

A Medication Assisted Tier-Based Approach to Treating Opioid Use Disorder: A Retrospective
Chart Review

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Abstract

Background: Opioid use disorder has reached epidemic proportions in the United States. Medical treatment options available include buprenorphine (BUP) and buprenorphine/naloxone (Suboxone). Research that identifies what factors increase patient success and their movement through a tier-based MAT program is limited.

Methods: This was a retrospective chart review of 18 patients enrolled in the MAT program at OHSU Family Medicine in Scappoose between September 1, 2016 and December 31, 2018. Electronic medical records were reviewed to abstract data on basic demographics, engagement, and tier status throughout the program.

Participants: Any patient greater than 18 years of age who holds a current diagnosis of OUD with at least 10 related clinic visits.

Results: Seven patients met or maintained Tier 4 or Tier Y. Nine patients were maintained at or above 16mg of buprenorphine. 55.6% had a positive UDS during the time period. Average number of days in the program was 389.72 (range 93-772), with 32 visits, 42.8% of which were with a medical provider. Average number of days in a particular tier was 65 days in tier 1, 76 days in tier 2, 115 days in tier 3, and 91 days in tier 4.

Conclusions: There are distinctive demographics and factors that influence patient success in a MAT program. Based on this sample, there are distinct patterns of stability through tiers, which suggest OUD is a chronic disease often accompanied by cycles of relapse and remission that require continued treatment in order to be successful.

Keywords: opioid use disorder, MAT, BUP, Suboxone

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Introduction

The current prevalence of opioid use disorder in the United States has grown to epidemic proportions. The 2014 National Survey on Drug Use and Health reported that 586,000 individuals aged 12 and older had a heroin use disorder and 1.9 million had a prescription painkiller use disorder (Center for Behavioral Health Statistics and Quality, 2015). According to the Centers for Disease Control and Prevention (CDC) (2018), the number of drug overdose deaths in the United States was 68,400 in 2017, up 12% since the previous year. More than 115 people die every day in the United States due to opioid overdose (National Institute on Drug Abuse, 2018a). Drug overdose today contributes to more deaths than motor vehicle accidents (CDC, 2017). Opioid abuse and overdose are estimated to cost the United States \$78.5 billion yearly due to costs of healthcare, lost productivity, addiction treatment, and criminal justice involvement (Florence, Luo, Xu, & Zhou, 2016). Prolonged use of opioids is one of the many reasons individuals develop dependence, potential addiction and the risk of drug overdose. In 2016 the rate of opioid-related overdose deaths in Oregon was 7.6 per 100,000, a rate that has remained fairly unchanged since 2013 (National Institute on Drug Abuse, 2018b). The Diagnostic and Statistical Manual of Mental Disorders define opioid use disorder as, “a problematic pattern of opioid use leading to clinically significant impairment or distress” (American Psychiatric Association, 2013).

Health System Problem

Due to safety concerns, dependence and addiction risk from the prescription of opioids, many organizations are considering changes to how they prescribe and manage opioids.

Fortunately, providers can now offer new treatments for those suffering with opioid use disorder. There are currently three FDA-approved medications for the treatment of opioid use disorder (OUD), which includes methadone, buprenorphine and naltrexone. The goals of these medications are to reduce opioid cravings and use, prevent withdrawal and promote patient retention in treatment.

Methadone is a long-acting full mu-opioid agonist and has been considered the treatment of choice for chronic opioid use disorder since the 1960's. However, it can cause withdrawal symptoms with a single missed dose, thus discontinuation can be difficult. Due to its potential for misuse and fatality with overdose, it requires daily observed dosing. BUP is a partial mu-opioid agonist that is often combined with naloxone, which is a mu-opioid antagonist. It was approved for the induction of treatment for opioid use disorder in 2014 (Fischer, Jonsson, & Hjelmstrom, 2015). BUP or buprenorphine/naloxone (Suboxone) can be administered in an office-based setting and does not require observed dosing. This product is now the most commonly prescribed and accessible form of an evidence-based treatment for opioid dependence (Lee et al., 2018). Finally, naltrexone extended-release is a monthly injectable opioid antagonist that was FDA approved in 2010 for the prevention of opioid relapse following detoxification (Lee et al., 2018).

Medication assisted treatment (MAT) has been shown through research to be effective in the treatment of OUD in reducing rates of relapse, drug overdose, death and overall cost (Baser, Chalk, Fiellin, & Gastfriend, 2011). According to the World Health Organization (WHO) and CDC, MAT is effective at decreasing drug use, rates of overdose, human immunodeficiency virus (HIV) transmission and criminal activity (Sharp et al., 2018). Retention in these programs for at least one year have resulted in reduced opioid use (Hser et al., 2016) and lower rates of

emergency room visits and hospitalizations compared to those that leave or are excused from programs early (Lo-Ciganic et al., 2016). To address this current public health emergency, it is essential MAT is available to anyone interested in treatment for OUD.

This study aims to improve understanding of how patients move through a tier-based treatment program for OUD, and what factors are associated with achievement or maintenance of a higher tier status (Tier 4 or Tier Y). Explanation of the tier-based approach utilized can be found in Appendix A. This data will provide demographics and history of patients that are at an increased risk to not achieve Tier 4 or Tier Y while in the MAT program. This data will be evaluated and applied through the Knowledge to Action (KTA) model, which serves to provide meaningful results that can be easily applied to inform necessary practice changes and improve overall retention and success.

Literature Review

Search Strategy

A review of the current literature was performed in August of 2018 to explore the most relevant and current data on MAT. Electronic searches were conducted utilizing OvidMEDLINE and CINAHL databases. Filters used included: English language, and full text. Publication date was filtered to include articles published in the last 10 years due to the lack of more recent research on MAT. Search terms within OvidMEDLINE included “medication assisted treatment” and sub-headings of “opiate substitution treatment,” “substance-related disorders,” “opioid related disorders,” and “Buprenorphine,” which yielded 13,183 results. An additional search was made with the search term “retention,” which yielded 22,609 results. Together these search terms were combined and yielded 421 articles including 116 RCTs and 20 meta-analyses. Search terms within CINAHL included: “medication assisted treatment”, and “retention.” This search yielded

3 articles. A total of 17 articles were reviewed for this paper. In addition, the 2015 Federal Guidelines for Opioid Treatment Programs by the Substance Abuse and Mental Health Services Administration was reviewed. There were no articles that discussed the impact of a tier-based approach on treatment of how patients move throughout tiers during treatment.

Increased Success in MAT

Given the importance of patient success in MAT to prevent opioid relapse and mortality, multiple studies have assessed what patient factors effect retention. Retention is influenced by one's external circumstances, personal motivation and readiness to make a change (Ali, Green, Daughters, & Lejuez, 2017). Several studies have shown those that use oral opioids are more likely to achieve program success than those that use heroin, either alone or in combination with prescription opioids (Nielsen, Hillhouse, Mooney, Ang, & Ling, 2015; Soeffing, Martin, Fingerhood, Jasinski, & Rastegar, 2009). Increased social support and overall stability in those that do not use heroin have been found to increase the likelihood of retention (Nielsen et al., 2015). Additional characteristics that are associated with MAT retention include Caucasian ethnicity, female gender, higher income (Choi, Adams, MacMaster, & Seiters, 2013), advanced age and employment (Alford et al., 2011). However, several additional studies have shown conflicting results. A retrospective chart review by Soeffing et al. (2009), stated employment, private insurance, and/or older age were not associated with treatment retention and there was no correlation between gender or comorbidities and positive outcomes. Saloner, Baubresse, & Alexander (2017), found that those that paid cash for treatment were likely to have increased retention rates compared to those utilizing any form of insurance. Reasons for improved retention in those that pay cash were due to insurance limitations on the duration of treatment,

providers not accepting insurance for BUP or patients' utilization of cash as a means to sell the medication in the illicit market (Saloner et al., 2017).

