reference
Black non-Hispanic	388	242 (62.4)	<b>0.51 (0.41 – 0.65)</b>
Hispanic	55	41 (74.5)	0.83 (0.44 – 1.54)
Other	717	495 (69.0)	<b>0.64 (0.54 – 0.77)</b>
Medicaid-eligible due to disability			
No	4,571	3,510 (76.8)	Reference
Yes	266	144 (54.1)	<b>0.41 (0.32 – 0.54)</b>
Pregnancy <sup>c</sup>			
No	4,064	3,109 (76.5)	Reference
Yes	773	545 (70.5)	<b>0.73 (0.60 – 0.88)</b>
Depression <sup>c</sup>			
No	3,227	2,415 (74.8)	Reference
Yes	1,610	1,239 (77.0)	<b>1.28 (1.08 – 1.51)</b>
Anxiety disorder <sup>c</sup>			
No	3,439	2,616 (76.1)	Reference
Yes	1,398	1,038 (74.2)	0.84 (0.71 – 1.00)
Attention deficit hyperactivity disorder <sup>c</sup>			
No	4,244	3,191 (75.2)	Reference
Yes	593	463 (78.1)	1.21 (0.97 – 1.53)
Alcohol use disorder <sup>c</sup>			
No	4,138	3,082 (74.5)	Reference
Yes	699	572 (81.8)	<b>1.43 (1.15 – 1.78)</b>
Other substance use disorder <sup>c</sup>			
No	2,307	1,740 (75.4)	Reference
Yes	2,530	1,914 (75.7)	0.94 (0.82 – 1.08)

Characteristic	Received Any Timely Treatment <sup>a</sup> (N = 3,654)		Adjusted <sup>b</sup> OR (95% CI)
	Total, N	N (%)	
Acute pain condition <sup>c</sup>			
No	3,282	2,505 (76.3)	Reference
Yes	1,555	1,149 (73.9)	1.16 (0.98 – 1.38)
Chronic pain condition <sup>c</sup>			
No	3,253	2,555 (78.5)	Reference
Yes	1,584	1,099 (69.4)	<b>0.59 (0.50 – 0.69)</b>

<sup>a</sup> Had a claim for either behavioral health services or medication treatment within 3 months of diagnosis

<sup>b</sup> Adjusted for all other covariates listed in the table

<sup>c</sup> At or during the three months prior to receiving OUD diagnosis

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 2.**

Type of addiction care received within 3 months of diagnosis among 3,654 Medicaid-enrolled youth who received any treatment for OUD.

Characteristic	Behavioral Health Services Only (N = 2,515), N (%)	Received OUD Medication <sup>a</sup> (N = 1,139), N (%)	Adjusted <sup>b</sup> OR for Receipt of OUD Medication (95% CI)
Age of diagnosis			
21–22 years	889 (57.3)	661 (42.7)	Reference
18–20 years	1,035 (70.0)	444 (30.0)	<b>0.78 (0.67 – 0.91)</b>
16–17 years	402 (93.1)	30 (6.9)	<b>0.16 (0.11 – 0.24)</b>
13–15 years	118 (96.7)	4 (3.3)	<b>0.08 (0.03 – 0.23)</b>
Sex			
Male	1,175 (73.9)	415 (26.1)	Reference
Female	1,340 (64.9)	724 (35.1)	1.06 (0.90 – 1.26)
Race/ethnicity			
White non-Hispanic	1,948 (67.7)	928 (32.3)	Reference
Black non-Hispanic	206 (85.1)	36 (14.9)	<b>0.48 (0.33 – 0.70)</b>
Hispanic	31 (75.6)	10 (24.4)	0.68 (0.32 – 1.45)
Other	330 (66.7)	165 (33.3)	1.01 (0.82 – 1.26)
Medicaid-eligible due to disability			
No	2,391 (68.1)	1,119 (31.9)	Reference
Yes	124 (86.1)	20 (13.9)	<b>0.47 (0.28 – 0.77)</b>
Pregnancy <sup>c</sup>			
No	2,219 (71.4)	890 (28.6)	Reference
Yes	296 (54.3)	249 (45.7)	<b>1.62 (1.31 – 2.00)</b>
Depression <sup>c</sup>			
No	1,562 (64.7)	853 (35.3)	Reference
Yes	953 (76.9)	286 (23.1)	<b>0.81 (0.67 – 0.98)</b>
Anxiety disorder <sup>c</sup>			
No	1,733 (66.2)	883 (33.8)	Reference
Yes	782 (75.3)	256 (24.7)	0.89 (0.72 – 1.09)
Attention deficit hyperactivity disorder <sup>c</sup>			
No	2,135 (66.9)	1,056 (33.1)	Reference
Yes	380 (82.1)	83 (17.9)	0.91 (0.69 – 1.21)
Alcohol use disorder <sup>c</sup>			
No	2,020 (65.5)	1,062 (34.5)	Reference
Yes	495 (86.5)	77 (13.5)	<b>0.43 (0.33 – 0.56)</b>
Other substance use disorder <sup>c</sup>			
No	1,045 (60.1)	695 (39.9)	Reference
Yes	1,470 (76.8)	444 (23.2)	<b>0.60 (0.52 – 0.70)</b>



