

Three-Month Outcomes from a Patient-Centered Program to Treat Opioid use Disorder

Alison Lynch (✉ alison-lynch@uiowa.edu)

University of Iowa <https://orcid.org/0000-0002-0966-6605>

Andrea N Weber

University of Iowa

Suzy Hedden

University of Iowa

Sayeh Sabbagh

University of Iowa

Stephan Arndt

University of Iowa

Laura Acion

University of Iowa

Short Report

Keywords: opioids, addiction recovery, treatment retention

Posted Date: September 2nd, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-65524/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published on January 12th, 2021. See the published version at <https://doi.org/10.1186/s13011-021-00342-5>.

Abstract

Background: Opioid use disorder (OUD), a chronic disease, is a major public health problem. Despite availability of effective treatment, too few people receive it and treatment retention is low. Understanding barriers and facilitators of treatment access and retention is needed to improve outcomes for people with OUD.

Objectives: To assess 3-month outcomes pilot data from a patient-centered OUD treatment program that utilized flexible treatment requirements and prioritized engagement over compliance.

Methods: Forty patients (62.5% female) receiving medication to treat OUD at all levels of care were enrolled in an observational study. Patients could select or decline case management, counseling, and peer recovery groups. Substance use, risk and protective factors, and recovery capital were measured at intake and 3 months.

Results: Most participants reported increased recovery capital. The median Assessment of Recovery Capital (ARC) score went from 37 at enrollment to 43 ($p < 0.01$). Illegal drug use decreased, with the median days using illegal drugs in the past month dropping from 10 to 0 ($p < 0.001$). Cravings improved: 29.2% reported no cravings at intake and 58.3% reported no cravings at 3 months ($p < 0.001$). Retention rate was 92.5% at 3 months. Retention rate for participants who were not on probation/parole was higher (96.9%) than for those on probation/parole (62.5%, $p = 0.021$).

Conclusion: This study shows preliminary evidence that a care model based on low-barrier access and strategies to improve treatment retention improves recovery capital, reduces illegal drug use and cravings, and retains people in treatment.

Background

The United States has experienced a dramatic increase in opioid use. Deaths due to opioid-related overdose have risen across the country over the past 20 years, with over 47,000 overdose deaths involving an opioid in 2017(1). In 2018, 2 million Americans had an opioid use disorder (OUD)(2). Although a national reporting system does not exist, estimates are that 32,000 US babies born in 2014 experienced neonatal opioid withdrawal syndrome, also called neonatal abstinence syndrome(3).

A number of factors contributed to a more widespread use of prescription opioid pain relievers as well as opioid addiction. These include increased emphasis on treating pain(4), payment models that favor prescriptions over other pain management modalities, a failure to fully appreciate the risks of long-term opioid use(5), and aggressive pharmaceutical marketing(6, 7).

In 2017, the United States Department of Health and Human Services declared the Opioid Crisis a public health emergency and recommended a 5-point strategy to combat it: 1) Improve access to prevention, treatment, and recovery support services; 2) Target the availability and distribution of overdose-reversing

drugs; 3) Strengthen public health data reporting and collection; 4) Support cutting-edge research on addiction and pain; and 5) Advance the practice of pain management(8). A critical component of the nation's response to this devastating epidemic is improving access to treatment and recovery services. Access is a key point because effective treatment exists, but it is underutilized. Data from the National Survey on Drug Use and Health(2) show that fewer than 20% of people who identify as having an OUD get treatment.

Barriers to accessing care are an important aspect of why treatment rates are so low. Access depends on a number of variables, including an available prescriber within a reachable distance; transportation to and from appointments; time from work to attend appointments; insurance or other resources to cover the cost of appointments, lab tests, and medication; and willingness/capacity to seek care despite existing stigma. Addressing each of these components of access requires different solutions and varies for different populations. Some solutions (e.g. transportation) are local while others (e.g. stigma) are more universal.

Agencies including the Substance Abuse and Mental Health Services Agency (SAMHSA), the American Academy of Addiction Psychiatry/Providers Clinical Support System (AAAP/PCCS), and others have worked to increase the number of prescribers with a Drug Enforcement Agency (DEA) waiver for prescribing buprenorphine as part of office-based treatment of OUD. Passage of the Substance Use Disorder Prevention that Promotes Opioid Recovery and Treatment (SUPPORT) for Patients and Communities Act of 2018(9) allows prescribers with a DEA waiver to treat more patients by increasing the patient panel size for prescribers. Nevertheless, there is still a shortage of providers who have a DEA waiver [needs ref]. This shortage is especially true in rural communities, where medical provider shortages were a challenge even before the opioid epidemic hit. In 2017, 42% of all US counties had no prescriber with a DEA waiver, and of those, the majority (69%) were rural counties(10). For example, according to SAMHSA's database of US providers with a DEA waiver, 61 (mainly rural) of Iowa's 99 counties do not have a waived prescriber(11). And a report in 2019 showed that 19.3% of Iowa's population lives in a county with no access to buprenorphine(12).

Increasing the number of prescribers who have a DEA waiver is a critical step, but in order to improve access to care, prescribers must use their waiver by prescribing buprenorphine to patients with OUD. Much room for improvement remains, as only 5% of physicians have a waiver(13), and most (72%) prescribers who have a waiver have a panel size limit of 30 patients(11, 14). Furthermore, not all prescribers with a waiver have ever used it, and 48% of prescribers who have used their waiver have prescribed for 5 or fewer patients(15, 16).

At treatment initiation, access is important because it enables people with OUD to get connected to a care provider, to receive medications and treatment recommendations, and to develop goals and a plan for ongoing management. After treatment initiation, a key component to successful outcomes is continuation of treatment. A recent study showed that medication for addiction treatment (MAT) reduced mortality rates for people with OUD by 80%, but this benefit occurred as long as the person remained in

treatment(17). Relapse risk and mortality rates increase after treatment ends, so in order to sustain desired outcomes from treatment, it is critical to keep people actively engaged. Despite the importance of treatment retention, a systematic review of 55 articles from randomized controlled trials looking at treatment retention with MAT found a wide variability in treatment retention rates, with 6-month treatment retention rates ranging from 3%-88%(18).