The use of non-prescribed BUP prior to entrance into a MAT program has also been studied with positive results. Monico et al. (2015), completed a mixed methods study and found those that utilized non-prescribed BUP prior to MAT had improved retention rates. The literature described several factors that contributed to this success. Alford et al. (2011), found those self-maintaining on illicit BUP were more likely to have positive outcomes likely due to motivation to obtain an insurance covered option of BUP. Cost of BUP is often less in MAT programs, and previous positive experience with BUP can help facilitate a patient's decision to enter treatment (Monico et al., 2015). Whitley et al. (2010), found those that utilized BUP prior to MAT were also less likely to have complicated inductions due to familiarity with the medication, which could allow providers to escalate doses rapidly and allow for faster relief of withdrawal symptoms, leading to improved retention.

Decreased Success in MAT

Factors that have been found in literature to be associated with poor retention in MAT include medication type, induction, dosage, and patient history. Although induction and maintenance with BUP has been shown to be easier and safer than methadone, several studies have compared retention with the two drugs and results have been conflicting. One multi-clinic study found that although those receiving BUP are likely to drop out early in treatment, retention curves of both medications eventually become parallel (Gryczynski et al., 2013). Mattick, Breen, Kimber, & Davoli (2014) hypothesize the inferior retention with BUP is due to its partial opioid effect only; that it is simple to withdraw from and may cause a mild withdrawal syndrome in those that recently ingested heroin. Dosage of BUP has been seen to have a linear relationship

with retention in that higher doses yield longer retention in MAT. In a study of 1,267 individuals, Hser et al. (2016) found that those taking at least 16mg of BUP were at a lower risk for drop out and those taking 30-32mg had a completion rate of 60%. Mattick et al. (2014), found similar results in regards to dosage and retention. A Cochrane Collaboration meta-analysis attributes retention to a quick induction, which is rarely done with BUP. Although it is known that patients can be inducted at higher doses quickly and safely, providers are hesitant to complete rapid inductions. Finally, criminal history should be taken into consideration when assessing if a patient will be successful in MAT. Increased levels of criminal offenses prior to treatment with MAT including offenses in the last 30 days were strongly associated with poor retention in the program (Bukten, Skurtveit, Waal, & Clausen, 2014). Overall, there are many factors that can influence a patients' retention in a MAT program that are both within and out of their control. It is important that providers take these factors into consideration and provide additional support as needed for those at higher risk of an early drop out.

Gaps in Literature

The majority of the research available compares the success rate of various medications (e.g., methadone, BUP or suboxone, etc.) or relative success of medication therapy versus abstinence. Questions remain, including the efficacy of these programs compared to medication management alone, the barriers patients encounter, and resources available and utilized that contribute to patient success. Although there are current studies that assess patient characteristics and factors associated with program retention, most have limited sample sizes and other limitations affecting results. The definition of success in a MAT program also varies in literature.

Additionally, this researcher was unable to find any research articles that assessed the impact of a tier-based MAT program on patient success. There are limited studies that assess

MAT retention in rural locations and in primary care clinics. Studies have shown that individuals starting opioid use disorder treatment with buprenorphine (BUP), often receive their treatment in office-based settings. In a study by Stein et al. (2012), almost two-thirds of individuals did not receive medication assisted treatment (MAT) from specialty addiction treatment programs, but instead in an office. Primary care settings have also been shown to have higher rates of patients with substance use disorders due to their number of comorbidities for which they seek medical care (Ober et al., 2017).

Available statistical data for the nation is also lacking in regard to the number of individuals suffering from opioid use disorder initiated into these programs, percentages of patients that fail treatment, number of overdose deaths of those in current treatment, and the number of those that repeat programs.

Application of Literature

Based on the literature review, there are significant internal and external factors that contribute to ones' success in a MAT program. It is hypothesized there are unique barriers to those in rural locations that need to be addressed by providers. Through the analysis of patient characteristics one can associate those with rate of overall retention in a MAT program. This data will provide demographics and characteristics of patients at risk for program drop out, which can be utilized to determine what additional resources these patients may need. Data regarding dosage and progression through tiers can also be utilized by providers to determine what provides the patient with the highest chance of success at one of the most critical time periods for program attrition.

The Knowledge to Action (KTA) model was used throughout the development and implementation of this study as it integrates knowledge development followed by application. It

is described as obtaining knowledge through inquiry and primary research, synthesizing it to develop the tools or products that are needed to present the knowledge in a meaningful way so those most likely to benefit can easily apply that information (White, 2012). This model places an emphasis on identifying the problem and knowledge deficit, assessing the barriers to using the knowledge, selecting and implementing interventions to promote use of that knowledge and monitoring and evaluating the use and outcomes. Feedback was continuously sought during all phases, which was crucial for new knowledge to be applied, monitored, and evaluated.

Approach to the Conduct of the Study

Background

The MAT program in Scappoose aims to address the current opioid use disorder epidemic. Scappoose is encompassed within Columbia County in Oregon, where 17% of those aged 18-25 years were utilizing prescription pain relievers for non-medical purposes (Oregon Coalition for Responsible Use of Meds, 2016). The combined approach of MAT includes behavioral health intervention, education from providers on opioid use disorder, and treatment. Once a patient is diagnosed with an opioid use disorder by their provider and has been deemed appropriate for MAT services, the patient is referred and completes a MAT program intake with a MAT team nurse and member of the behavioral health team. Prior to initiation of medication therapy with buprenorphine or buprenorphine/naloxone, the patient completes the intake and a behavioral health team member conducts a psychological assessment of the patients' needs. The team, which includes a healthcare provider with prescriptive privileges, MAT nurse and a behavioral health specialist, create a plan with the patient to address and monitor specific needs throughout treatment. Following induction with BUP with or without naloxone, the patient is required to follow up with their team on a frequency in accordance with their tier status and care

plan. See Appendix A for a description of the different tiers in the program and patient requirements. A patient can be involuntarily discontinued from the program at the providers discretion due to failure to meet program requirements or if MAT is no longer appropriate for the patient. A patient may also discontinue from the program voluntarily when they feel they can maintain sobriety without medication assistance (Fleishman & Gideonse, 2018). Overall goals of the MAT program in Scappoose include cessation of substance use, restoration of health and wellness, improvement in function and quality of life, and reduction in overdoses and intravenous drug related infections (Fleishman & Gideonse, 2018).

Setting

The setting of this DNP project was the OHSU Family Medicine MAT Program located in rural Scappoose, Oregon. The program consists of approximately 150 current patients, 10 medical prescribers, 1 behavioral healthcare provider, and 1 nurse case manager. Medical prescribers include nurse practitioners, medical doctors, and physician assistants.

The purpose of the MAT program is to address the issue of opioid use disorder through an integrated approach of structured medication assisted treatment, connection to behavioral health care, and education of primary care providers in the treatment of substance abuse (Fleishman & Gideonse, 2018). Overall goals of the MAT program are to provide MAT services to the region, educate the community of the opioid use disorder epidemic, seek effective public health interventions and help other regional practice partners start their own MAT programs. Currently, patients present to the clinic with a desire to change their addictive behavior and if deemed to be an appropriate candidate for MAT, they will be referred for intake. Assessment of their substance use history, readiness to change, mental health needs, and physical assessment are completed.

