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Treatment retention, return to use, and recovery support following COVID-19 relaxation of methadone take-home dosing in two rural opioid treatment programs: A mixed methods analysis

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ABSTRACT

Objectives: In March 2020, the Substance Abuse and Mental Health Services Administration permitted Opioid Treatment Programs (OTPs) to relax restrictions on take-home methadone and promoted telehealth to minimize potential exposures to COVID-19. We assessed the effects of COVID-19-related changes on take-home methadone dosing in two OTPs serving five rural Oregon counties.

Methods: We used a mixed-methods convergent design. The OTPs extracted urine drug test (UDT) results, take-home methadone regimens, and treatment retention from the electronic health record (EHR) for patients ($n = 377$). A mixed-effects negative binomial regression model assessed patient-level differences in take-home doses before and after the COVID-19 policy changes and the associations with treatment discontinuation, and UDT positivity. Semi-structured qualitative interviews ($n = 32$) explored patient reactions to increased take-home dosing and reduced clinic visits to provide context for quantitative findings.

Results: The number of take-home doses increased in the post-COVID-19 period for patients engaged in treatment for more than 180 days (median: 8 vs 13 take-home doses per month, $p = 0.011$). Take-homes did not increase for patients with fewer days of treatment. Each percentage point increase in take-home dosing above what would be expected without COVID-19 policy changes was negatively associated with the percent of UDT positive for opioids ($B = -0.12$, CI $[-0.21, -0.04]$, $p = 0.005$) and the probability of treatment discontinuation (aOR = 0.97, CI $[0.95, 0.99]$, $p = 0.003$). Qualitative analysis revealed three themes explaining how increased take-home dosing supported recovery: 1) value of feeling trusted with increased responsibility; 2) reduced travel time permitted increased employment and recreation; and 3) reduced exposure to individuals less stable in recovery and potential triggers.

Conclusions: Take-home methadone dose relaxations were associated with increased methadone take-home doses, improved retention, and decreased UDT opioid positive results among clinically stable patients. Qualitative findings suggest that fewer take-home restrictions are feasible and desirable and do not pose safety or public health harms.

1. Introduction

The Substance Abuse and Mental Health Services Administration (SAMHSA) released guidance (March 16, 2020) to State Opioid Treatment Authorities (SOTAs) that they could request blanket exceptions and permit opioid treatment programs (OTPs) to dispense additional

take-home methadone to improve treatment access and reduce COVID-19 transmission risk during the COVID-19 public health emergency. Federal regulations limit access to take-home medication based on the number of days in care and eight criteria that must be met to obtain additional take-homes (see summary in Table 1) and require documentation of rationale for increases or decreases in take-home dosing

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Table 1
Take-home restrictions and take-home considerations.

Duration of care	Number of take-home doses	Medical director must consider 8 criteria
1 to 90 days	Up to 1 per week	1. Absence of recent alcohol or drug use
91 to 180 days	Up to 2 per week	2. Clinic attendance pattern
181 to 270 days	Up to 3 per week	3. Co-morbid behavioral problems
271 to 365 days	Up to 6 per week	4. Recent criminal involvement
One year to two years	Up to 13 every two weeks	5. Home environment stability
More than 2 years	Up to 27 per month	6. Treatment duration
		7. Assurance of safe storage for take-homes
		8. Rehabilitative benefit exceeds the risk of diversion

regimens. Limited access to take-home methadone results in many patients attending clinic in-person five to six days per week and waiting in lines to receive their daily dose. Given concerns around congested settings at OTPs, SAMHSA relaxed limits on take-homes allowing “clinically stable patients” to receive up to 27 days and “less stable patients” to receive up to 13 days of take-homes (Kleinman, 2020).

Reports from 20 OTPs in Oregon documented a 50% reduction in monthly clinic visits and a 100% increase in number of take-home doses dispensed monthly (pre-COVID, the modal number of take-homes per patient was one, post-COVID the distribution was bimodal with peaks at one and 27 take-homes per patient) (McIlveen et al., 2021). Early reports in rural communities raised concerns about the negative impacts of COVID-19 on mental health and substance use (Stack et al., 2021). Travel time and distance from OTPs can be especially burdensome for patients with OUD living in rural communities (Hoffman et al., 2019; Joudrey et al., 2019; Joudrey et al., 2019; Kleinman, 2020; McCarty et al., 2021); fewer trips and reduced total travel time are potential benefits from the COVID-19 policy changes. The clinical and public health impacts of increased access to take-homes on patients and their recovery in OUD treatment, however, remain unknown. The purpose of our study is to assess patients' responses to the enhanced access to take-home methadone in two OTPs that served five Southern Oregon rural counties.