Successful treatment should include approaches to enhance treatment retention and low-barrier pathways for re-entering treatment when recovery has been interrupted. As OUD is a chronic health condition, symptom recurrence is common and too often leads to substance reuse and treatment termination. A person with diabetes who eats a candy bar or has an elevated hemoglobin A1c would likely receive dietary counseling and a medication adjustment, but a person in treatment for a SUD is more likely to be discharged from treatment if they use a substance or have a positive urine drug test(19). Understanding the components of treatment and recovery services that increase treatment retention and reduce barriers to treatment re-entry are needed to improve outcomes for people with OUD.

In this study we sought to assess 3-month outcomes from a patient-centered practice that included MAT with buprenorphine or naltrexone plus the option to participate in psychosocial treatments. The psychosocial treatments included case management, psychotherapy, peer recovery groups such as Narcotics Anonymous or Smart Recovery, or peer support through a local harm reduction program. We hypothesized that patients were more likely to remain in treatment if participation in one or more psychosocial treatments was optional rather than required. We also hypothesized that allowing patients to continue in treatment even if they used a substance or had a relapse would increase treatment retention. As expected, this patient-centered program had a high rate of treatment retention at 3 months. In addition, drug use decreased, and patients reported improvement in their ability to access the personal, family and community resources needed to find and maintain recovery, also called recovery capital.

Methods

Participants

Study participants were recruited from the University of Iowa (UI) MAT Clinic. The UI MAT Clinic is located in an academic medical center in Iowa City (Iowa) and provides outpatient care to adults who have OUD and who are receiving MAT with buprenorphine or naltrexone.

This study's inclusion criteria were people who have OUD and are receiving MAT with buprenorphine or naltrexone; age 18 years and older; and able to speak English well enough to participate in case management and complete study surveys. Not intending to continue care in the clinic for at least the next 6 months was the exclusion criterion.

Setting

Study participants were self-referred to the UI MAT clinic or referred by a provider or after presenting to the hospital's emergency department (ED) in opioid withdrawal and starting buprenorphine. In addition, UI MAT clinic staff partnered with community representatives from law enforcement, community corrections, social service agencies, healthcare providers, and a harm reduction organization to promote referrals to the clinic. The providers in this clinic included physicians, nurses, social workers, addiction counselors, and case managers. In addition, resident physicians from psychiatry and family medicine rotated in this clinic, spending between 1 and 12 months on an addiction medicine rotation.

Insert Fig. 1 here

As seen in Fig. 1, patients initiating care at the UI MAT Clinic underwent a diagnostic evaluation, which included a complete medical, psychiatric, and substance use history, an examination, diagnostic determination, discussion of options including risks and benefits, shared decision making and development of a treatment plan. Patients with OUD were offered MAT with buprenorphine or naltrexone; a prescription for naloxone and instructions on how to use it to treat opioid overdose; and linkage with a clinic case manager. Patients also received information about local resources including counseling, mutual support groups, and a harm reduction organization. Patients met with a case manager at the end of each clinic visit to discuss treatment goals and recovery supports, and to schedule follow up appointments. In between appointments, case managers were available by phone or text so patients had easy access if they had questions or experienced unexpected developments (e.g. change in health insurance, housing, or transportation) that could interfere with treatment adherence.

Clinic staff saw patients weekly at the beginning of treatment. The duration between follow-up visits was gradually increased as their recovery stabilized. At each visit, the treatment team assessed risk for return to drug use, HIV, hepatitis C, pregnancy, medical and psychiatric co-morbidities, and overdose. When indicated, testing, referral, prevention, and treatment were offered.

When a patient missed an appointment, the case manager called or texted them to find out what happened, to assess for medication refill needs, and to assist with rescheduling. Maintaining medication adherence was prioritized. If a patient missed multiple appointments, the case manager worked with them to identify and overcome barriers to attending appointments. The clinic had a written policy stating patients could be dismissed from the clinic if they did not attend appointments or if they engaged in problematic behavior such as threatening staff or selling their MAT medication, however this policy rarely needed to be utilized.

Patients could participate in additional services at the MAT clinic, including the dual diagnosis partial hospital program, the intensive outpatient program, counseling, or other relapse prevention services. Mutual support groups such as Narcotics Anonymous and Alcoholics Anonymous were available in the hospital and at nearby locations. The Clinic provided information about local meeting times and places and encouraged using this support if patients believed it was helpful to their recovery. Patients received information about a local harm reduction organization that offered peer support services as well as harm

reduction services (e.g. naloxone distribution, fentanyl test kits for drugs, hepatitis C testing). The harm reduction organization also referred patients to the clinic.

Several evidence-based practices were incorporated into the care offered in the MAT clinic, to supplement the medications for addiction treatment. All providers had training in motivational enhancement therapy, and this approach was utilized during evaluation, treatment planning, and monitoring at follow up visits. When patients were not meeting treatment goals, additional treatment options were discussed, such as adding counseling or increasing the level of care.

It was expected that patients would continue receiving MAT and participating in the MAT clinic for as long as they found it beneficial to their recovery. Some patients expressed an interest in tapering or discontinuing their medication as one of their goals; others intended to remain in treatment indefinitely. Either way, case managers and physicians supported each patient's goals regarding treatment duration and assisted them in planning their recovery over the short and long term.

Procedures and Evaluations

This study was approved by the University of Iowa Institutional Review Board for Human Subjects Research. All study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at the University of Iowa(20, 21).

To recruit participants for this study, the case manager introduced the opportunity to participate to patients during a clinic visit. Patients were given a copy of the study consent form to review while they considered participating. If they decided to participate, the case manager reviewed the consent document and obtained informed consent. Patients who initially declined to participate in the study could opt to enroll at a subsequent appointment. After informed consent was obtained, the case manager enrolled the participant into the study. During the study period, 141 unique patients were seen in the clinic and 40 patients consented to participate in the study, as shown in Fig. 2.

