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Choice of extended release medication for OUD in young adults (buprenorphine or naltrexone): A pilot enhancement of the Youth Opioid Recovery Support (YORS) intervention

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ABSTRACT

Background: The Youth Opioid Recovery Support (YORS) intervention is a promising approach for the treatment of opioid use disorder (OUD) in young adults that seeks to improve adherence to extended-release medications for OUD (XR-MOUD) and reduce opioid relapse through assertive outreach techniques. YORS was previously tested with individuals seeking extended-release naltrexone (XR-NTX), but has not been tested on individuals pursuing extended-release buprenorphine (XR-BUP).

Methods: This pilot study tested the YORS intervention among a group choosing either XR-MOUD compared to historical treatment as usual (H-TAU) and intervention conditions from a previous study. This study also tested feasibility of a stepped care approach using a protocol for transition to standard care. Twenty-two young adults (ages 18–26) with OUD intending to pursue outpatient treatment with XR-NTX ($n = 11$) or XR-BUP ($n = 11$) were recruited from inpatient treatment and received 12–24 weeks of the YORS intervention.

Results: Participants in YORS compared to H-TAU received more outpatient doses at 12 weeks (1.91 vs. 0.40, $p < .001$) and 24 weeks (3.76 vs. 0.70, $p < .001$), had lower relapse rates at 12 weeks (36.4% vs.75.0%; $p = .012$) and 24 weeks(52.9% vs. 95.0%; $p = .003$), and had greater cumulative relapse-free survival over 24 weeks (HR = 2.65, 95% CI: 1.17–6.02, $p < .05$). Rates of continuing MOUD in a standard care setting after the intervention ended were extremely poor. Outcomes did not differ by medication choice.

Conclusions: These results are consistent with previous findings and demonstrate feasibility and efficacy of YORS with patient choice of medication. The results highlight the need for innovative strategies to sustain positive outcomes and step-down care successfully in these vulnerable young adults.

1. Introduction

Opioid use disorder (OUD) has devastating consequences for young adults and their families. The current opioid crisis has disproportionately affected young adults, with alarming rates of opioid overdose deaths and the highest per capita rates of prescription opioid and heroin misuse (Ahrnsbrak et al., 2019; Scholl et al., 2018). Medications for OUD (MOUD) drastically decrease mortality (Ma et al., 2019) and are the standard-of-care treatment for OUD (Levy, 2016; Volkow et al., 2019); however, uptake of MOUD in young adults remains alarmingly low (Chang et al., 2018; Hadland et al., 2018; Soloner et al., 2017; Windsor et al., 2017; Woody et al., 2008), and outcomes are worse than for older adults (Fishman et al., 2020a; Schuman-Oliver, et al. 2014). Strategies such as extended-release medications for OUD (XR-MOUD) may help to overcome some of the adherence challenges presented by daily medications, but even with this advantage, many barriers to retention remain and overall adherence is distressingly low (Cousins et al., 2016; Mitchell et al., 2018a; Mitchell et al., 2018b; Stein et al., 2016).

The Youth Opioid Recovery Support (YORS) model is a novel assertive outreach treatment approach that addresses many barriers to treatment adherence in young adults with OUD (Fishman et al., 2020b). YORS is an innovative multi-component intervention to improve

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treatment engagement and MOUD adherence for young adults with OUD transitioning from an acute inpatient stay to outpatient treatment. Its components include: home delivery of XR-MOUD, family or alternate treatment significant other (TSO) involvement with an emphasis on promotion of medication adherence, assertive outreach to engage and maintain contact through often chaotic trajectories (e.g., ambivalence about treatment, lapses/relapses, and periods of no contact), and contingency management incentives for receipt of XR-MOUD. Although the YORS intervention has shown promising results in a pilot randomized controlled trial (Fishman et al., 2020b), it has been limited to the minority of young adults seeking treatment with XR-NTX.

Since the initial design of YORS, monthly injectable extended-release buprenorphine (XR-BUP) has become commercially available, with demonstrated safety and efficacy (Haight et al., 2019), and improved quality of life (Ling et al., 2020). Broadening patient choice of XR-MOUD offers several advantages. This expansion promotes principles of patient-centered care such as shared decision-making and individualized care (Bradley & Kivalahan, 2014; Institute of Medicine, 2006; Marchand et al., 2019). It is increasingly clear that there is no single approach to recovery that works for everyone with OUD, and that an array of options is best in treating heterogeneous patient populations. Furthermore, research has demonstrated that patient-centered approaches improve treatment adherence for a variety of chronic health conditions (Kuntz et al., 2014; Viswanathan et al., 2012).