The two clinics followed SAMHSA guidelines and issued up to 27 days of take-home medications for “stable” clients despite time in treatment (i.e., negative UA for past 60 days, adherence to treatment plan for at least 60 days, no behavioral health difficulties, stable housing, no past diversion activity, safe medication storage). Working with the client and the client's counselor, they evaluated each patient's condition and issued up to 27 days of take-homes if deemed stable and the patient was comfortable with 27 take-homes (S. Denny, personal communication, March 7, 2022). SAMHSA also allowed for up to 13 days of take-homes for clients considered less stable (adherence to treatment plan for at least 30 days, absence of diversion activity, at least 30 days of negative toxicology screens). The clinics made decisions on a case-by-case basis. The COVID-19 take-home exception was mainly used for patients who tested positive for COVID, met the “less stable” criteria, and needed to distance from the clinic (S. Denny, personal communication, March 7, 2022).

2. Methods

We used a mixed methods convergent design to abstract and analyze quantitative data from electronic health records and qualitative data from semi-structured interviews with patient participants (Creswell & Creswell, 2018). A non-profit behavioral health and primary care center operated the two OTPs. The Oregon Health and Science University Institutional Review Board approved the study as a minimal risk intervention and permitted a verbal consent process for qualitative interviews.

2.1. Quantitative methods and analysis

OTP staff extracted electronic health record (EHR) data on monthly urine drug screens, admission date to the OTP, number of in-clinic and take-home doses per month and patient demographics (e.g., age, gender, race, ethnicity) and provided the study team with a deidentified dataset (please see consort diagram, Fig. 1).

2.1.1. Urine drug tests

Consistent with federal guidelines, patients provided random monthly urine drug tests (UDTs); EHR data included the monthly number of UDTs administered and the percent positive for opioid use. The study categorized a patient as having discontinued treatment if their last recorded methadone dose occurred during the COVID-19 study period (April 2020 to September 2020). Covariates included age, gender, days in treatment as of September 2019 (the beginning of the study period) or when they entered care, and patient's cumulative proportion of opioid positive UDT during the pre-COVID period. The analysis compared opioid positive drug test percentages before (September 1, 2019, to February 28, 2020) and after (April 1, 2020, to September 30, 2020) the SAMHSA policy relaxation. The study excluded March 2020 as the SAMHSA exception became effective mid-month. We restricted data to methadone patients ($n = 377$) who received methadone during the study period.

2.1.2. Pre-COVID-19 vs. post-COVID-19 analysis

The study compared proportion of take-home doses, opioid positive drug tests, and retention rates between pre- and post-COVID periods, stratified by time in treatment (0 to 90 days, 91 to 180 days, 181 days or more). The analysis included all patients who received methadone during the study period ($n = 377$). Time in treatment was a time-varying variable—someone could have been in treatment for fewer than 90 days during the pre-COVID period, and more than 90 days following the policy change, and “contributed” to both exposure categories. Our primary analysis estimated the effect of SAMHSA's blanket exception on opioid drug screen positivity rates and treatment discontinuation.

A mixed-effects negative binomial regression model estimated rates of take-home doses in the pre- and post-COVID periods. The outcome was monthly number of doses dispensed as take-homes; fixed effects included the covariates, site, and the (log) total number of doses received per month as an offset term (to model the rate of take-homes, rather than the absolute number). The study included patient-period specific random intercepts, allowing the expected take-home proportion to vary for each patient and period. The model also included patient-specific random slopes for time in treatment, allowing the take-home dose trajectory to vary between patients according to the length of time they had been in treatment at the OTP prior to the study.