Insert Fig. 2 here

Following enrollment, participants completed a thorough contact information form, the Government Performance and Results Modernization Act of 2010(22) (GPRA) tool, a previous drug use survey, the Brief Addiction Monitor (BAM) to assess recent drug use, risk factors for relapse, and protective factors for recovery; and the Assessment of Recovery Capital(23) (ARC).

Next, the case manager reviewed the ARC scores with the study participant and selected 2–3 domains with the lowest scores to guide selection of resources and services to be provided during treatment.

Throughout participation in the study, participants continued to receive treatment for OUD in the MAT clinic. Study participants who, at any point, were not meeting treatment goals and had barriers to accessing counseling were invited to utilize a web-based counseling program, Computer Based Training for Cognitive Behavior Therapy (CBT4CBT)(24). This self-guided, interactive web-based program has

been shown to teach cognitive behavioral skills for reducing and managing substance use. In order to receive CBT4CBT, participants had to have access to a computer or smartphone with internet capabilities; the cost of the program was covered by a grant.

Three months following enrollment into the study, the case manager met with each participant to complete a care coordination form, list services that had been provided over the past 3 months and identify which services would be provided in the coming 3 months. The care manager re-administered the GPRA, BAM, and ARC assessments. The participant also completed a Service and Satisfaction Scale that was developed for this project, to obtain feedback about the care and services received.

Statistical Methods

Data are described using medians and proportions. Categorical data were analyzed using the Fisher exact test and McNemar's test for before and after comparisons. Baseline and 3-month continuous outcomes were compared using the exact Wilcoxon signed-rank test.

All analyses were performed using R 3.6.1(25) and R packages janitor(26), tidyverse(27), and coin(28). All the p-values reported are 2-tailed. Significance level was set at $p < 0.05$.

Results

Participants characteristics

A total of 40 participants out of whom 25 (62.5%) self-identified as females participated in the study. The participants had a mean age of 35.7 years (sd = 9.5 years). The youngest participant was 22 and the oldest was 64 years old. Racial, ethnic, and education characteristics are detailed in Table 1. About a quarter of the sample (n = 11, 27.5%) resided in rural Iowa counties, 32.5% (n = 13) were employed full-time, 12.5% (n = 5) were employed part-time, and 52.5% (n = 21) were unemployed. At baseline, 52.5% (n = 21) participants rated their overall health as good or very good and 19 participants as fair or poor. None of the participants indicated their overall health was excellent. Of the 40 study participants, 19 received psychiatric treatment from their MAT provider.

Table 1

Race	n	%
White	32	80.0
Hispanic	1	2.5
Asian	1	2.5
Alaskan	1	2.5
African American	5	12.5
Education		
Less than High School	5	12.5
High School	11	27.5
Some College	18	45.0
Bachelor's	3	7.5
Vocational or Technical Diploma	3	7.5

Insert Table 1 here

Treatment Outcomes

Thirty-seven (92.5%) participants were retained in treatment for three months. Retention rate was significantly higher for participants who were not on probation or parole (31 out of 32 participants retained, 96.9% 3-month retention rate), when compared to participants on probation or parole (5 out of 8 participants retained, 62.5% 3-month retention rate, Fisher Exact test $p = 0.021$).

Addiction-Related Outcomes

For the participants that completed three months of treatment ($n = 37$), ARC scores improved at the 3-month visit. The median ARC at intake was 37, while the median at 3-months was 43 (Exact Wilcoxon Signed-Rank Test $z = -2.6$, $p < 0.01$, Fig. 3a).

Insert Fig. 3 here

When past 30-day use of illegal drugs was evaluated, there was a significant reduction in the number of days during which participants used these substances. The median number of days participants used illegal drugs at intake was 10 days versus 0 day at 3-months (Exact Wilcoxon Signed-Rank Test $z = 3.2$, $p < 0.001$, Fig. 3b).

Of the 37 people with both intake and 3-month thirty-day abstinence for illegal drugs, 15 (40.5%) were abstinent at intake. At 3-month follow-up, 23 (62.2%) were abstinent (Exact McNemar's Test chi-squared = 5.3, $p = 0.039$).

Due to a delay in implementing the BAM among assessments, from the 37 patients who completed the three months of treatment, there were only 24 participants with the BAM data at intake and 3 months. For the BAM's question "In the past 30 days, how much were you bothered by cravings or urges to drink alcohol or use drugs?", there was a significant reduction in past 30-day craving between the intake and 3-month visits. Of the 24 people with complete data, at intake, 29.2% answered "Not at All" when asked about cravings at intake while, at 3-months, 58.3% had no cravings (Exact Wilcoxon Signed-Rank $z = 3.54$, $p < 0.001$, Fig. 4a).

Insert Fig. 4 here

General Outcomes

After 3 months of treatment, participants were more likely to consider they had enough money to meet their needs (Exact Wilcoxon Signed Rank $z = -2.27$, $p = 0.02$, Fig. 4b). However, there was no significant evidence that the participant's employment status (Exact McNemar's chi-squared = 3.27, $p = 0.12$) or overall health (Exact Wilcoxon Signed Rank $z = 0.45$, $p = 0.69$) improved after 3 months of treatment.

Discussion

This study shows that people with OUD can achieve a high treatment retention rate, cut down their use of illicit drugs, and build their recovery capital. More than half (62.2%) of the study participants were abstinent from substance use during this study, but some (37.8%) participants used opioids or other substances during the study. Continued use was not a criterion for terminating treatment. Despite relapses, over 90% of participants in this study remained in treatment for OUD at 3 months. During their treatment, participants reported significant improvements in recovery capital, fewer cravings to use opioids, and reduced use of other illicit drugs.