Expanding choice to include XR-BUP broadens access to treatment and interventions such as YORS for young adults who are not willing or able to take XR-NTX. Many patients enter treatment with a belief about which medication is "better" based on their experiences or experiences of their peers (Randall-Kosich et al., 2019). Others may have had side effects or unsatisfactory outcomes with a previous trial of MOUD, warranting a switch. Including XR-BUP in addition to XR-NTX expands the overall applicability of the YORS intervention, an important step in treatment development. YORS was designed with the goal of increasing adherence to a monthly injectable relapse prevention medication for OUD—initially XR-NTX. Since XR-BUP is also a monthly injectable relapse prevention medication for OUD, including it as an option is a natural adaptation requiring minimal shift in the delivery of YORS.

The YORS intervention has been limited in its "real world" generalizability because of the intensive effort and resources needed to provide wrap around support and services that are not captured in traditional fee-for-service models (e.g., assertive outreach, contingency management incentives, and home delivery). Patients in the intervention also had difficulty transitioning to standard clinic-based care, even after 24 weeks of the intensive YORS intervention. Therefore, the purpose of this study was to test the preliminary feasibility and efficacy of the YORS intervention among young adult patients with OUD choosing *either* XR-NTX or XR-BUP and to include a standardized stepped-care transition to usual care to increase the likelihood of enduring success after a more intensive treatment episode with the YORS intervention.

2. Material and methods

This study was a variable length (ranging from 12 to 24 weeks), single-arm clinical trial to test the feasibility and efficacy of the YORS intervention with medication choices. The length of the trial was variable based on the timing of enrollment within the overall study period with a set study end date. We recruited patient participants ($n = 22$) aged 18–26 seeking treatment for OUD with XR-NTX or XR-BUP regardless of the research, from a community SUD treatment program (Mountain Manor Treatment Center in Baltimore, MD, USA) during an acute inpatient/residential treatment episode. Participants met the Diagnostic and Statistical Manual-5 (American Psychiatric Association, 2013) criteria for OUD, endorsed using illicit opioids within the 30 days prior to study enrollment, were prescribed their choice of XR-MOUD, and were willing to designate at least one person as TSO of their choice. The study excluded participants if their living situation was beyond reasonable travel or if they had legal involvement that would prevent completion of the study (e.g., incarceration). The study compared participants from this sample to a similarly characterized sample of patients from a prior study (Fishman et al., 2020b) who had been randomized to a historical treatment as usual (H-TAU) sample ($n = 20$) and a historical YORS intervention group using XR-NTX only ($n = 18$). We also recruited patient-selected TSOs ($n = 19$) who were willing to be involved in the patient's care. The University of Maryland Baltimore IRB approved the study, and all participants provided informed consent.

The study prescribed participants in all groups a first dose of XR-MOUD prior to inpatient discharge. Participants in H-TAU received standard referrals to continuing SUD care, including specific arrangements for ongoing treatment with XR-NTX and housing referrals as needed. Participants in the YORS groups also received these standard referrals, but with medication treatment delivered through YORS along with its other components as outlined next (for further details, see supplemental treatment manual in Fishman et al., 2020b):