Methods

Study Population

All patient charts of those enrolled in the MAT program at OHSU Family Medicine in Scappoose, Oregon at the time of data collection (March 2019) were assessed. Those that met eligibility criteria received a full chart review via OCHIN electronic health records (EHR). The remaining patient charts were disregarded. This researcher consulted with the Institutional Review Board (IRB) prior to collecting patient information from medical health records and was approved by the IRB of Oregon Health & Science University. The research involved no more than minimal risk and patient information was kept confidential. Requirements of the Health Insurance Portability and Accountability Act (HIPAA) were met. Informed consent was not needed for this study.

Eligibility Criteria

Individuals must be at least 18 years of age with an OUD diagnosis. They must have been induced prior to the start of the MAT program (September 1, 2016) and had at least ten visits at OHSU Scappoose for MAT between the dates of September 1, 2016 and December 31, 2018. Visits may include prescriber, individual behavioral health, group behavioral health and/or nurse visits. Transfer patients and Project Nurture patients were excluded, including those that were induced elsewhere and transferred to this program for maintenance.

Collection of data

Data was collected retrospectively from the sample population's medical records on the OCHIN software. Data collected included basic demographics such as: date of birth, gender, race, history of/current alcohol use, tobacco use, and legal system involvement. History of engagement in a BUP program and use of diverted BUP prior to induction was assessed. Date of

visit, visit type (i.e. intake, induction, follow-up, group), provider involved (i.e. prescriber, nurse, behavioral health), tier status, buprenorphine dose, and any urine drug screen results at that visit were also recorded for analysis.

Data was kept within a secure online site, ohsu.box. Descriptive statistics were calculated for all variables including mean, standard deviation, frequency, and percentile. Graphs were created to demonstrate patient movement through tiers. Additional data is presented in both tables and charts created through Microsoft Word Excel. There were no associated costs for this review.

Results

There was a total of 18 patient charts retrospectively reviewed for this study.

Outcomes Measured

Demographics (Refer to Table B1)

The largest portion of patients (38.9%) were in the 25 to 34-year-old age range, followed by age 55 and over (22.2%). The majority of the sample was female (11) and all but one was listed as Non-Hispanic, white. 13 (72.2%) of the individuals had graduated from high school and either completed some or all of college, whereas only one patient had not completed high school. In regards to substance use, an overwhelming 83.3% (15) reported historical or current use of tobacco products and 44.4% alcohol products. The three main drugs used were heroin (83.3%), Oxycodone/Hydrocodone (61.1%), and methamphetamine (50%). There were four patients currently using Kratom to help with withdrawal symptoms on intake. Nearly half of the sample (44.4%) listed medical reasons as contributing to the development of their opioid addiction. Reasons listed included opioid prescription for acute injuries (fracture, following motor vehicle accident or surgery) or chronic pain. Over half (66.7%) had reported never being involved in a

program that offered buprenorphine treatment for OUD prior to intake at OHSU Scappoose; however, 55.6% had reported using diverted buprenorphine or Suboxone illegally from the street prior to intake. Finally, 72.2% (13) reported history of or current legal system involvement, with most still being on probation for a drug related offense.

Treatment & Engagement (Refer to Table B2)

The average number of days a patient was in the program was 389.72 (range 93-772) and had 32 visits (range 5-101). The majority of these visits (57.2%) were with a registered nurse, behavioral health provider, or other medical provider, while 42.8% were with the prescribing medical provider.

Urine drug screens were obtained at all prescriber visits to assess relapse and possible diversion. 55.6% of patients had a positive urine drug screen during the data collection time period, whereas 44.4% had only negative drug screens. Both buprenorphine and buprenorphine/naloxone (Suboxone) were administered at this clinic. The average induction dosing of buprenorphine (alone or as suboxone) was 13mg (range 8-24mg), with the most common dosing being 16mg for nine patients. Last dose charted during the study period averaged 13mg (range 2-20mg), with majority being maintained at or above 16mg (9 patients).

Tier Movement (Refer to Table B3)

Regarding tier status, an achievement of tier 4 or tier Y is considered successful as they are the highest tiers a patient may attain while in the program. Of the 18 sample patients, seven reached this status and were either maintained at Tier 4 or tapered off suboxone completely and thus graduated from the program at the end of the data collection. Only one patient was classified as tier X, and thus removed from the program for lack of follow-up to complete a supervised UDS. The average number of days a patient was in a tier at a given time was 65 days in tier 1

(range 17-230), 76 days in tier 2 (range 0-295), 115 days in tier 3 (range 0-421) and an average of 91 days in tier 4 (range 0-441). This statistic was obtained by computing all days at a particular tier during the data collection time period. There was only one patient that required re-induction during the data collection. A visual aid to see how a sample of the patients move through the different tier levels while engaged in treatment can be seen in Appendix C, Figures 1-7.

Discussion

In a sample of 18 patients with diagnosed OUD in treatment at the OHSU Scappoose MAT program, there were several findings with comparable results to other published studies. First, characteristics associated with success in the program, which was measured in this study by achieving tier 4 or tier Y status, were similar to those published by other studies. For instance, in this sample success was seen more frequently in those older than 55 years of age, females, and those with an education completion of high school or beyond. This is similar to the results found by Choi, Adams, MacMaster, & Seiters (2013) and Alford et al. (2011). This may be due to higher incidence of current employment in those with at least a high school education, and insurance coverage for older patients such as Medicare to cover program costs. This author also found an increased success rate in those of Caucasian ethnicity; however, given that this sample consists of only one non-Caucasian individual, I am unable to associate ethnicity with success.

Second, those using oral opiates tended to be more successful in the MAT program compared to intravenous opiate users, with approximately 45% achieving tier 4 or Y. Although the majority of patients reported using heroin overall, only 26.7% of these individuals were successful in the program. This is similar to other studies that have shown those that use oral opioids are more likely to achieve success than those that use heroin alone or in combination

with oral opioids (Nielsen, Hillhouse, Mooney, Ang, & Ling, 2015; Soeffing, Martin, Fingerhood, Jasinski, & Rastegar, 2009).

Third, similar to the study by Bukten, Skurtveri, Waal, & Clausen (2014), this study shows those without prior or current involvement in the legal system were more successful in the program overall; however, this was minimal with a difference of only 9.2%. Based off these results, it is unknown the potential effect of current or history of tobacco use on one's overall success in the program. Although, this data shows that 40% of those who reported using tobacco products achieved tier 4 or Y, the majority of patients in the program overall reported smoking and thus skew the results. This study did show that reported alcohol use did not affect program outcomes.

In contrast to other studies, the data did not show a correlation of increased program success in those that had utilized non-prescribed BUP prior to induction. 40% of patients that achieved tier 4 or Y reported never using BUP, and 66.7% had never used prescribed BUP through an established program prior to induction. This is in contrast to results presented by Monico et al. (2015), and Alford et al (2011), whom found BUP utilization prior to induction resulted in improved retention rates and positive outcomes. Differences in results may be due to the limited sample size and availability of diverted BUP in rural locations such as Scappoose, OR.

In regards to movement through tiers, there were three identified types of movement in the program: 1) steady increase in stability; 2) increased stability, relapse, followed by increased stability again; and 3) increased stability, relapse, followed by decreased stability (See Appendix C, Figures 1-7). Those that achieved and maintained a higher tier such as 3 or 4 were often well engaged in behavioral health and nurse visits. However, the two patients that achieved tier Y

mainly had prescriber visits over shorter periods of time. It is difficult to hypothesize why this is as these two patients were very different. One patient was a 34-year-old Hispanic female with a Bachelor's degree that was in the program for 241 days and wanted to self-taper off the BUP. The other patient was a 58-year-old Caucasian male that graduated high school and was in the program for 304 days and needed to self-taper off the BUP because his insurance was lapsing. Both of these individuals did report their opioid addiction starting after being prescribed opioids due to involvement in a motor vehicle accident.