Treatment retention with MAT is important because it has been linked to substantial reductions in both all-cause and overdose-related mortality in people with OUD(29). Understanding what optimizes treatment retention is critical to implementing programs that are successful in keeping people in treatment. In a systematic review looking at OUD treatment retention, MAT with methadone, buprenorphine, or naltrexone was highly associated with increased treatment retention(18). In this review, retention rates across different treatment settings were extremely variable. Between 19% and 94% of people who initiated MAT for OUD remained in treatment at 3 months, with an average of 62% retained at 3 months across studies. At 92.5%, our study's 3-month retention rate is comparable to the highest performing studies in the systematic review.

The role of psychosocial or behavioral treatment in promoting treatment retention in office-based settings is unclear, as there are few studies examining this issue and some studies have reported conflicted findings. A systematic review of 8 randomized clinical trials evaluating MAT with buprenorphine, with or without various behavioral interventions, found 4 studies showed benefit and 4 studies did not(30). Three of the four studies that found benefit used a contingency management-based intervention(31–34). While

there may be some value added by offering psychosocial and behavioural treatments with MAT for OUD, and some patients may wish to incorporate these treatments into their overall care plan, current data do not support requiring its use. Our study used a patient-centered approach, whereby participants were offered psychosocial or behavioural treatments such as cognitive behaviour therapy-based group psychotherapy and peer support groups, and motivational enhancement therapy was utilized during medication management to assist with overcoming barriers to recovery, but these interventions were not a required component of treatment.

Mental illness (MI) frequently co-occurs with SUDs and is a risk factor for treatment non-completion and early departure from treatment(35). Integrating psychiatric treatment with SUD treatment leads to improved outcomes in general, and may lead to higher rates of treatment completion, compared to treating SUD and MI separately(36). For patients with OUD who are receiving MAT, MI does not appear to have a measurable impact on OUD treatment retention(37), but integrated treatment for MI and OUD improves MI treatment initiation and mental health outcomes(38). In our study, most of the MAT providers were also psychiatrists, and study participants could receive integrated treatment for co-occurring MI if needed.

Among people with a SUD, ongoing substance use is a risk factor for adverse health outcomes(39), so it stands to reason that reducing or stopping substance use would improve health. People who cut back or stop using substances have less adverse consequences of drug use such as mental health symptoms or impairment(40), have improved social and family functioning(41), and are less likely to engage in criminal behaviour(42). In a study of outcomes for people with OUD, reductions in regular heroin use were strongly associated with reductions in crime(42). Other studies have shown that reductions in cocaine use are associated with reductions in crime(43, 44). Reducing substance use has been shown to improve adolescents' school attendance(45). Because of its positive effects on health, reducing or abstaining from substance use is a treatment target for people with OUD. In our study, 40.5% of participants reported no substance use for the past 30 days at intake, and that increased to 62.2% at 3 months. Importantly, while 30-day abstinence from substance use increased over the 3-month period, persistent substance use did not prompt treatment termination. Applying a chronic disease model approach, when symptoms persist, the appropriate response is to continue or adjust treatment, not discharge from care. Furthermore, this approach also supports treatment retention. We followed this approach, which could be part of why the retention rate is in the high end for OUD treatment.

Cravings preoccupy the mind and distract from other thoughts and activities that can strengthen recovery. Cravings are hypothesized to play a central role in relapse to opioid use(46). Reduced cravings is a primary treatment target when treating OUD, as cravings predict relapse of opioid use(47). Buprenorphine, the medication prescribed to most patients at the UI MAT clinic, has been shown to significantly reduce cravings for opioids(47). We titrated buprenorphine doses to control cravings. At intake, nearly a third of participants in our study reported no cravings to use opioids. By 3 months, the number of people reporting no cravings doubled.

Psychosocial treatments also aim to help people manage cravings by identifying and avoiding triggers that cause cravings and building skills to redirect thoughts and behaviors away from using an opioid to satisfy a craving. It is unclear to what extent reducing cravings leads to increased retention versus retention in treatment drives reductions in cravings, although both effects are likely to play a role. Our study demonstrated a reduction in cravings and a high rate of treatment retention, but it was not designed to further characterize the relationship between these two outcomes.

Another component of treatment retention is the building of recovery capital. Recovery capital includes skills and attitudes related to confidence, self-efficacy, and support system. Recovery capital predicts sustained recovery, enhances life satisfaction, and enhances ability to cope with stress [ref]. Early successes in recovery help to increase a sense of confidence in one's ability to build their recovery. In our study, recovery capital, as measured by the ARC score, increased for most participants between intake and 3 months. Despite a decrease in the ARC score for 10 participants and a small sample size in our study, there was still a statistically significant increase in the mean ARC score overall. Over a 3-month period, our study found improvements in recovery capital, reduced cravings, and reduced substance use, all of which likely contribute to a high rate of treatment retention.

Limitations

Our results should be interpreted considering this study's limitations. All study participants received treatment for opioid use disorder, but forty percent of participants in this study reported no illicit drug use in the 30 days prior to enrollment. Some patients transferred care from another provider and were already in recovery at the time of enrollment, and some patients chose to get started in treatment and then consented to study participation later.

We measured treatment retention and other outcomes for 3 months, but as treatment retention is associated with reduced mortality(17), treatment retention should be measured in years, not months. Longer duration of treatment, however, is built on a foundation of early treatment retention.

Our study showed high rates of treatment retention at 3 months. Treatment retention in the initial months of MAT is critical to achieving higher rates of treatment retention later. Several studies have demonstrated that treatment discontinuation is highest during the first month of treatment(48, 49). Focusing on early treatment retention may help people with OUD to overcome causes of early treatment discontinuation and lead to higher rates of long-term treatment retention.

As a single-site study, reproducibility was not proven and effects sizes could be larger than those expected in a multi-site trial, but many of the components of the treatment program are widely available(50, 51) and can be replicated in other sites. Our sample does not reflect the US population, primarily because Iowa's population is less diverse than the country's overall. While the study population has less racial and ethnic diversity than the general population, people living in rural areas are well-represented in this study. Access to SUD treatment and MAT is a challenge in many rural communities

across the country so understanding the experience of care for people living in rural communities is relevant.