2.1.3. Take-homes above expectation

To assess the counterfactual scenario in which no guideline change occurred, the study limited a person-specific (random effects) model to patients with at least three months of pre-COVID data and one month of post-COVID data ($n = 216$); three months of pre-COVID data were required to estimate patient-specific treatment trends leading up to the guideline change, and one month of post-COVID data allowed inclusion of individuals who discontinued treatment during the post-COVID period. The model generated patient-specific estimates of the expected take-home dose proportion for each period. We contrasted these estimates to obtain a quantitative measure of take-home doses received above or below expected for each patient, representing the difference between the observed guideline change (the post-COVID period) and what would have been expected under no change (estimated during the pre-COVID period, accounting for pre-COVID UDT results, demographics, and treatment trajectory). Positive values indicated that patients received more take-homes than expected given no change in guidelines. Two regression models were fit comparing this quantity, the

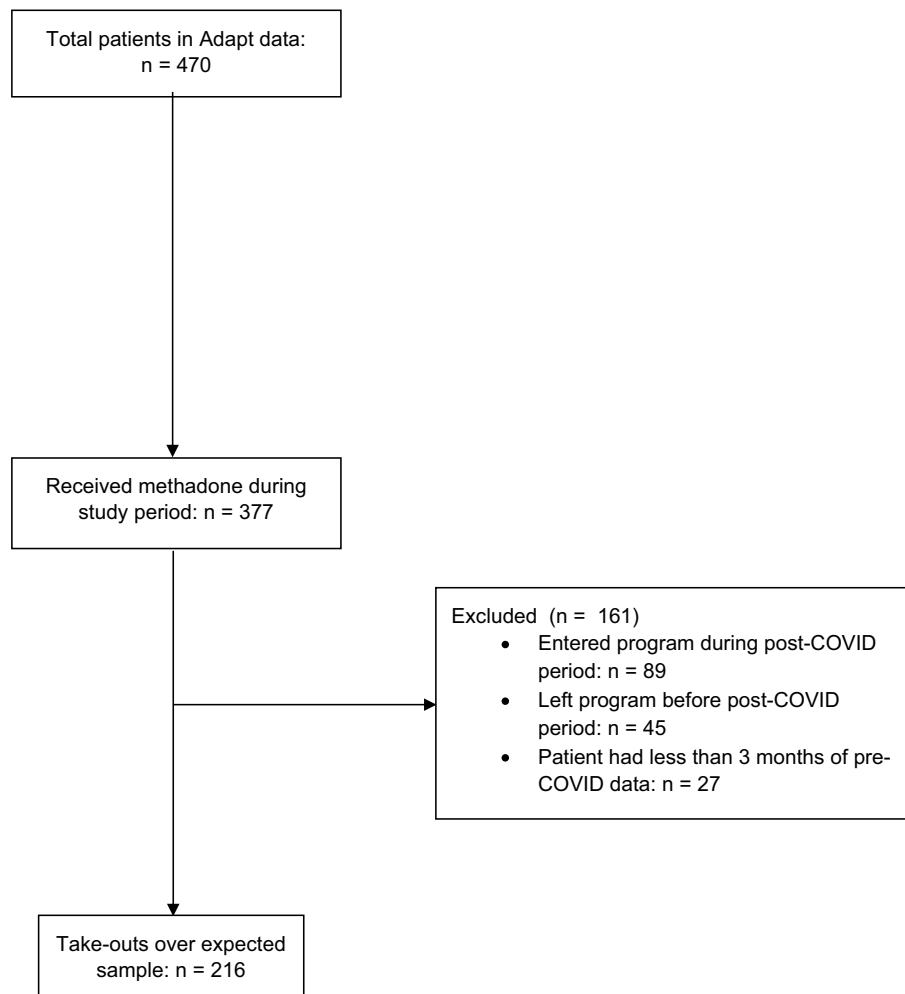


Fig. 1. OR-HOPE COVID consort diagram.

“take-homes above expected,” with the patient's rate of opioid positive UDT results in the post-COVID period (a linear regression model) and the likelihood of treatment discontinuation during the post-COVID period (a logistic regression model). These models adjusted for patient age, gender, clinic, time in treatment, and pre-COVID UDT positivity.