When assessing tier movement for the entire sample, type and quantity of visit engagement did not correlate with improved program success as there were similar results across all tier statuses. There does appear to be a small correlation between increasing nurse case management visits and progression to a higher tier (Refer to Figure B1). Regarding retention in the program, tier X is associated with fewer days and visits in the program; however, these results are based on a sample size of one. Interestingly, the total number of visits was fairly consistent between tier 1 and 4 despite differences in number of days retained in the program with the most days retained seen in those achieving tier 4 (Refer to Figure B2). This may be related to fewer required visits as tier status progresses and time in the program becomes longer.

Limitations

This study has several limitations. First, the limited sample size may not be representative of the large OUD population seeking medication assisted treatment with BUP, therefore limiting the ability to generalize these results to a larger population. Secondly, the data was collected retrospectively and the data measure for every variable was not available in each chart. For example, not all charts listed education, history of using diverted buprenorphine, or subjective cause of opioid use disorder development. Although this information is listed in the appropriate

tables, it may skew percentages of these variables and this must be taken into consideration when analyzing the results. Third, there was often conflicting data charted for patients including what tier status they were believed to be on at a visit, which leads to decreased validity of results. In these situations, tier status listed by the prescriber was used.

Conclusions

Opioid use disorder and its consequences have been on the rise in the past decade. MAT has been shown to be an effective treatment option for this population. This retrospective chart review adds to the growing literature for health care providers. These findings show that there are distinctive demographics and factors that influence whether a patient will be successful in a MAT program. Based on this sample of patients involved in a risk-stratified OUD treatment program, there are distinct patterns of stability. These patterns suggest that OUD is a chronic disease often accompanied by cycles of relapse and remission that require continued treatment in order to be successful. Larger prospective or retrospective studies are needed to validate these findings and increase their usefulness to the general public. Together, these findings will be useful for designing and evaluating effective OUD treatments, such as tier-based MAT programs.

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Appendix A Risk Tier Table

(Tier X = avoid opioids and contact MAT provider; note this in ALERT/FYI in EHR)

	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Indications	Induction, relapse	Recent Instability, Short term harm reduction (on-going opiate use failing stepped care), other drugs of abuse, psychiatric instability, pain complications. Routine advancement from Tier 1	Chronic, “stable” Instability, Long term harm reduction (on-going opiate use failing stepped care), other drugs of abuse, psychiatric instability, pain complications. Routine advancement from Tier 2	Routine advancement from Tier 3. Doing well in recovery.	Doing well in recovery; special circumstances call for longer Rx duration.
Rx Total	1 week	2 weeks	4 weeks	8 weeks	12 weeks
Duration				(4 weeks with 1 RF)	(4 weeks with 2 RF)
RF Duration	0	2 weeks	1-4 weeks	4 weeks	4 weeks
Scheduled UDS¹	Weekly	Every 2 weeks	Every 4 weeks	Every 8 weeks	Every 12 weeks
Random Call-In¹	Every 2 weeks	Every 4 weeks	Every 8 weeks	Every 8 weeks	Every 12 weeks
MAT Prescriber Visits	Every 2 weeks	Every 4 weeks	Every 8 weeks	Every 8 weeks	Every 12 weeks
Nurse Visits	Weekly, alternating with MAT provider	Every 2 weeks, alternating with MAT provider	Every 4 weeks, alternating with MAT provider	Every 8 weeks alternating with MAT provider	Every 12 weeks alternating with MAT provider
Behavioral Health Touch	Twice Weekly	Every 2 weeks	Every 12 weeks	Every 24 weeks	Every 24 weeks
Behavioral Health Plan Review	Every 4 weeks	Every 4 weeks	Every 12 weeks	Every 24 weeks	Every 24 weeks
Minimum Time to Next Tier	2 weeks	4 weeks	8 weeks	Dependent on circumstance	N/A

Adapted from “Family Health Center of Worcester Office-Based Opioid Treatment (OBOT) of Opioid and Opiate Dependence Clinical Quality Management Plan.” Authored by Philip Bolduc, MD, OBOT Program Director at Family Health Center of Worcester, University of Massachusetts Medical School, Department of Family Medicine and Community Health, Worcester, MA.

¹ These are maximum intervals; the PCP may ask the MAT team for more frequent UDSs or random call-ins at their discretion

²A “Behavioral Health Touch” is defined as two way communication between the Behavior Health Consultant or Behavioral Health Resource Specialist and the patient.

Appendix B
Quantitative Results

Table B1

Sample baseline characteristics in opioid use disorder treatment

	<i>n</i> (18)	Percent (%)	% Tier 4 or Y (<i>n</i>)
Age (years)			
18-24	1	5.6	0 (0)
25-34	7	38.9	28.6 (2)
35-44	3	16.7	33.3 (1)
45-54	3	16.7	0 (0)
55+	4	22.2	75 (3)
Sex			
Male	7	38.9	28.6 (2)
Female	11	61.1	36.4 (4)
Race/Ethnicity			
Non-Hispanic, white	17	94.4	
Hispanic	1	5.6	
Highest education			
Some or less than high school	1	5.6	0 (0)
GED	1	5.6	100 (1)
High school graduate	7	38.9	28.6 (2)
Some or all of college	6	33.3	50 (3)
Unknown	3	16.7	0 (0)
Tobacco use (current or history of)			
Yes	15	83.3	40 (6)
No	3	16.7	0 (0)
Alcohol use (current or history of)			
Yes	8	44.4	37.5 (3)
No	10	55.6	30 (3)
History of legal system involvement			
Yes	13	72.2	30.8 (4)
No	5	27.8	40 (2)
History of buprenorphine program use prior to intake			
Yes	6	33.3	16.7 (1)
No	12	66.7	41.7 (5)
History of using diverted buprenorphine prior to intake			
Yes	10	55.6	30 (3)
No	5	27.8	40 (2)
Unknown	3	16.7	33.3 (1)
Drugs utilized prior to intake			
Oxycodone/Hydrocodone	11	61.1	45.5 (5)
Heroin	15	83.3	26.7 (4)
Methamphetamine	9	50	22.2 (2)
Methadone	1	5.6	0 (0)
Fentanyl	1	5.6	0 (0)
Morphine	1	5.6	100 (1)
Cocaine	3	16.7	33.3 (1)
Kratom	4	22.2	25 (1)
Reported cause of OUD			
Medical	8	44.4	50 (4)
Unknown	10	55.6	20 (2)

Table B2

Results: Engagement & Treatment

	Mean (%)	SD	% Tier 4 or Y (n)
Retention (days in treatment)	389.72	229.83	
Number of visits			
Prescriber*	15.11 (42.8)	6.87	
Individual Behavioral Health	9.78 (27.7)	8.20	
Group Behavioral Health	5.83 (16.5)	13.26	
Nurse	4.61 (13)	4.41	
Total	32.5	25.14	
Buprenorphine dose**			
At induction	13.33	4.55	
At end of data collection***	13	5.10	
UDS result during data collection****			
Positive	10	55.6	30 (3)
Negative	8	44.4	37.5 (3)

* Prescriber includes medical doctor (MD), nurse practitioner (NP), physician assistant (PA).

** Buprenorphine dose ranges from 2-24mg.

*** End of data collection was March 2019

**** UDS includes cocaine, opiates, oxycodone, amphetamines, methamphetamines, methadone, benzodiazepines. It does not include marijuana (THC).