This study will continue to follow patients up to 3 years. The rather small sample size of 40 reflects recruitment during the first year for this study, follow-up publications will incorporate data from the whole sample. Since our early treatment retention rate was higher than usually reported, we consider these preliminary results can contribute significantly to the OUD treatment field. Our study supports previous findings showing that evidence-based treatment (in particular MAT), offering but not requiring less proven treatment approaches (e.g., psychosocial treatment), and continuing treatment even when all treatment goals (e.g., 30-day substance use abstinence) are not met continuously can achieve high rates of success with treatment retention and other associated outcomes.

Next steps

Our study demonstrates that high rates of treatment retention during the first three months of recovery are achievable. Further study is needed to determine which variables improve early treatment retention, whether these increased rates of treatment retention can be sustained during the later stages of recovery, and whether these results can be replicated in other sites and patients with different characteristics. Further disentangling the mechanisms behind optimizing recovery and treatment retention is warranted.

Conclusions

This study demonstrates that people receiving MAT for OUD can have high rates of treatment retention, reduce their substance use, and build recovery capital. Factors that likely contribute to treatment success include prioritizing treatment retention, using patient-centered treatment planning, and integrated treatment for co-occurring disorders. Increased utilization of MAT and interventions that enhance treatment retention and recovery are critical to ending the opioid crisis.

Abbreviations

Opioid use disorder (OUD)

Substance use disorder (SUD)

Assessment of Recovery Capital (ARC)

Substance Abuse and Mental Health Services Agency (SAMHSA)

American Academy of Addiction Psychiatry (AAAP)

Providers Clinical Support System (PCSS)

Drug Enforcement Agency (DEA)

Substance Use Disorder Prevention that Promotes Opioid Recovery and Treatment (SUPPORT)

Medications for Addiction Treatment (MAT)

University of Iowa (UI)

Emergency Department (ED)

Research Electronic Data Capture (REDCap)

Government Performance and Results Act (GPRA)

Brief Addiction Monitor (BAM)

Computer Based Training for Cognitive Behavior Therapy (CBT4CBT)

Mental Illness (MI)

Declarations

Ethics approval and consent to participate

This study was approved by the University of Iowa Institutional Review Board.

Consent for publication

Not applicable

Availability of data and materials

The datasets analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors report no relevant disclosures.

Funding

This work was supported by the University of Iowa Carver College of Medicine Department of Psychiatry and the Substance Abuse and Mental Health Services Agency (SAMHSA), under grant SAMHSA 1H79TI081620-01.

Authors' Contributions

AL, SH, SS, and SA conceived of and designed the study. AL, SS, and AW implemented the study. SS and SH led data collection. SH, SA, and LA analysed and interpreted the data. AL, SA, and LA prepared the

manuscript. All authors read and approved the final manuscript.

Acknowledgements

Not applicable

References

1. CDC/NCHS. National Vital Statistics System, Mortality. Atlanta, GA, CDC WONDER, US Department of Health and Human Services; 2018.
2. Substance Abuse and Mental Health Services Administration. Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health (HHS Publication No. PEP19-5068, NSDUH Series H-54). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. 2019 Retrieved from <https://www.samhsa.gov/data/>.
3. Jilani SM, Frey MT, Pepin D, Jewell T, Jordan M, Miller AM, Robinson M, St Mars T, Bryan M, Ko JY, Ailes EC, McCord RF, Gilchrist J, Foster S, Lind JN, Culp L, Penn MS, Reefhuis J. Evaluation of State-Mandated Reporting of Neonatal Abstinence Syndrome - Six States, 2013–2017. *MMWR Morb Mortal Wkly Rep.* 2019;68:6–10.
4. The use of opioids for the treatment of chronic pain. A consensus statement from the American Academy of Pain Medicine and the American Pain Society. *Clin J Pain.* 1997;13:6–8.
5. Centers for Disease C, Prevention. Vital signs: overdoses of prescription opioid pain relievers—United States, 1999–2008. *MMWR Morb Mortal Wkly Rep.* 2011;60:1487–92.
6. Hadland SE, Rivera-Aguirre A, Marshall BDL, Cerdá M. Association of Pharmaceutical Industry Marketing of Opioid Products With Mortality From Opioid-Related Overdoses. *JAMA Network Open.* 2019;2:e186007–7.
7. Chisholm-Burns MA, Spivey CA, Sherwin E, Wheeler J, Hohmeier K. The opioid crisis: Origins, trends, policies, and the roles of pharmacists. *American journal of health-system pharmacy: AJHP : official journal of the American Society of Health-System Pharmacists.* 2019;76:424–35.
8. Services USDoHaH. Opioid Crisis is a Public Health Emergency. 2017.
9. US Congress: Substance Use-Disorder Prevention that Promotes Opioid Recovery and Treatment for Patients and Communities Act. 115th Congress; 2018, Oct. 24. pp. 115–271, Public Law.
10. Andrilla CHA, Moore TE, Patterson DG, Larson EH. Geographic Distribution of Providers With a DEA Waiver to Prescribe Buprenorphine for the Treatment of Opioid Use Disorder: A 5-Year Update. *J Rural Health.* 2019;35:108–12.
11. SAMHSA. Practitioner and Program Data. 2020.
12. Arndt S, Hedden S. Iowa Access to Medication-Assisted Treatment for Opioid Use Disorder by County. 2019.