Characteristic	Behavioral Health Services Only (N = 2,515), N (%)	Received OUD Medication <sup>a</sup> (N = 1,139), N (%)	Adjusted <sup>b</sup> OR for Receipt of OUD Medication (95% CI)
Acute pain condition <sup>c</sup>			
No	1,685 (67.3)	820 (32.7)	Reference
Yes	830 (72.2)	319 (27.8)	0.91 (0.74 – 1.10)
Chronic pain condition <sup>c</sup>			
No	1,755 (68.7)	800 (31.3)	Reference
Yes	760 (69.2)	339 (30.8)	<b>1.30 (1.07 – 1.59)</b>

<sup>a</sup>. Includes youth who did and did not receive concurrent behavioral health services

<sup>b</sup>. Adjusted for all other covariates listed in the table

<sup>c</sup>. At or during the three months prior to receiving OUD diagnosis

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 3.**

Retention in care among youth with at least two claims for addiction treatment.

Characteristic	Adjusted <sup>a</sup> HR (95% CI)	
	Attrition from Any Addiction Treatment <sup>b,c</sup> (n = 3,247)	Attrition from Behavioral Health Services <sup>b</sup> (n = 2,885)
<i>Sociodemographic characteristics</i>		
Age ≥ 21 years	<b>1.63 (1.45 – 1.83)</b>	<b>1.59 (1.41 – 1.80)</b>
Male sex	<b>1.13 (1.03 – 1.24)</b>	<b>1.13 (1.02 – 1.24)</b>
Non-Hispanic white	1.03 (0.93 – 1.14)	1.05 (0.94 – 1.18)
Medicaid-eligible due to disability	<b>0.63 (0.49 – 0.80)</b>	<b>0.60 (0.46 – 0.78)</b>
<i>Clinical characteristics</i>		
Pregnancy <sup>d</sup>	<b>0.87 (0.75 – 0.99)</b>	0.90 (0.77 – 1.04)
Comorbid behavioral health diagnosis (depression, anxiety, or attention deficit hyperactivity disorder) <sup>d</sup>	1.04 (0.95 – 1.14)	1.01 (0.92 – 1.11)
Comorbid alcohol or other substance use disorder <sup>d</sup>	1.02 (0.93 – 1.12)	1.00 (0.91 – 1.10)
Acute or chronic pain condition <sup>d</sup>	0.92 (0.84 – 1.01)	0.92 (0.83 – 1.01)
<i>Treatment received</i>		
Higher level of behavioral health services <sup>e</sup> within 3 months of initiating episode of care	0.94 (0.85 – 1.02)	0.92 (0.83 – 1.01)
Received timely OUD medication within 3 months of diagnosis		
No medication	<i>Reference</i>	<i>Reference</i>
Buprenorphine	<b>0.58 (0.52 – 0.64)</b>	<b>0.73 (0.64 – 0.82)</b>
Naltrexone	<b>0.54 (0.43 – 0.69)</b>	<b>0.57 (0.44 – 0.73)</b>
Methadone	<b>0.32 (0.22 – 0.47)</b>	<b>0.47 (0.33 – 0.68)</b>

<sup>a</sup>. Multivariable models included all covariates listed in table<sup>b</sup>. Attrition defined as ≥ 60 days without any claims for services<sup>c</sup>. Includes receipt of any behavioral health services or OUD medications<sup>d</sup>. At or during the three months prior to receiving OUD diagnosis<sup>e</sup>. Includes intensive outpatient treatment, partial hospitalization, residential care, or inpatient care