Table B3

Results: Tier Movement

	<i>n</i> (18)	Percent (%)	Mean (SD)
Tier status achieved at end of data collection*			
Tier 1	3	16.7	
Tier 2	4	22.2	
Tier 3	3	16.7	
Tier 4	5	27.8	
Tier X	1	5.6	
Tier Y	2	11.1	
Average number of days in a tier			
Tier 1			65 (56)
Tier 2			76 (66)
Tier 3			115 (121)
Tier 4			91 (141)

* End of data collection was March 2019

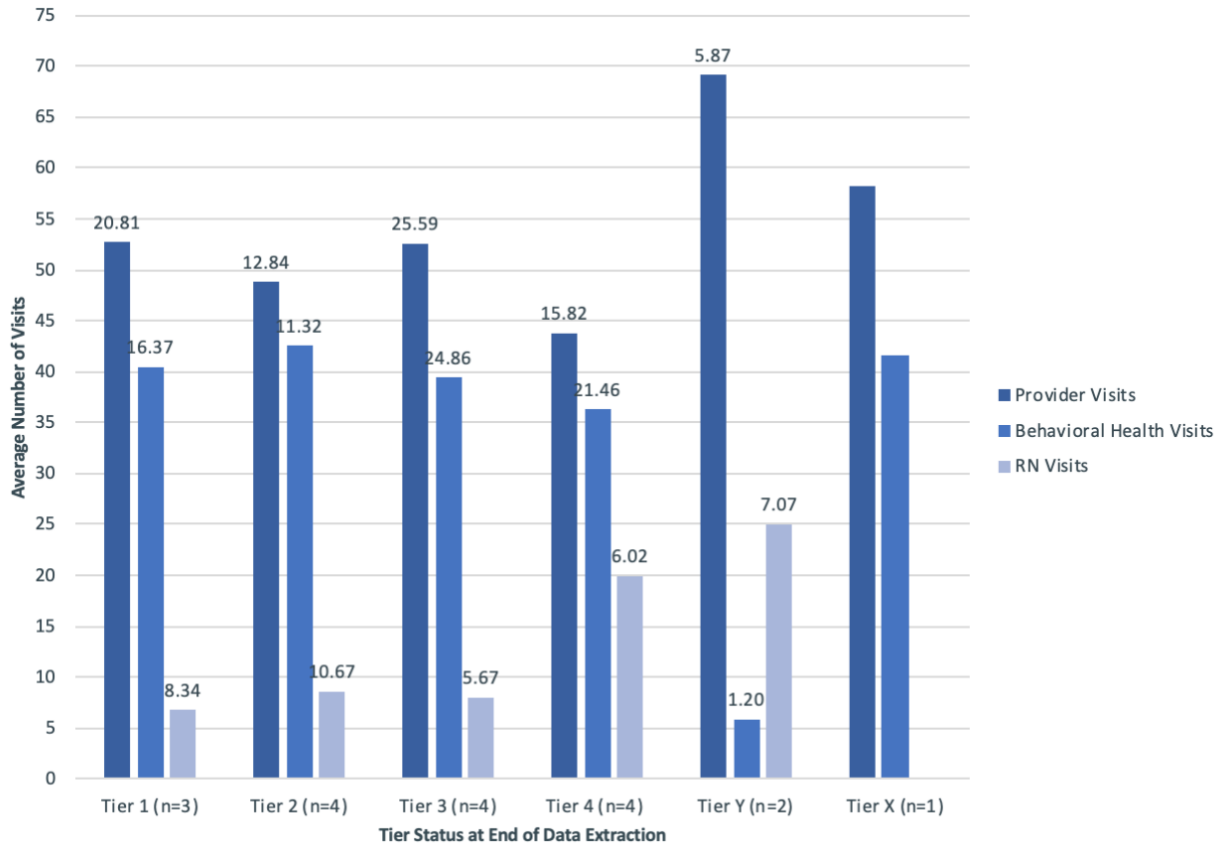


Figure B1. Tier Status Achieved vs. Average Visit Type

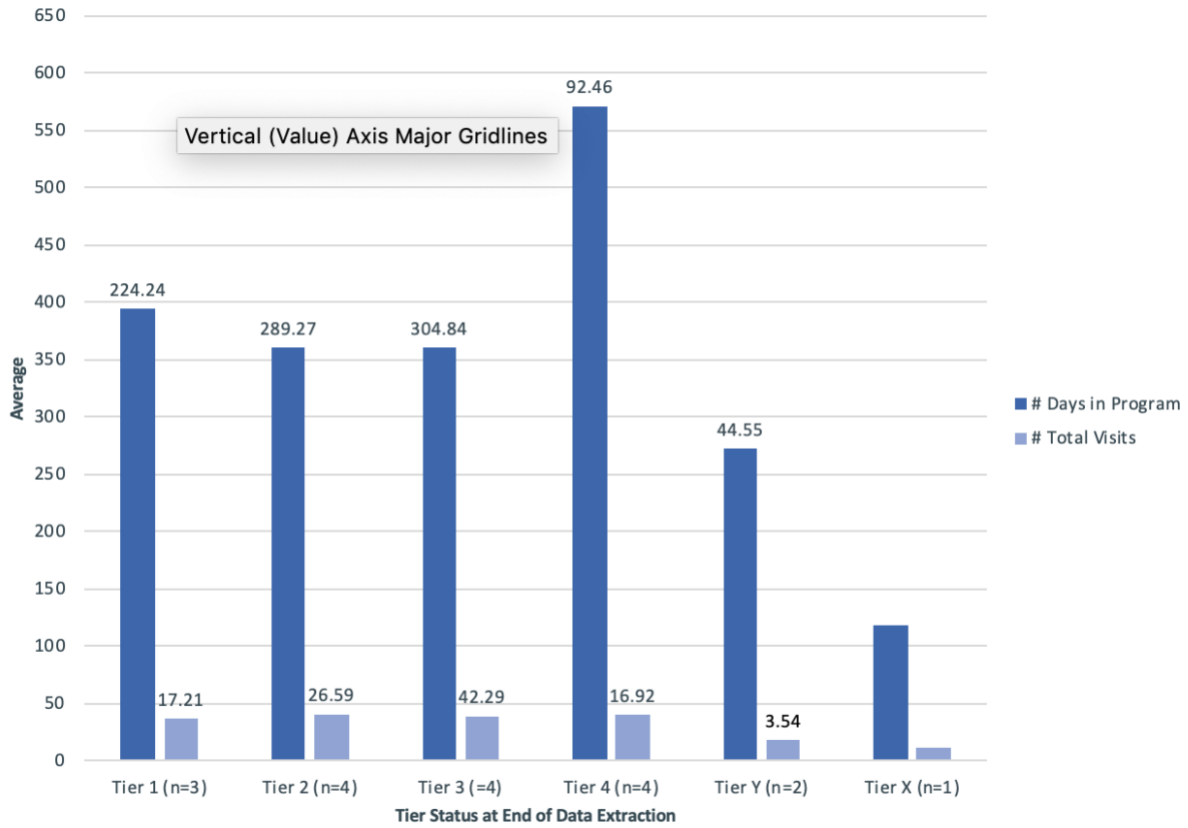


Figure B2. Program Engagement vs. Tier Status Achieved

Appendix C
Qualitative Results

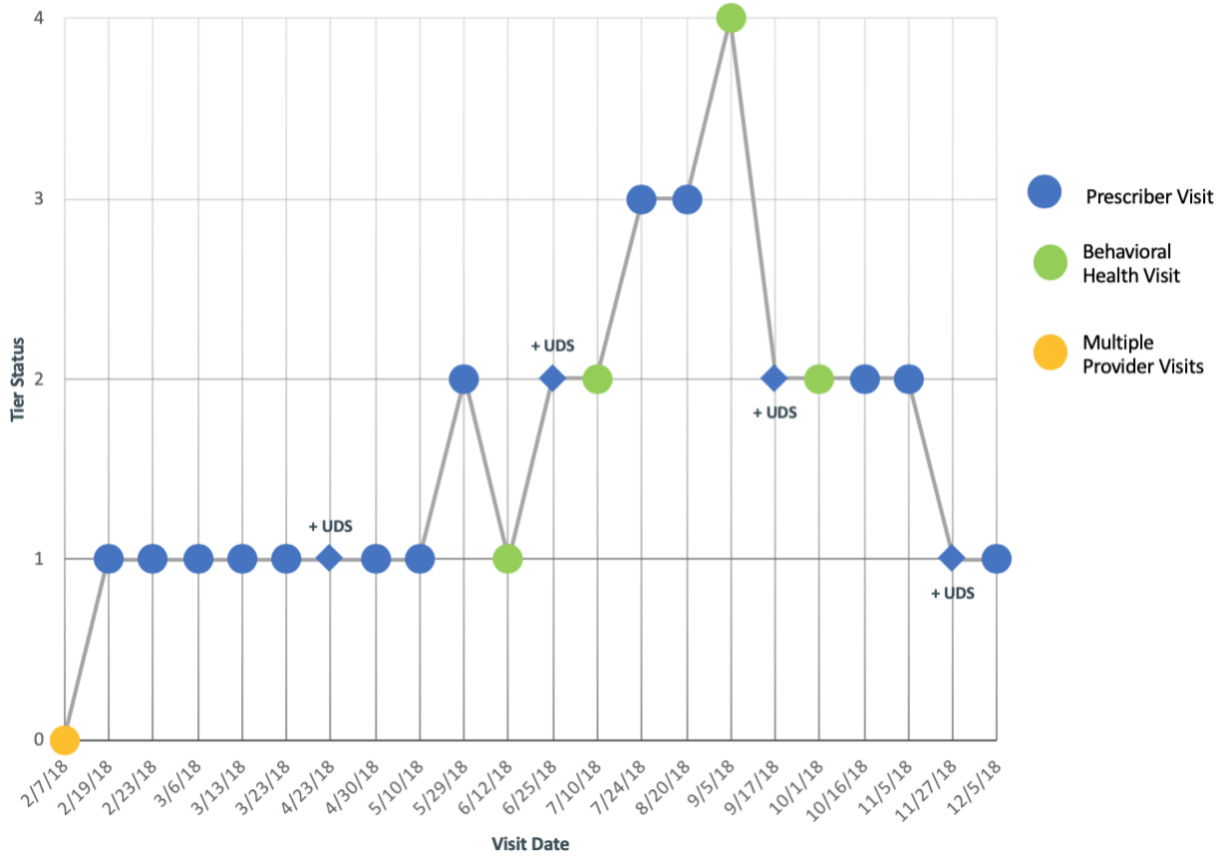


Figure C1. Patient ID 101: Tier 1.

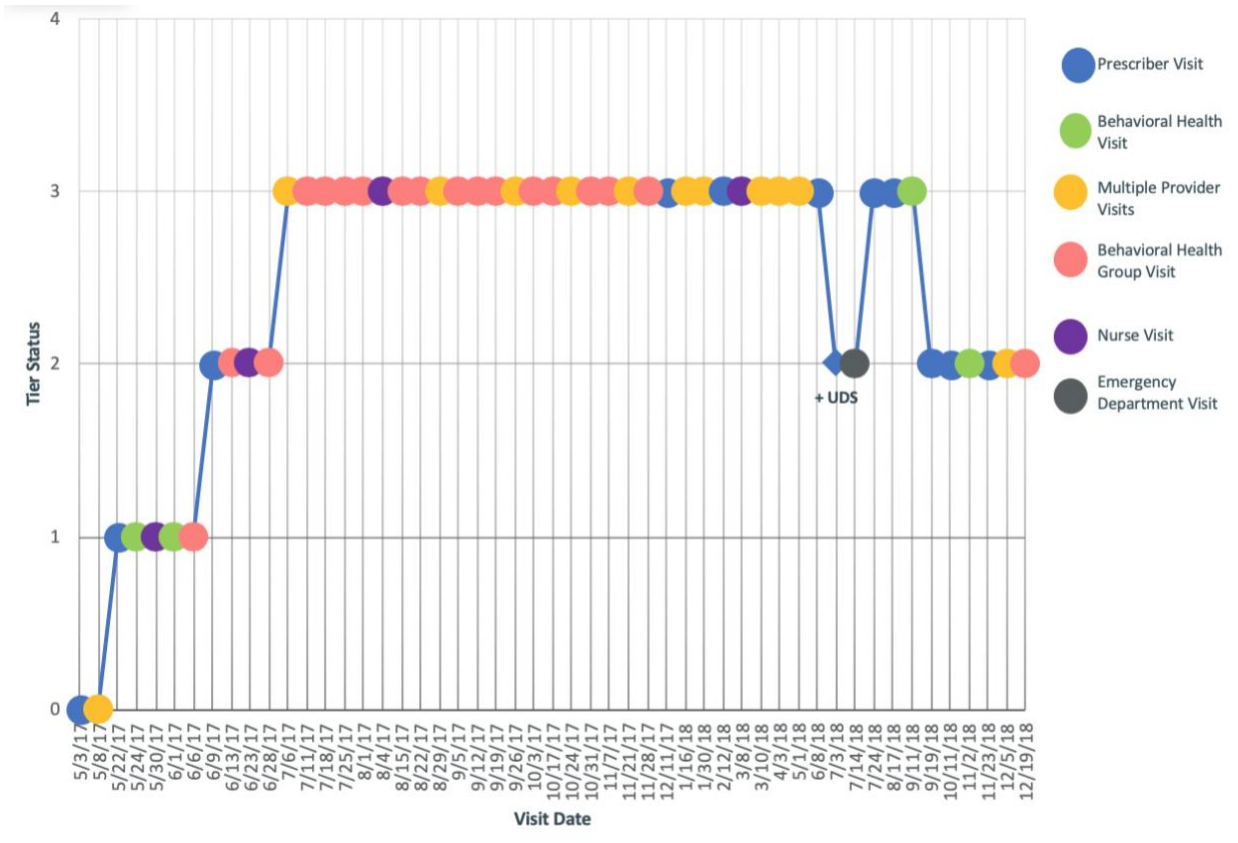


Figure C2. Patient ID 104: Tier 2.