13. Rosenblatt RA, Andrilla CH, Catlin M, Larson EH. Geographic and specialty distribution of US physicians trained to treat opioid use disorder. *Ann Fam Med*. 2015;13:23–6.
14. Grimm CA. Geographic Disparities Affect Access to Buprenorphine Services for Opioid Use Disorder. Edited by General UDoHaHSOol2020.
15. Sigmon SC. The untapped potential of office-based buprenorphine treatment. *JAMA Psychiatry*. 2015;72:395–6.
16. Jones CM, McCance-Katz EF. Characteristics and prescribing practices of clinicians recently waived to prescribe buprenorphine for the treatment of opioid use disorder. *Addiction*. 2019;114:471–82.
17. Krawczyk N, Mojtabai R, Stuart EA, Fingerhood M, Agus D, Lyons BC, Weiner JP, Saloner B. Opioid agonist treatment and fatal overdose risk in a state-wide US population receiving opioid use disorder services. *Addiction*. 2020.
18. Timko C, Schultz NR, Cucciare MA, Vittorio L, Garrison-Diehn C. Retention in medication-assisted treatment for opiate dependence: A systematic review. *J Addict Dis*. 2016;35:22–35.
19. White WL, Scott CK, Dennis ML, Boyle MG. It's Time to Stop Kicking People Out of Addiction Treatment. *Counselor (Deerfield Beach)*. 2005;6:12–25.
20. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377–81.
21. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, McLeod L, Delacqua G, Delacqua F, Kirby J, Duda SN, Consortium RE. The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform*. 2019;95:103208.
22. Substance Abuse Mental Health Services Administration. CSAT-GPRA Core Client Outcome Measures. Rockville, MD, Substance Abuse Mental Health Services Administration; 2017.
23. Groshkova T, Best D, White W. The Assessment of Recovery Capital: properties and psychometrics of a measure of addiction recovery strengths. *Drug Alcohol Rev*. 2013;32:187–94.
24. Carroll KM, Ball SA, Martino S, Nich C, Babuscio TA, Nuro KF, Gordon MA, Portnoy GA, Rounsaville BJ. Computer-assisted delivery of cognitive-behavioral therapy for addiction: a randomized trial of CBT4CBT. *Am J Psychiatry*. 2008;165:881–8.
25. R Core Team. R: A language and environment for statistical computer. Vienna, Austria, R Foundation for Statistical Computing 2019.
26. Firke S. janitor: Simple Tools for Examining and Cleaning Dirty Data. R package version 1.2.0; 2019.
27. Wickham H, Averick M, Bryan J, Chang W, McGowan L, Francois R, Grolemund g, Hayes A, Henry L, Hester J, Kuhn M, Lin Pedersen T, Miller E, Milton Bache S, Muller K, Ooms J, Robinson D, Seidel DP, Spinu V, Takahashi K, Vaughan D, Wilke C, Woo K, Yutani H. Welcome to Tidyverse. *JOSS, Journal of Open Source Software*. 2019;4:1686.
28. Hothorn T, Hornik K, van de Wiel MA, Zeileis A. Implementing a class of permutation tests: The coin package. *J Stat Softw*. 2008;28:1–23. <https://doi.org/10.18637/jss.v18028.i18608>.

29. Schuckit MA. Ethanol-induced changes in body sway in men at high alcoholism risk. *Arch Gen Psychiatry*. 1985;42:375–9.
30. Carroll KM, Weiss RD. The Role of Behavioral Interventions in Buprenorphine Maintenance Treatment: A Review. *Am J Psychiatry*. 2017;174:738–47.
31. Bickel WK, Marsch LA, Buchhalter AR, Badger GJ. Computerized behavior therapy for opioid-dependent outpatients: a randomized controlled trial. *Exp Clin Psychopharmacol*. 2008;16:132–43.
32. Christensen DR, Landes RD, Jackson L, Marsch LA, Mancino MJ, Chopra MP, Bickel WK. Adding an Internet-delivered treatment to an efficacious treatment package for opioid dependence. *J Consult Clin Psychol*. 2014;82:964–72.
33. Miotto K, Hillhouse M, Donovan R, Cunningham-Rathner J, Charuvastra C, Torrington M, Esagoff AE, Ling W. Comparison of buprenorphine treatment for opioid dependence in 3 settings. *J Addict Med*. 2012;6:68–76.
34. Schottenfeld RS, Chawarski MC, Pakes JR, Pantaloni MV, Carroll KM, Kosten TR. Methadone versus buprenorphine with contingency management or performance feedback for cocaine and opioid dependence. *Am J Psychiatry*. 2005;162:340–9.
35. Andersson HW, Steinsbekk A, Walderhaug E, Otterholt E, Nordfjærn T. Predictors of Dropout From Inpatient Substance Use Treatment: A Prospective Cohort Study. *Substance Abuse: Research Treatment*. 2018;12:1178221818760551.
36. Kelly TM, Daley DC. Integrated treatment of substance use and psychiatric disorders. *Social work in public health*. 2013;28:388–406.
37. Astals M, Díaz L, Domingo-Salvany A, Martín-Santos R, Bulbena A, Torrens M. Impact of co-occurring psychiatric disorders on retention in a methadone maintenance program: an 18-month follow-up study. *Int J Environ Res Public Health*. 2009;6:2822–32.
38. King VL, Brooner RK, Peirce J, Kolodner K, Kidorf M. Challenges and outcomes of parallel care for patients with co-occurring psychiatric disorder in methadone maintenance treatment. *J Dual Diagn*. 2014;10:60–7.
39. Scott CK, Dennis ML, Laudet A, Funk RR, Simeone RS. Surviving drug addiction: the effect of treatment and abstinence on mortality. *Am J Public Health*. 2011;101:737–44.
40. Kulhalli V, Isaac M, Murthy P. Cannabis-related psychosis: Presentation and effect of abstinence. *Indian J Psychiatry*. 2007;49:256–61.
41. Liepman MR, Nirenberg TD, Doolittle RH, Begin AM, Broffman TE, Babich ME. Family functioning of male alcoholics and their female partners during periods of drinking and abstinence. *Fam Process*. 1989;28:239–49.
42. Gossop M, Marsden J, Stewart D, Rolfe A. Reductions in acquisitive crime and drug use after treatment of addiction problems: 1-year follow-up outcomes. *Drug Alcohol Depend*. 2000;58:165–72.
43. Hubbard RL, Craddock SG, Flynn PM, Anderson J, Etheridge RM. Overview of 1-year follow-up outcomes in the Drug Abuse Treatment Outcome Study (DATOS). *Psychol Addict Behav*. 1997;11:261–78.