2.2. Qualitative methods and analysis

A case study approach using a constructivist paradigm provided the framework for the qualitative portion of the study. The study team developed research questions and an interview guide using an iterative group process to explore patient experiences and reactions to increased take-home dosing. Highly trained and experienced qualitative researchers (KAH and XAL) conducted in-depth, semi-structured qualitative interviews with a convenience sample of 32 patient participants at the two OTPs. The interviewers did not have previous contact with the participants and built trust and rapport with participants during the informed consent process, ensuring that patients understood that their responses were confidential and would not impact their relationship with the OTP or their counselor. Interviews were conducted until data saturation was achieved. Participants received compensation of \$40.00 following interview completion. Participants had varying take-home methadone allowances following the COVID-19 policy changes. The study completed the interviews in 2 waves: 1) August–September 2020 and 2) November–December 2020 (total $n = 32$). We conducted all interviews via phone using best practices for virtual collection of qualitative data (Lobe et al., 2020); interviews were audio-recorded and

professionally transcribed.

We conducted a thematic analysis following Braun and Clarke's (2006) guidelines. Three researchers (KAH, XAL, and JPT) developed a list of preliminary codes after reading interview transcripts, with codes grouped into overarching themes. Data were iteratively analyzed at the semantic level using Atlas.ti (ATLAS.ti, 2020) for data management. Two coders performed the coding (KAH and XAL). Ten percent of the sample was double coded to check for inter-coder agreement. A third coder (JPT) adjudicated the double coded sample. The study achieved an inter-coder agreement rate of 85%.

3. Results

3.1. Quantitative results

3.1.1. Overall effects

The patients were primarily non-Hispanic White (93%) women (49%) and men (51%) with a mean age of 40 years ($SD = 11$) and a median care duration of 532 (IQR: 257, 851) days (from treatment entry to the end of the study period; see Table 2). Two-thirds (65%) of patients were in the program at the beginning of the study period, and 47% of the initial cohort remained through the end of the study period.

Fig. 2 displays trends in patient take-home dosing (median number and percentages), UDT opioid positivity by length of time in treatment, and treatment discontinuation; we summarize these results across the two periods in Table 3 ($n = 377$). Patients in care for more than 180 days had a significant increase in median per month take-home dosing

Table 2
Patient Characteristics Overall and by OTP site.

Characteristic	Overall N = 377	Roseburg N = 258	North Bend N = 119	P- Value ^a
Age	40 (11)	40 (11)	40 (11)	0.4
Gender				>0.9
F	183 (49%)	125 (48%)	58 (49%)	
M	194 (51%)	133 (52%)	61 (51%)	
Race				0.6
White	337 (93%)	236 (93%)	101 (94%)	
Unknown ^b	15	3	12	
Median days in treatment (IQR) ^c	532 (257, 851)	605 (296, 1008)	481 (220, 649)	<0.001

^a Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's test exact.

^b Not included in percent calculations for non-missing units.

^c Defined as the number of days between patient's entry into the program and the end of the study period.

(premedian = 8 take-homes; postmedian = 13 take-homes per month, $p = 0.011$). The proportion of positive UDT results or retention rate in treatment did not change. Patients in treatment fewer than 90 days did not have an increase in take-home doses and were more likely to discontinue treatment in the post-COVID period (13% discontinuation pre-COVID vs. 26% post, $p = 0.047$). Patients in treatment for 90 to 180 days did not receive more take-homes following the take-home relaxation and their UDT opioid positivity rate increased post-COVID (19% to 33%, $p = 0.041$).

3.1.2. Take homes above expected analysis

The 216 patients included in the "take-homes above expected" analysis had more days in care than those in the overall patient population, with a median of 688 days in treatment (IQR: 482, 936). On average, these patients received 42% of their doses as take-homes pre-COVID. The take-home rate increased to 57% following the COVID-19 policy relaxation. In the mixed effects model estimating take-home doses above expected, take-home dosing increased an average of 15% (95% CI 0.11, 0.19, $p < 0.001$). A negative relationship existed between the increase in take-home dosing and post-COVID policy relaxation UDT opioid positivity ($B = -0.12$, 95% CI -0.21 , -0.04 ; $p = 0.005$). The adjusted odds of treatment discontinuation declined 0.97 for every one-percentage point increase in take-home dosing above expected (aOR = 0.97, 95% CI 0.95, 0.99; $p = 0.003$).