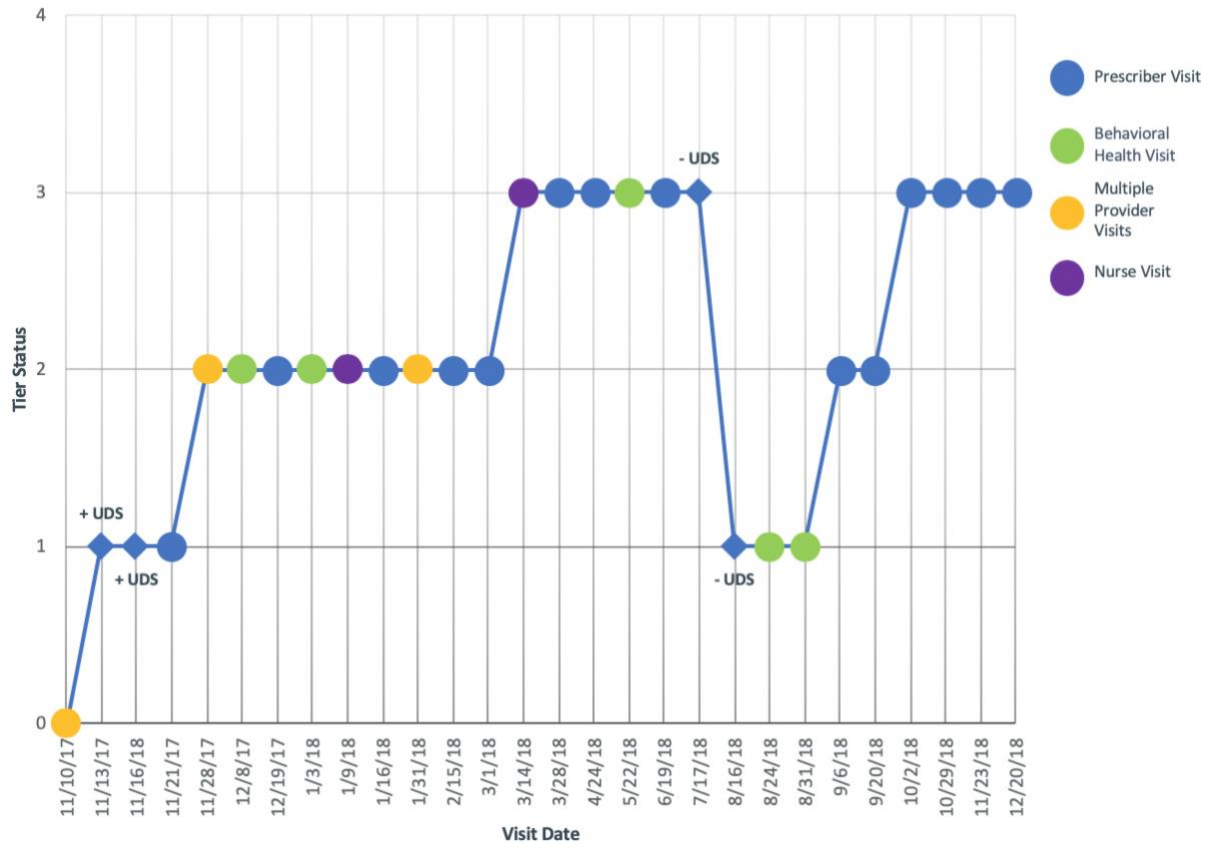


Figure C3. Patient ID 115: Tier 3.

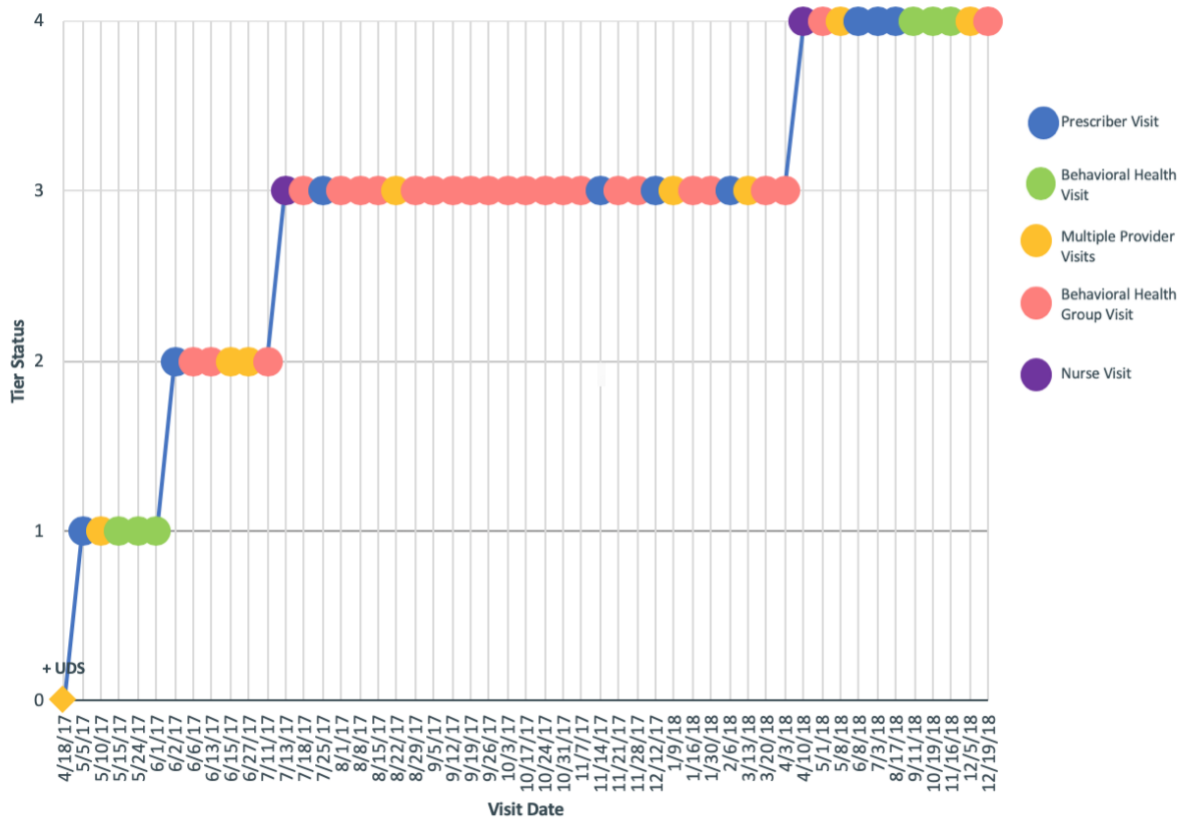


Figure C4. Patient ID 116: Tier 4.

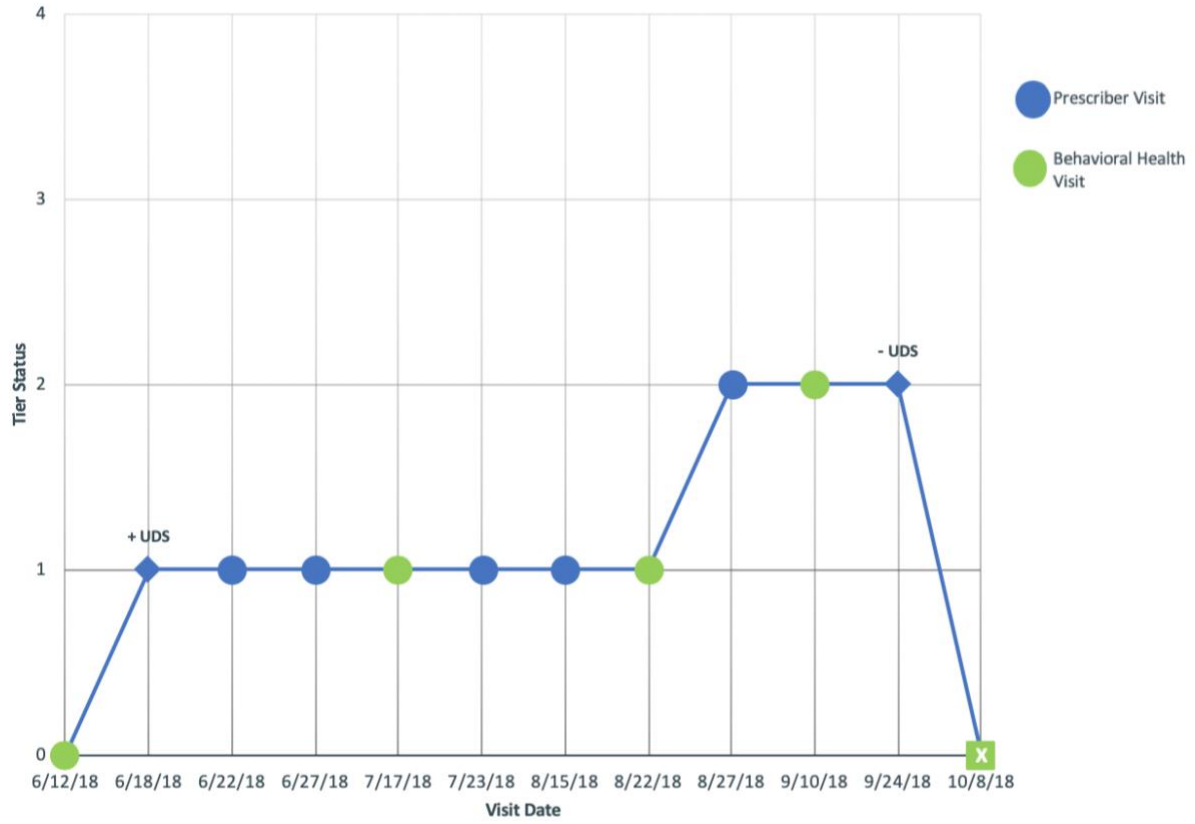


Figure C5. Patient ID 109: Tier X.