44. Hubbard RL, Marsden ME, Rachal JV, Harwood HJ, Cavanaugh ER, Ginzburg HM. Drug Abuse Treatment: A National Study of Effectiveness. London: Chapel Hill; 1989.
45. Engberg J, Morral AR. Reducing substance use improves adolescents' school attendance. *Addiction*. 2006;101:1741–51.
46. Tiffany ST, Wray JM. The clinical significance of drug craving. *Ann N Y Acad Sci*. 2012;1248:1–17.
47. Tsui JI, Anderson BJ, Strong DR, Stein MD. Craving predicts opioid use in opioid-dependent patients initiating buprenorphine treatment: a longitudinal study. *Am J Drug Alcohol Abuse*. 2014;40:163–9.
48. Hser YI, Saxon AJ, Huang D, Hasson A, Thomas C, Hillhouse M, Jacobs P, Teruya C, McLaughlin P, Wiest K, Cohen A, Ling W. Treatment retention among patients randomized to buprenorphine/naloxone compared to methadone in a multi-site trial. *Addiction*. 2014;109:79–87.
49. Stein MD, Cioe P, Friedmann PD. Buprenorphine retention in primary care. *J Gen Intern Med*. 2005;20:1038–41.
50. Medicine ASoA. National Practice Guideline for the Treatment of Opioid Use Disorder. Rockville, MD2020.
51. D’Onofrio G, O’Connor PG, Pantalon MV, Chawarski MC, Busch SH, Owens PH, Bernstein SL, Fiellin DA. Emergency Department–Initiated Buprenorphine/Naloxone Treatment for Opioid Dependence: A Randomized Clinical Trial. *JAMA*. 2015;313:1636–44.

Figures

Figure 1—Clinic workflow

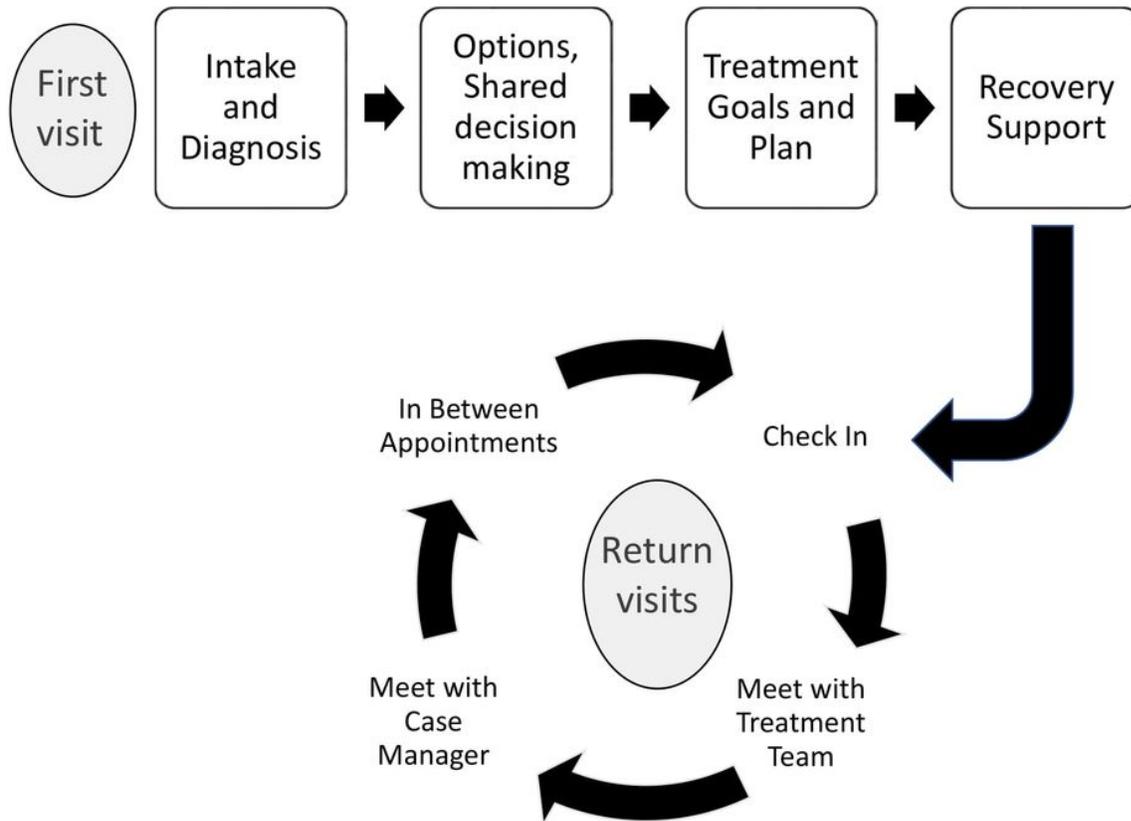


Figure 1

During the first visit to the clinic, patients undergo an intake and diagnosis, discuss and select treatment options, set goals, and work with a case manager to develop a recovery plan. Patients meet with the case managers at each visit and communicate with the case manager in between appointments.