3.2. Qualitative results

The 32 interviewed participants were non-Hispanic White (81%), women (50%) with a mean age of 42.6 years. The qualitative interviews assessed the specific aspects of methadone take-homes that participants found most helpful to contextualize the quantitative findings. Overall, participants found increased take-home doses effective and acceptable without return to substance use. Three themes emerged: 1) value of feeling trusted with increased responsibility; 2) reduced travel time permitted increased employment and recreation; and 3) reduced exposure to individuals less stable in recovery and potential triggers.

3.2.1. Theme 1: Value of feeling trusted with increased responsibility

Most participants given more take-home doses expressed appreciation for the opportunity and did not want to jeopardize their dosing schedule: "It's took me a long time to get to this point, so I'm not going to do anything to mess that up." [Case Wave 2_11]. Many expressed a sense of pride in being given the responsibility for their take-home doses, which instilled a feeling of trust and enhanced their recovery. One participant noted that the take-homes "helped her recovery," later on explaining,

...I feel that it's given me a sense of responsibility. I wasn't sure if I was ready to handle– but of course, I rose to the challenge. That

makes me feel proud of myself. It really does. Having that responsibility and taking care of them on my own. [Case Wave 1_09]

This sense of responsibility indicated to participants that they had grown in their recovery over time, and they felt affirmed they were on the right track:

Not to give myself a pat on the back but like compared to the beginning I must be doing well to get that many. It gets a good feeling in that sense... [Case Wave 2_12]

Several participants noted that despite now having extra doses, this new-found pride inspired sticking to their dosing schedule:

It was very exciting because it made me feel like– I was proud of myself, I was able to– able to take my medication the way I was supposed to. I didn't have to think of taking extra, I didn't want to take extra. [Case Wave 2_15]

Freedom from coming into the clinic each day felt empowering and was a catalyst for practicing some of the life skills engendered by the clinic and counselors:

I think it's awesome...you have to be dedicated to get [more take-homes] otherwise you will never even get that far. You'll be coming in every day...At that point you start a different routine; you know, you are incorporating what you know, what you learned. The mental tools they provide so it's nice, you have a longer leash you know? [Case Wave 1_12]

3.2.2. Theme 2: Reduced travel time permitted increased employment and recreation

Rural participants traveling long distances to attend the clinic reported reduced burdens related to transportation, time, and costs.

[Take-homes make] it much easier for me– probably more than most people, because it might not be a big deal to a lot of people but I live twenty four miles... Every day when I was coming in, it was almost forty-five minutes to an hour driving round trip every day just the driving. I did that for probably a couple of years. Six days a week. [Case Wave 2_12]

In this man's case, less time commuting to the clinic each day created more time and energy for work activities on his ranch:

I feel like I wasn't getting started– when I was coming here every day– I got here, did my thing, went back home, then got everything re-situated and then started going, just seemed like it took longer to really get my motor going and my day going. It just kind of kept dragging you know. This is just– you can get going right away with everything. [Case Wave 2_12]

Due to the nature of the large catchment area of the clinic, many respondents reported traveling up to an hour or more from their homes to reach the clinic. Increased take-homes meant fewer trips to the clinic, which saved time and reduced stress:

There is kind of a stress knowing that ... four days a week– I would come in on my days that I worked and [I], was getting up an hour earlier every day. [Case W1_14]

I am being blessed with these [take-home doses], not having to come in here every day and they just– six days a week for like the last couple years I have been doing that and it's three days a week...I don't have to get up at 6:30 every morning now you know what I mean? [Case Wave 1_02]

Some participants who were not yet on 27-day take-home schedules aspired to become entrusted with that responsibility, as it would open up possibilities for them such as visiting family in other states. This incentive motivated patients:

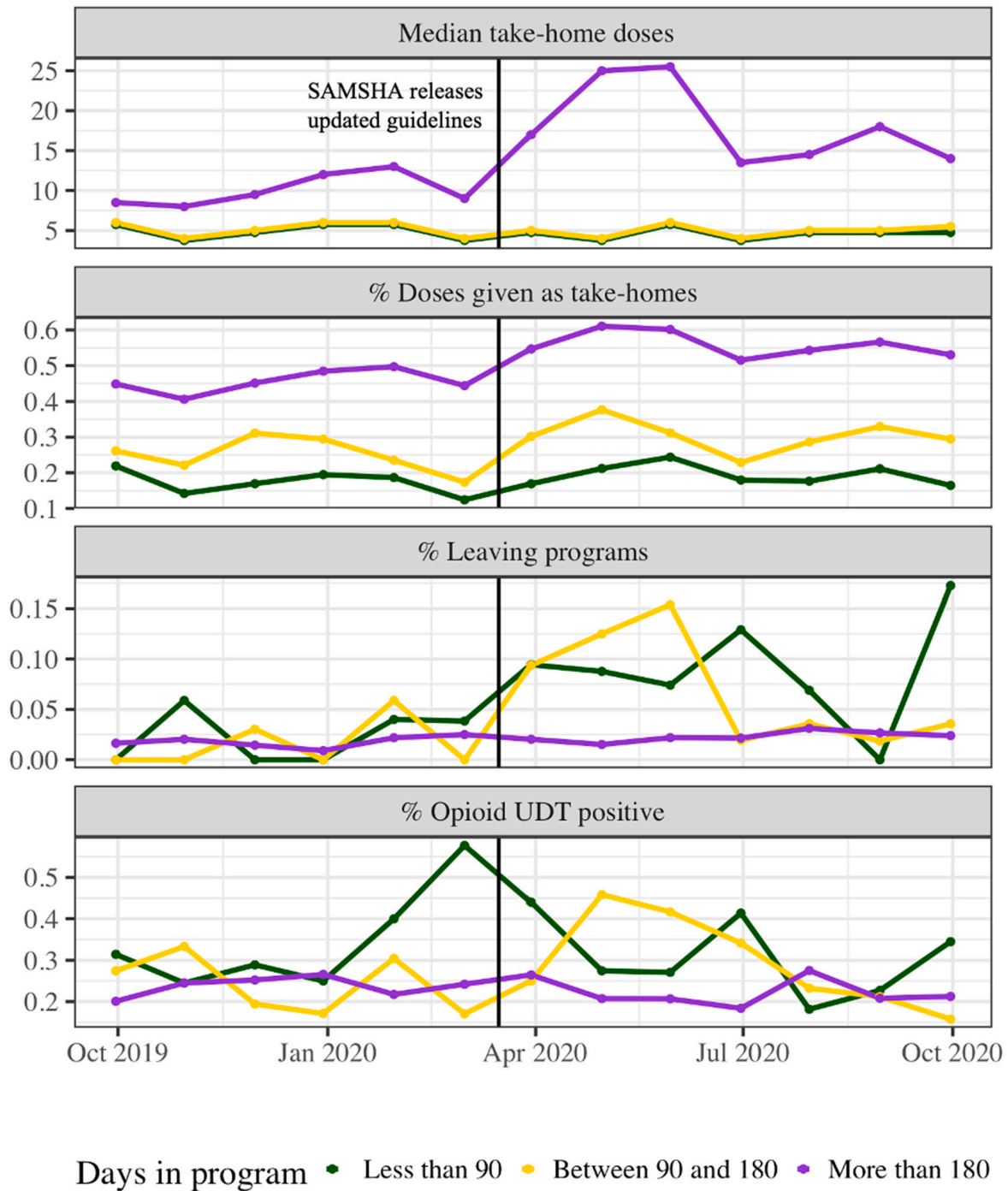


Fig. 2. Take-home dosing, treatment discontinuation, and UDT opioid positivity by month by time of current treatment episode based on the “take-homes in excess of expected” analysis. (Note, the less than 90 days and the 90 to 180 days lines overlap in the top panel below.)

I'd like to go visit [my parents in another state] and if I got 30 days'... and I am responsible with them and keep them put up and locked up in a good safe spot and take them how I am supposed to take them like I am, then I can do things. [Case Wave 1_02]

It's a small town. You run into people that you used to use with or ... you have known from before, so having the month's take-homes and only having to deal with that once a month is so much nicer than having to try to avoid those people on a daily basis. I really, really appreciate having the take-homes...most people already know from seeing you at the clinic that you don't want to talk to them or you don't want to have a part of that life so they kind of keep their distance like outside of here too. So that makes it nice for making that barrier. [Case Wave 1_13]

3.2.3. Theme 3: Reduced exposure to individuals less stable in recovery and potential triggers

Another positive aspect of not having to commute into the town center where the clinics were located related to avoiding chance encounters with people who participants knew and possible triggers related to previous substance use:

This sentiment was echoed by another respondent:

Table 3
Patient dosing and outcomes by study period, time in treatment.