1) *Home-delivery of XR-MOUD* was offered to all participants in the YORS condition, scheduled for roughly monthly dosing, conducted by a team consisting of a nurse, therapist, and/or treatment assistant.
2) *Treatment significant other (TSO) involvement* began during the inpatient stay. It consisted of three primary sessions that a specially trained and supervised study therapist delivered. The sessions focused on OUD education and family treatment planning with the TSO and included the development of a written family treatment agreement and other family-based strategies and skills. Brief coaching by telephone or text continued throughout the intervention.
3) *Contingency management* incentives were given in the form of gift cards according to the following escalating reinforcement schedule: Dose #0 (inpatient, as a "priming" reinforcer): $20; outpatient dose #1: $25; dose #2: $30; dose #3: $35; dose #4: $40; dose #5: $45; dose #6 and above: $50; bonus for receiving all prescribed doses: $50.
4) *Assertive outreach* incorporated frequent outreach to patients and TSOs via text messages and phone calls with treatment reminders, progress check-ins, scheduling for medication and other sessions, and case-management. The study contacted patients at least weekly and TSOs at least every other week with increased frequency at any warning of nonadherence or relapse.
5) *A transition protocol* for transferring from YORS to standard clinic-based care began during the final 2 months of participation for participants who were enrolled in the current study for at least 5 months and were engaged in treatment at the time of transition. Specific components of the transition protocol included:
   a) Early discussion and planning for transition: Participants and TSOs were informed at the beginning of the study that home-based delivery of medications was limited to the study period, after which there would be a plan for clinic-based treatment. Counseling focused on exploration of available resources for care and facilitation of transition.
   b) "Rescue" home delivered doses: If the participant had not successfully transitioned to receive XR-MOUD through standard clinic-based care, the study team provided back-up doses of home delivered XR-MOUD.
   c) Other YORS components (i.e., assertive outreach, family involvement) continued as usual during the transition protocol with an emphasis on increasing autonomy and responsibility of the young adult.

Primary outcomes for this study were: 1) Number of outpatient XR-MOUD doses received and 2) Relapse to opioid use at 12-week and 24-week follow-ups. The research team chose the sample size based on a power level of 0.8 and an estimated large effect size based on pilot data

from the prior study (Fishman et al., 2020b). The study defined relapse to opioid use as at least 10 days of opioid use within a four-week period, using a well-established and clinically meaningful measure (Lee, Friedmann, et al., 2016; Lee, Nunes, et al., 2016) that amalgamates self-report and urine drug screen (UDS) data to calculate days of opioid use. The study imputed missing (even in the presence of available self-reported data) or positive UDS results as positive for five days of opioid use per two-week period as a conservative approximation of actual use, unless self-reported days of use exceeded five days during the two-week period, in which case the study used self-reported data. The study conducted research follow-ups every two weeks in person. If a participant was not able to attend in person, study staff conducted follow-ups by telephone and supplemented them through patient clinical records with permission.

2.1. Measures

2.1.1. Urine drug screens (UDS)

The study conducted commercially available instant tests including the synthetic opioids oxycodone and fentanyl at two-week intervals.

2.1.2. Timeline follow-back (Sobell & Sobell, 1996)

Interview-based assessment that trained study staff administered to measure opioid and other substance use at baseline and at two-week intervals.

2.1.3. Case report form

Investigator-created form used to record demographic information, receipt of clinical services, medication administration, and medical chart abstraction.

2.2. Data analyses

This study used one-way ANOVA, chi-square tests, and Fisher exact tests to test for differences between the three groups on baseline characteristics. The study used independent *t*-tests and chi-square tests to test for group differences (current YORS vs. historical TAU) on primary and secondary outcomes of number of XR-MOUD doses received and relapse to opioids (yes/no). The study used Cox proportional hazards regression to test for group differences (current YORS vs. H-TAU) on opioid relapse over time in a survival analysis. As previously described, study staff imputed missing and positive UDS data as positive for 5 days of use. Study staff imputed missing XR-MOUD doses (e.g., unable to verify delivery by other providers) as not received. The study excluded missing baseline data from sample characteristic analyses.

3. Results

Participant baseline characteristics by group are presented in Table 1. Overall, most participants from all three groups were white men with primary OUD who used heroin by injection and were insured through Medicaid. All participants in the historical groups selected XR-NTX, whereas participants in the current YORS cohort ($N = 22$) chose XR-NTX ($n = 11$) or XR-BUP (n = 11). More current YORS participants had previous treatment with buprenorphine or methadone than the other groups. Twelve-week outcomes used data from all 22 current YORS participants, whereas 24-week outcomes analyzed data from 17 participants who received a longer duration of intervention due to timing of enrollment within the overall study period.