Figure 2—Recruitment results

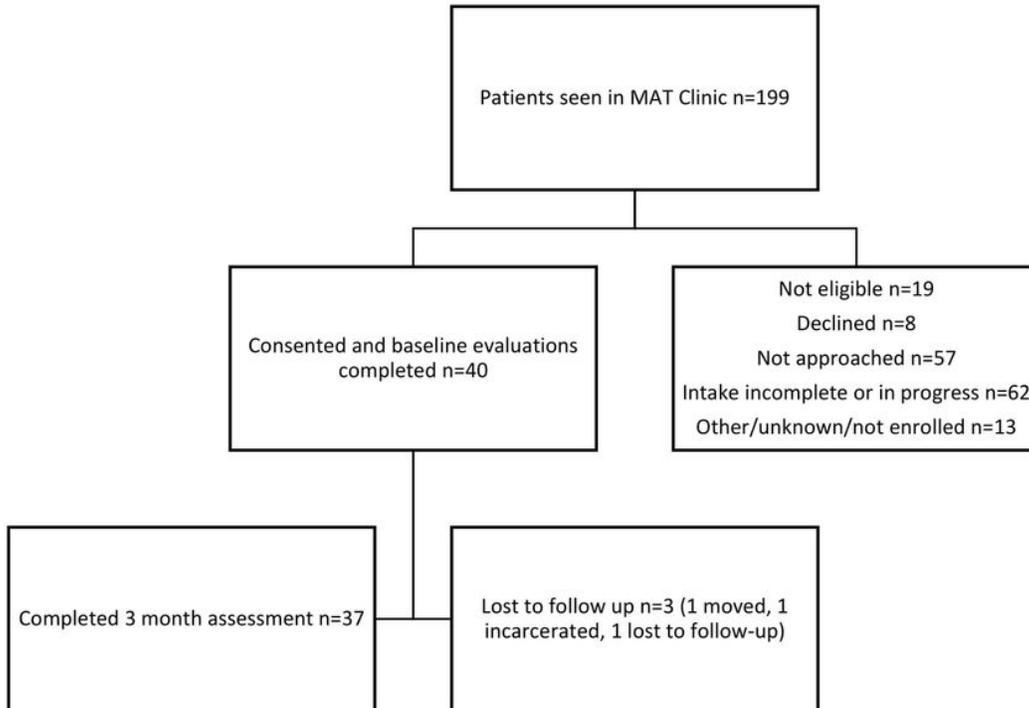


Figure 2

During the study period, 199 unique individuals were seen in the clinic. Of these, 40 were enrolled in the study, and 37 completed the 3-month assessment.

Figure 3 (3a and 3b)

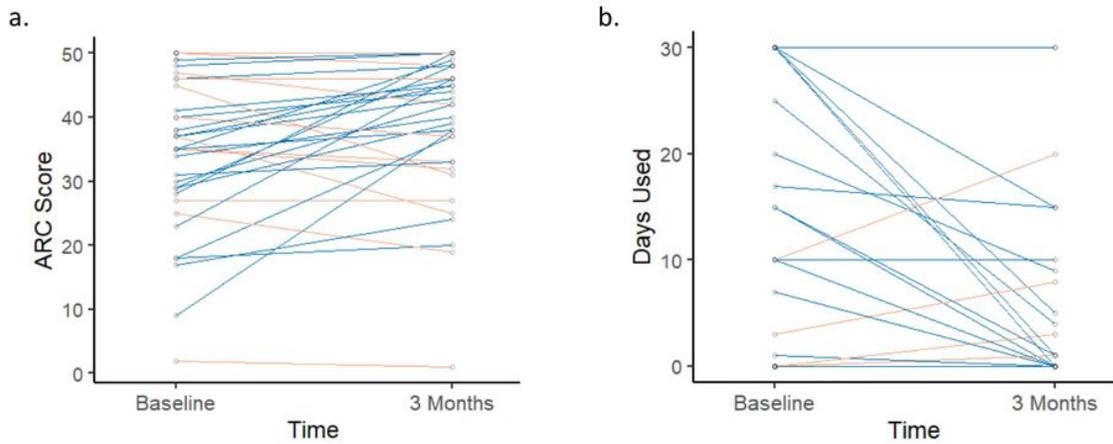


Figure 3

ARC scores for baseline and 3-month visits. Blue lines represent participants whose ARC scores improved (n = 23). Orange lines indicate people whose ARC score stayed the same (n = 4) or whose ARC score decreased (n = 10). Past 30-day illegal drug use at treatment intake and 3-month visits. Blue lines represent participants whose days of use decreased (n = 17) or stayed the same (n = 16). Orange lines indicate people whose days of use increased (n = 4).

Figure 4 (4a and 4b)

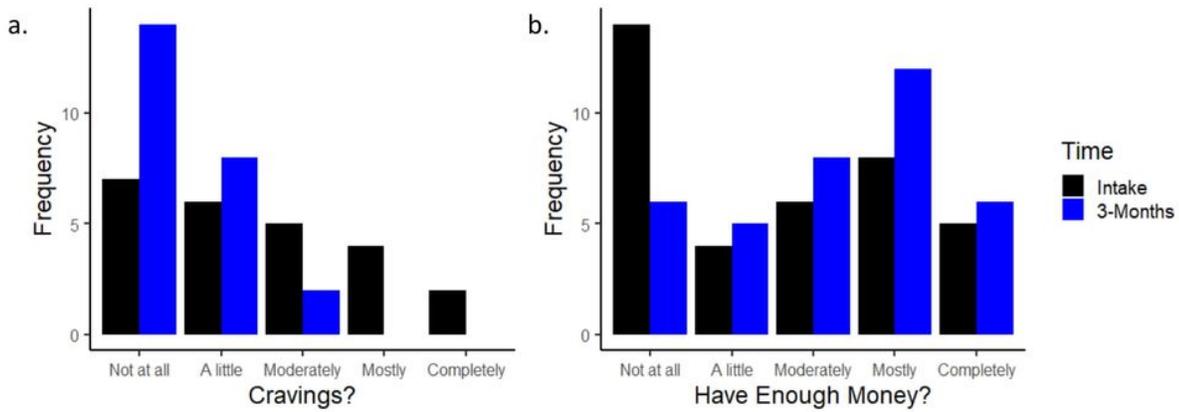


Figure 4

Past 30-day cravings at treatment intake (black bars) and 3-month visits (blue bars). Almost a third of participants answered that they had no cravings at intake. That amount doubled after 3 months of treatment. Participants at 3 months considered they had enough money to meet their needs more often than at treatment start.