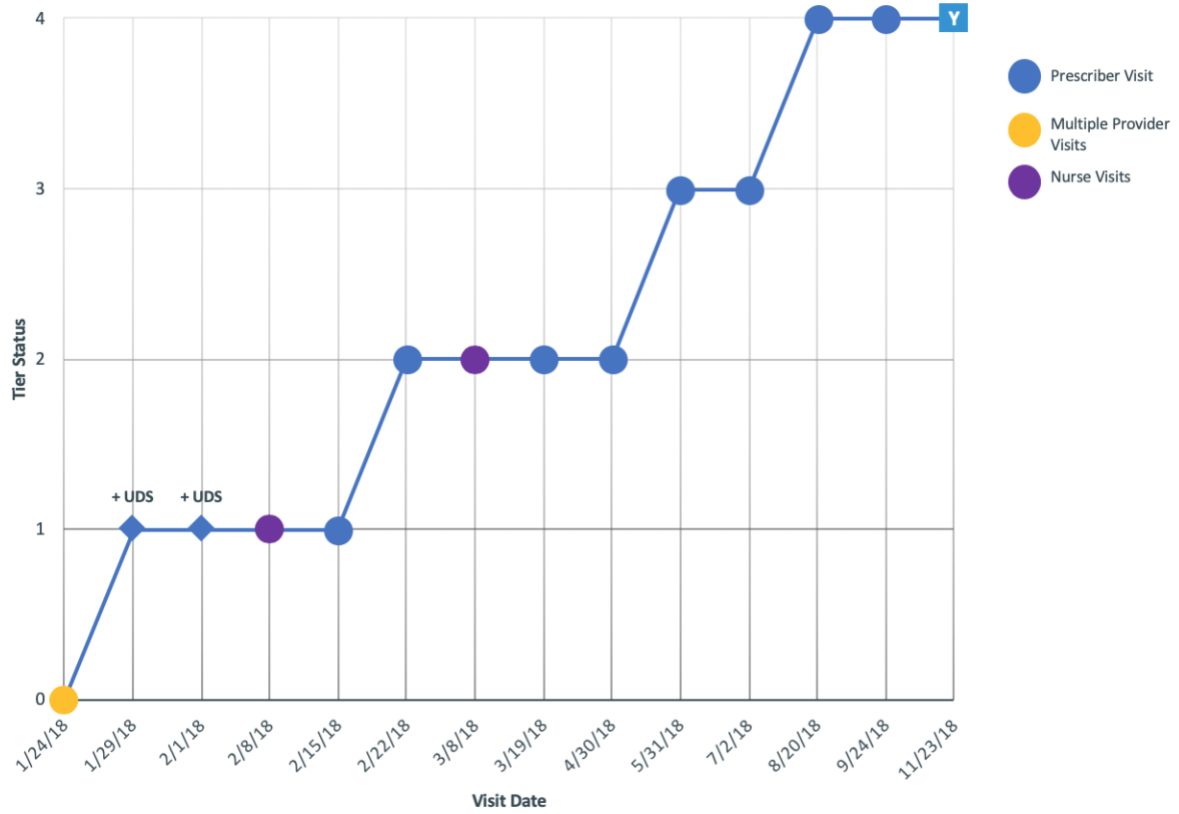


Figure C6. Patient ID 110: Tier Y.

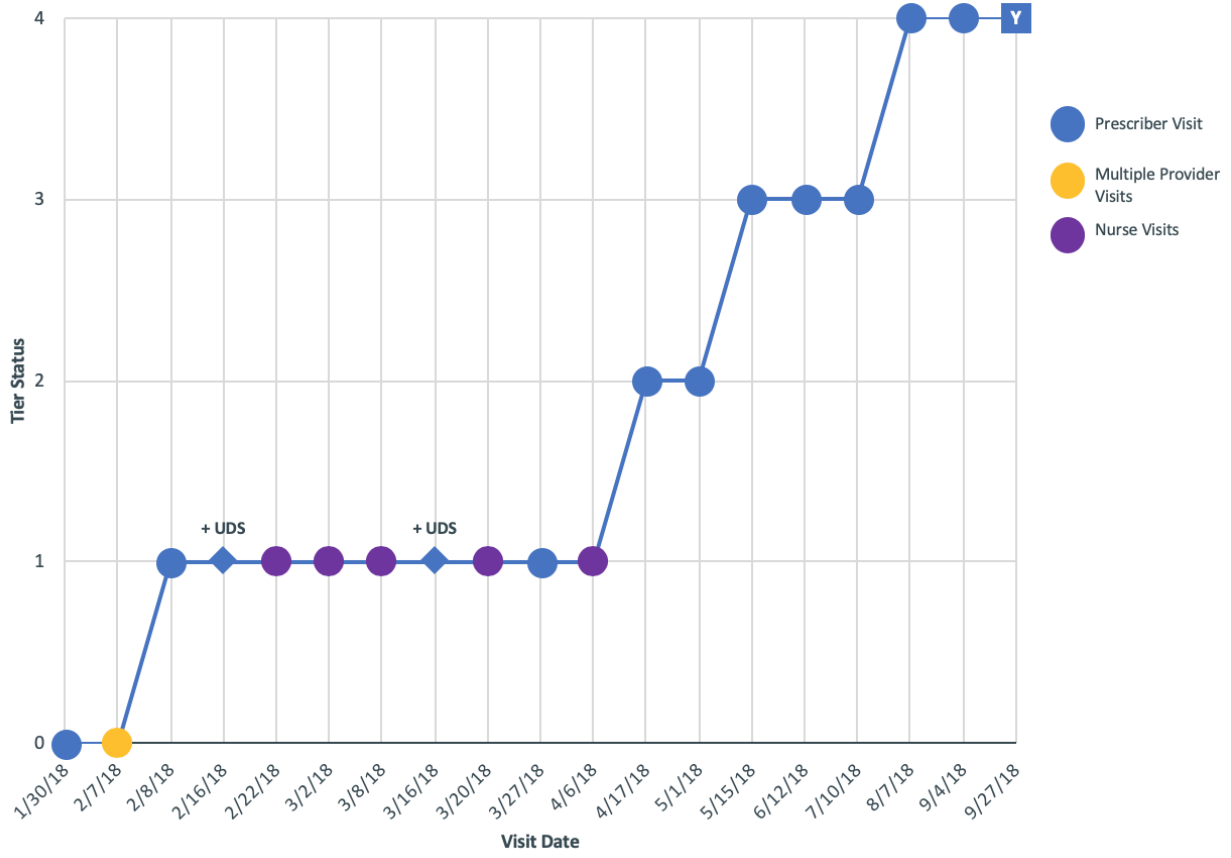


Figure C7. Patient ID 118: Tier Y.