3.1. Receipt of outpatient XR-MOUD doses

Participants in the current YORS condition received more outpatient XR-MOUD doses compared to those in H-TAU at 12 weeks (1.91 vs. 0.40; $t(40) = 4.62$, $p < .001$, $d = 1.43$) and at 24 weeks (3.76 vs. 0.70; $t(35) = 4.38$, $p < .001$, $d = 1.44$) (Table 2). Dose outcomes at 24 weeks are cumulative and include doses received during the first 12 weeks of the intervention. The overall rates of missing/unconfirmed data of XR-MOUD receipt were 15.8% (current YORS: 22.5% vs. H-TAU: 10.0%) at 24 weeks, respectively. The study found no statistically significant differences between current YORS and historical YORS groups on receipt of XR-MOUD doses at 12 weeks (1.91 vs. 2.17) or 24 weeks (3.76 vs. 4.28) ($p > .05$).

Table 1
Baseline sample characteristics.

	YORS ($n = 22$)	Historical YORS ($n = 18$)	Historical TAU ($n = 20$)	p
Demographics	Presented as *M* (*SD*) or percentage (*n*)			
Age	23.9 (2.1)	23.1 (2.3)	23.7 (2.4)	0.48
Male	72.7% (16)	66.7% (12)	65.0% (13)	0.85
African American/ Black	13.6% (3)	5.6% (1)	5.0% (1)	0.51
Caucasian/White	86.4% (19)	88.9% (16)	85.0% (17)	0.51
Hispanic/Latinx	0.0% (0)	5.6% (1)	10.0% (2)	0.51
Subjective SES rank*	4.4 (2.0)	3.9 (1.3)	3.9 (1.5)	0.66
Months worked in past year	6.7 (4.3)	6.6 (4.4)	7.5 (3.7)	0.75
Medicaid coverage	86.4% (19)	94.4% (17)	75.0 (15)	0.24
Severity measures				
Previous overdoses	3.1 (4.5)	4.2 (8.1)	2.2 (2.5)	0.52
Years of opioid use	7.5 (3.7)	5.3 (2.8)	5.5 (2.4)	0.051
Began using under 18 years old	77.3% (17)	38.9% (7)	40.0% (8)	0.2
Previous heroin use	100% (22)	100% (18)	100% (20)	1
Previous injection drug use	63.6% (14)	61.1% (11)	80.0% (16)	0.38
Past treatment				
Prior residential treatment episodes	4.0 (4.1)	1.9 (2.6)	3.7 (2.6)	0.12
Previous treatment with XR-NTX	36.4% (8)	38.9% (7)	50.0% (9)	0.66
Previous treatment with buprenorphine	77.3% (17)	38.9% (7)	70.0% (14)	0.03
Previous treatment with methadone	45.5% (10)	22.2% (4)	10.0% (2)	0.03
Participant use at baseline (% who self-reported use in the 28 days prior to inpatient/ residential admission)				
Heroin	100% (22)	88.9% (16)	95.0% (19)	0.28
Other illicit opioids	4.5% (1)	27.8% (5)	20.0% (4)	0.13
Cannabis	31.8% (7)	61.1% (11)	35.0% (7)	0.13
Cocaine	50.0% (11)	61.1% (11)	65.0% (13)	0.59
Alcohol	18.2% (4)	27.8% (5)	20.0% (4)	0.75
Benzodiazepines	27.3% (6)	33.3% (6)	10.0% (2)	0.20

SES: socioeconomic status.
XR-NTX: extended-release naltrexone.

3.2. Opioid relapse

Participants in the current YORS group compared to those in H-TAU had lower rates of opioid relapse at 12 weeks (36.4% vs. 75.0%; $X^2(1) = 6.31$, $p = .012$, Cramer's V = 0.388) and at 24 weeks (52.9% vs. 95.0%; $X^2(1) = 8.83$, $p < .01$, Cramer's V = 0.489) (Table 2). A Cox-proportional hazards analysis (survival curve displayed in Fig. 1) found that the odds of relapse at 24 weeks were significantly greater among participants in the H-TAU group compared to current YORS (HR = 2.65, 95% CI = [1.17, 6.02], $p < .05$), but did not reach significance at 12 weeks (HR = 2.36, 95% CI = [0.997, 5.59], $p = .051$). Rates of

Table 2
XR-MOUD receipt and opioid relapse.