	Time in Treatment Less than 90 days			Time in Treatment Between 90 and 180 days			Time in Treatment More than 180 days		
	Pre N = 76	Post N = 86	p ^d	Pre N = 85	Post N = 69	p ^d	Pre, N = 221	Post N = 265	p ^d
% Take-home doses ^a	0.17 (0.08)	0.20 (0.16)	0.10	0.24 (0.15)	0.31 (0.27)	0.7	0.42 (0.29)	0.52 (0.33)	0.027
Median Take home doses per month ^b	5 (4, 5)	5 (3, 5)	0.071	6 (4, 8)	5 (5, 8)	0.8	8 (4, 21)	13 (5, 26)	0.011
% Opioid UDT positive ^a	0.38 (0.43)	0.33 (0.42)	0.6	0.19 (0.34)	0.33 (0.43)	0.041	0.23 (0.33)	0.20 (0.32)	0.12
Left program ^c	10 (13%)	22 (26%)	0.047	8 (9.4%)	13 (19%)	0.090	25 (11%)	33 (12%)	0.7

^a Mean (SD).

^b Median (IQR).

^c n (%).

^d Wilcoxon rank sum test; Pearson's Chi-squared test.

'Cause when I would come here every day, I see people that I used with every day. And so when I am not seeing them every day I am getting a different type of habit. I am growing a different type of a habit outside of the clinic and so it's better for me that way I guess. I have changed people, places and things in my life so when I come here and I still see some of the same ol' people doing the same old things that kind of stuff bothers me now and so I like—so that's where I like being able to come just once a month. [Case Wave 2_15]

Given that the clinic was limiting the number of individuals who could be in the waiting room, patients would often stand in a queue outside. When asked what aspects they enjoyed about having more take-homes, a participant explained: "You don't have to listen to the crap—outside [the clinic]" [Case Wave 2_09].

A working mother mentioned that it was difficult for her to get childcare early in the morning, and she preferred that her daughter not have contact with individuals they might encounter on their way to the clinic:

Well, I just—I don't like to bring my daughter down here. Not that it's anything— but [the clinic] is downtown and...I just don't like to always have to bring her in unless I absolutely have to. It's easier for me to not have to look for somebody to keep an eye on her for a little bit so I can come here. [Case Wave 1_11]

4. Discussion

The relaxation of take-home methadone restrictions was associated with increased distribution of take-home medication among established patients. Quantitative analyses suggested that increased take-homes did not increase, and potentially slightly decreased, use of illicit opioids and the likelihood of treatment discontinuation. We observed, however, that patients who had been in treatment for fewer than 90 days were more likely to discontinue treatment in the post-COVID period. Because this group saw no change in take-out dosing, this finding may be due to COVID-19 disruptions and stressors. Also of note, one OTP's patients had more days in treatment prior to the policy change, an important difference given that the literature shows better outcomes for people retained in care for longer periods (Chan et al., 2020; Sordo et al., 2017). The OTP had been established two years prior to the other site. These findings provide additional data on how patients adapted to COVID-19-related policy changes, the benefits and challenges with increased take-home doses, and possibilities for future directions of OTP-related regulations (Harris et al., 2021; Levander, Hoffman, et al., 2021). Qualitative reports of continued recovery in the context of fewer restrictions suggest feasibility and desirability of enhanced access to take-homes without detrimental harm particularly in OTPs serving rural communities.

Assessment of the implementation of the take-home modification illuminates the potential for changing OTP policies to permit greater use of take-home medication in the future and re-evaluation of how OTPs

determine patient stability. Crisis can be a tipping point for policy innovation and our results suggest that the federal regulations could be formally amended to permit more use of take-homes. The qualitative interviews provided patient perceptions and important context for the quantitative findings on the impacts of the pandemic and regulatory relaxation to reduce COVID-19 transmission risks. Qualitative analysis revealed three themes that explain and support how increased access to take-home methadone supported patient recovery.