	Current YORS	N	Historical TAU	N	p-Value
Doses received at 12-weeks	1.91	22	0.40	20	<0.001
Doses received at 24-weeks	3.76	17	0.70	20	<0.001
% relapsed at 12-weeks	27.3%	22	75.0%	20	<0.01
% relapsed at 24-weeks	52.9%	17	95.0%	20	<0.01

missing data for opioid use at 24 weeks were 49.3% for UDS (current YORS: 36.8% vs. H-TAU: 60.0%) and 19.2% for self-report (current YORS: 32.4% vs. H-TAU: 12.9%). The study found no statistically significant differences between current YORS and historical YORS groups on opioid relapse at 12 week (36.4% vs. 38.9%) or 24 week (52.9% vs. 61.1%) outcomes ($p > .05$).

3.3. Transition to standard care

The study tested the transition protocol on a subset of 18 patients from the total sample. Of those, 12 (66.7%) participants received all prescribed doses and were therefore eligible for transition to stepped-down care. Of the 12 eligible individuals, 7 (58%) received a clinic-based XR-MOUD dose during the first month of transition, and 2 (17%) received a "rescue" mobile dose during the first month of transition. Each of these 9 participants received a clinic-based dose during the second month of transition. However, in the month following the intervention and transition period, only one participant received a clinic-based dose of XR-MOUD. In addition, one of the 12 eligible participants switched to sublingual MOUD and continued to receive prescribed MOUD through the transition and month following the intervention.

3.4. Exploratory analyses of outcomes by patient selected medication

In comparisons between the XR-BUP or XR-NTX groups, there were no differences in receipt of XR-MOUD or opioid relapse by patient's choice of medication for participants in the current YORS sample (see Table 3).

4. Discussion

The results of this small pilot study support the feasibility and efficacy of YORS, a multi-component assertive outreach intervention for OUD in young adults, now enhanced with patient choice of XR-MOUD. Outcomes were superior compared to H-TAU on both main outcomes of number of XR-MOUD doses received and opioid relapse at 12 and 24 weeks, with large effect sizes. Participants in the current YORS intervention group received, on average, almost four outpatient doses at 24 weeks compared to fewer than one outpatient dose among those in the historical comparison group. Although four outpatient doses is below the typical recommended course of six outpatient doses of XR-MOUD over 24 weeks (one dose per month), it is much improved from individuals in treatment as usual. Differences in relapse rates were also substantial, with about half of the participants in the intervention group relapsing at some point during the 24-week period whereas almost all participants in the historical control group relapsed. Cumulative opioid relapse–free survival over time also differed between the groups, with individuals receiving the intervention showing greater nonrelapse

Table 3
Exploratory outcomes by medication choice.

	XR-NTX	N	XR-BUP	N	p-Value
Doses received at 12-weeks	2.00 (1.41)	11	1.82 (1.25)	11	0.75
Doses received at 24-weeks	3.80 (3.19)	10	3.71 (2.56)	7	0.95
% relapsed at 12-weeks	18.2%	11	36.4%	11	0.34
% relapsed at 24-weeks	50.0%	10	57.1%	7	0.77

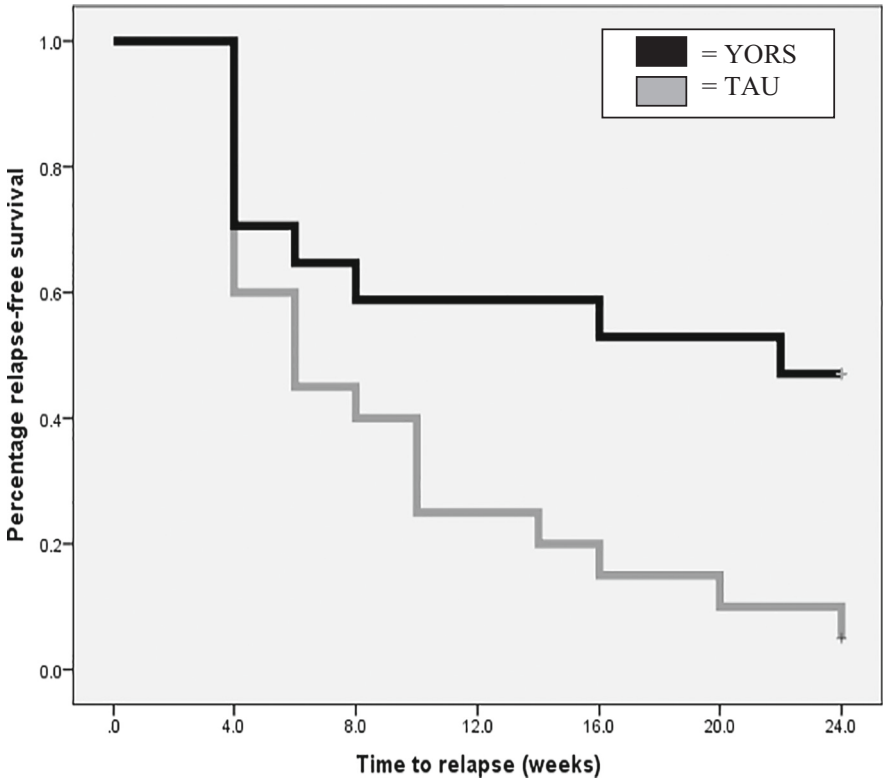

Fig. 1. Kaplan-Meier survival curve of opioid relapse at 24-weeks.

compared with those in H-TAU over 24 weeks. Although we did not observe a main effect of group in a survival analysis over 12 weeks, the *p*-value ($p = .051$) trended toward significance, which seems promising from a clinical perspective and may well demonstrate significance with a more adequately powered sample size. Although our small sample was not amenable to noninferiority analyses, the unadjusted data on number of medication doses and rates of opioid relapse appear to be comparable between participants in the current intervention and the historical intervention group (see Fishman et al., 2020b), providing an important step toward replication and validation. Another novel contribution of this study was that it demonstrated feasibility of administering XR-BUP outside of standard clinic-based approaches. Overall, the results of this study extend the initial randomized controlled trial of the YORS intervention by demonstrating superior outcomes to a historical comparison group and expanding the applicability of YORS to individuals seeking treatment with choice of XR-MOUD.

The research team designed this study to promote patient choice of XR-MOUD for three primary reasons: 1) It encourages patient-centered care; 2) There is no available evidence of differential XR-MOUD efficacy (i.e., XR-NTX vs. XR-BUP); and 3) It involved only very small adaptations of the existing YORS intervention. Operating under the premise that "the most effective treatment is the one you're willing to participate in", we found that half of the participants chose XR-BUP and half chose XR-NTX. This result suggests that the applicability of the YORS intervention is at least doubled by expanding to include XR-BUP. As the availability of XR-BUP increases with time (i.e., Sublocade™ only recently FDA approved in 2017) and access to alternative formulations (i.e., Brixadi™ to be commercially available by 2021), we expect that the proportion of individuals selecting XR-BUP will increase. Expanding patient choice of medication required minimal adaptations of the existing YORS intervention. For example, the study changed the content of MOUD education during family sessions to highlight the medication of choice. The study also sometimes adjusted the dosing schedule by medication. The study dosed patients particularly sensitive to buprenorphine at longer intervals, while the study sometimes prescribed sublingual buprenorphine to supplement the injection to participants who reported sustained cravings and had difficulties with opioid abstinence. Despite slight differences, the primary components of YORS remained unchanged. Overall, demonstrating the feasibility of expanding patient choice of XR-MOUD is a substantial step toward widening the applicability of the YORS intervention to more young adults suffering from OUD.

This study was underpowered to detect any differences between medication groups; however, it is notable that the opioid relapse rate among participants choosing XR-NTX was half of that for participants on XR-BUP. Although this study did not use a randomized design, our results are consistent with large randomized trials that have found noninferiority of XR-NTX compared to daily sublingual buprenorphine (Lee et al., 2018; Tanum et al., 2017). Additional comparative effectiveness research on XR-BUP vs. XR-NTX is needed.

Despite many positive outcomes, the transition to standard care was a significant challenge for participants in the YORS group. Although the clinical staff carefully planned by engaging participants in frequent discussions of transitions starting early in the intervention, providing resources and referrals, assisting with care coordination, and engaging family members, the hand-off to standard care was largely unsuccessful or inconclusive.