Speculatively, the pre-COVID limitations on methadone take-home doses may not improve the quality or safety of contemporary OTP services. In fact, stricter rules may be harmful to patient recovery, as participants noted how increased responsibility with take-homes made them feel more trusted and enhanced their recovery. Strict federal and state OTP regulations could be modified to permit greater use of clinical judgement and reassessment of the take-home methadone requirements. Prior to COVID-19, at 181 days patients at OTPs became eligible for 3 take-home doses compared to the 27 they were potentially eligible for during COVID-19. On November 18, 2021, SAMHSA announced that the relaxation would be maintained for at least one year following an expiration of the pandemic public health emergency and the intent to modify the federal restrictions on take-home medication (SAMHSA, 2021). Engaging all key stakeholders, including OTP leaders and staff who likely have unique perspectives and interests around changing federal policies will be important in modifying federal regulations around take-home methadone, (Levander, Pytell, et al., 2021). Any changes in federal restrictions to take-home methadone will also need to include updates to insurance reimbursement moving from fee-for-service to bundled payments (Joseph et al., 2021).

Changing the federal regulations would be particularly beneficial for patients in rural communities, as people with OUD in rural communities often have difficulty accessing OTPs (Joudrey et al., 2019). Respondents noted that distance and time spent traveling to their respective clinics were significant barriers to continuing in treatment and engaging in meaningful activities such as work and spending time with family prior to the pandemic. Similarly, a systematic review of rural-specific barriers to medication treatment for OUD in the United States found that travel and time constraints presented barriers to accessing care (Lister et al., 2020). Our results are similar to a prior report that demonstrated that patients who received more take-home doses felt they had fewer life disruptions than when they had to come into the clinic each day (Frank et al., 2021).

Our results are consistent with studies testing medically managed methadone using primary care physicians to monitor patient health and providing 27-days of methadone for selected stable patients. Novick and Joseph (Novick & Joseph, 1991) found that 82.5% of methadone clinic patients who were transferred to primary care and received ongoing 27-day take-homes remained in care. Similarly, Schwartz et al. (1999) showed that only 28.6% of patients withdrew from care during a 12-year study of monthly prescribed methadone by primary care physicians and the study observed no methadone-related overdose or diversion. In a

study of methadone medical maintenance patients who received a 27-day supply of methadone, King et al. (2006) found that 84% of patients completed the 12-month study, patients had low rates of drug use or failed medication recall, and treatment satisfaction was high. In general, no evidence existed of diversion or return to drug use with the 27-day take-homes, and patients reported increased satisfaction with services and improved quality of life because of less restriction on work and travel. Our study found similar results as the relaxation of take-home restrictions and implementation of tele-health in response to COVID-19 did not change rates of positive UDT among OTP patients. This, together with qualitative reports of continued recovery in the context of fewer restrictions, suggests that amending federal regulations to permit more use of take-homes might be safe and merits study in broader populations. More research and outreach is needed to study patients with OUD receiving methadone who do not remain in care or who are less stable in their recovery.

5. Limitations

Several limitations to the study may limit generalizability of the findings. The sample included a specific geographic region that lacks racial/ethnic diversity. Additionally, the study took place in two smaller OTPs with the same medical director, thus their policy responsiveness may differ from larger OTPs. The two study OTPs, moreover, operate more conservatively than many OTPs. The OTP's administrative data were not collected for research purposes and, therefore, important measures such as patients' reasons for treatment discontinuation, methadone dosage levels, and treatment histories were not available. The OTPs in our study collected monthly UDTs, which may be different from other clinical settings given notable regional variability in UDT guidelines. Urine drug screens are frequently used for care decisions (number of take homes); however research on correlations between urine drug testing frequency and clinical outcomes is needed (McEachern et al., 2019; Moss et al., 2018). Further research should assess whether the changes seen in the initial analysis period were durable over time.

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CRediT authorship contribution statement

Kim A. Hoffman: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. **Canyon Foot:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Ximena A. Levander:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Ryan Cook:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Javier Ponce Terashima:** Formal analysis, Writing – original draft. **John W. McIlveen:** Writing – original draft. **P. Todd Korthuis:** Conceptualization, Funding acquisition, Supervision, Writing – original draft, Writing – review & editing. **Dennis McCarty:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None to declare.

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