Only two-thirds of the individuals in the intervention were appropriate for transition to standard care. This study deemed participants who were not at least minimally engaged in treatment as inappropriate for transition to stepped-down care because they had not been succeeding in the more intensive level of care (YORS). The finding that so few individuals remained in treatment despite a highly tailored intervention highlights that despite our best efforts so far there is still considerable room for improvement. Even among those individuals who were eligible for stepped-down transition, the degree of case management and coordination to achieve a successful transition was formidable. With a great deal of outreach and assistance, most of the individuals in the transition phase were able to get doses of XR-MOUD in clinic; however, no participants received XR-MOUD in clinic during the month following the intervention transition.

We need to re-think our approaches to "standard care" for young adults with OUD by using tailored solutions for those who struggle most. One such solution could be including a longer duration of assertive care until a transition to standard care is feasible, but an adequate duration of YORS is not yet known. The availability of XR-MOUD in the community, especially XR-BUP, was still fairly low at the time of this study, making it difficult to transition to standard care at clinics other than the study clinic. There were also a few unfortunate instances in which recovery housing or other programming did not admit individuals who were prescribed XR-BUP, impeding the transition to standard care. We hope that these barriers will dissipate as XR-MOUD becomes more widespread and accepted in the field.

Another major challenge for transition success (and its measurement) was that accessibility to clinic-based care was compromised for several key months during the study period due to the COVID-19 pandemic. The repercussions of COVID-19 hampered the transition plan for several participants. In response, the study team modified the protocol from its original plan of contingency management incentives for clinical-based doses received during the transition period to continue incentives for home-delivered "rescue" doses. Even so, the proportion of individuals receiving a dose of XR-MOUD (or any MOUD) during the month after the intervention concluded was very small. On the other hand, although overall retention and subsequent transition were less than optimal, the study transitioned three-quarters of those retained through five months into clinic-based standard care for at least one month, which offered us hope that further refinements could be fruitful.

Strengths of this study included patient choice of XR-MOUD, a focus on the critical young adult population, and the use of innovative programming to support adherence. While this study lacked the gold standard of randomization, the study used a similarly characterized group of young adults from a randomized trial as meaningful comparators. Another limitation of this study was the extent of missing data for the UDS samples. We combated this limitation by using a well-known conservative approach to imputation, while still taking into account that missing data in OUD research tends to correlate with negative outcomes. The generalizability of the study results to other populations is limited by the sample being predominately white, non-Hispanic/Latinx, and male. The small sample size of this pilot study limited the statistical analyses including full exploration of differences in outcomes by medication choice. Furthermore, incomplete retention in the intervention meant that the study tested the transition protocol on an even smaller sample of participants, making it difficult to draw conclusions on its feasibility. Despite the small sample size, this is to our knowledge the first study examining a group of patients treated with either XR-NTX or XR-BUP, and certainly the first doing so for a sample of young adults.

Several lines of research are needed to continue to validate the YORS intervention. More work is needed to broaden the applicability of YORS, which could include testing YORS in similar vulnerable target populations such as adolescents with OUD. Another improvement might focus on enhancing other elements of patient-centered care, such as a formal, shared decision-making model. Determining the economic feasibility of the YORS intervention is also important to determine a path to sustainability and dissemination outside of research funding. Identifying the individual contributions of YORS components, identifying when patients can be stepped down successfully, and learning how to sustain positive outcomes past 24 weeks remain elusive.

5. Conclusions

In summary, this pilot study provides a single-arm replication of the YORS intervention in young adults in treatment with XR-MOUD, and

confirms its preliminary feasibility and efficacy in patients who have selected either XR-BUP or XR-NTX. This study also especially highlights that our standard approaches to treatment of OUD are woefully inadequate for this vulnerable young adult population, and emphasizes the need for expanding efforts to improve MOUD adherence and retention.

CRediT authorship contribution statement

Kevin Wenzel: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration.

Victoria Selby: Conceptualization, Resources, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration, Funding acquisition.

Jared Wildberger: Formal analysis, Investigation, Data Curation, Writing - Review & Editing, Visualization.

Luciana Lavorato: Investigation, Writing - Review & Editing.

Julia Thomas: Investigation, Data Curation, Writing - Review & Editing, Visualization.

Marc Fishman: Conceptualization, Methodology, Resources, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

Dr. Fishman has been a consultant for and received research funding from Alkermes. Dr. Fishman has an ownership interest in Maryland Treatment Centers, where this study was conducted.

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