A Comparison of Buprenorphine Taper Outcomes Between Prescription Opioid and Heroin Users

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Objectives: Dependence on prescription opioids (PO) is a growing problem. Although most research with buprenorphine has focused on heroin-dependent populations, we hypothesize that individuals dependent on PO display characteristics that may predict different outcomes in treatment, particularly in short-term taper procedures in which comorbidities such as pain conditions may complicate taper.

Methods: This secondary data analysis examined differences in outcomes between PO users (n = 90) and heroin users (n = 426) after a buprenorphine taper. Data were collected in a multisite randomized clinical trial conducted by the National Drug Abuse Treatment Clinical Trials Network at 11 study sites across the United States. After a 4-week buprenorphine induction/stabilization phase, 516 opioid-dependent individuals were randomized into 1 of 2 taper lengths (7 vs 28 days) to assess the association between taper length and outcome. The primary outcome was measured by urine drug test for opioids at the end of the taper period. Craving, withdrawal, and buprenorphine dose were also examined.

Results: After controlling for baseline demographic and drug use differences between the opioid use groups, results indicate that a higher percentage of the PO group (49%) provided an opioid-free urine drug specimen at the end of taper compared with the heroin group (36%; $\chi^2_1 = 6.592$, $P < 0.010$).

Conclusion: Short-term taper is not recommended as a stand-alone treatment; however, patients may taper from buprenorphine as part of a treatment plan. Despite greater comorbidity, PO users seem to have favorable taper outcomes compared with heroin users. Further studies are required to examine longer-term treatment outcomes.

Key Words: buprenorphine taper, induction, opioids, prescription opioid, treatment

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Prescription opioid (PO) dependence is an increasing problem in the United States and worldwide (Manchikanti et al., 2010; Larance et al., 2011; Maxwell, 2011), yet few studies have specifically examined buprenorphine treatment for PO users. Because research suggests that PO users differ in characteristics compared with traditional opioid-dependent populations, specifically heroin users, research is needed to examine whether treatment outcomes for PO-dependent patients are comparable with outcomes seen in heroin-dependent patients.

Previous research indicates differences between heroin and PO users. In a comparison of 178 PO- and heroin-using methadone treatment admissions, Brands et al. (2004) found that PO patients were differed on demographic characteristics, being older with higher levels of employment. Prescription opioids users were also more likely to report pain and to be involved in psychiatric treatment. In a separate study, Moore et al. (2007) reported greater treatment retention in a PO group than in a heroin group. The PO group also had fewer opioid positive urine test results and achieved more weeks of continuous abstinence. The PO-using group had a higher percentage of white patients and a higher mean income, used opioids for a shorter period of time, and were less likely to have previously participated in drug treatment (Moore et al., 2007).

Given the differences in characteristics between heroin and PO users, and particularly the greater presence of pain and psychological symptoms among PO users (Wu et al., 2010), it is important to examine differences in outcomes of specific aspects of buprenorphine treatment, such as buprenorphine taper, where comorbidities may reduce the possibility of a successful outcome.

Limited research has been conducted to understand differences in buprenorphine taper between PO- and heroin-using samples. Although detoxification regimens are not

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recommended as a stand-alone treatment, there are clinical circumstances in which patients need to be tapered off buprenorphine, similar to a short-term detoxification method. Although a taper is not expected to produce long-term abstinence, where the goal is to detoxify a patient off opioids, little research on buprenorphine taper has been conducted in PO-dependent samples.

Findings from a pilot study that examined the feasibility of a 2-week buprenorphine taper (Sigmon et al., 2009) in 15 PO-dependent patients found that 5 of the participants (36%) successfully completed detoxification. This was a small pilot study with only 1 taper condition. A recent larger study examined short-term and extended buprenorphine treatment for PO dependence (Weiss et al., 2011). Most participants in this study returned to opioid use. Examination of different taper approaches was not included, and comparison of outcomes to other opioid-using populations such as heroin users was not possible within the design of the study.

To address this evidence gap, this study examines taper outcomes for heroin- and PO-dependent users, utilizing secondary analysis of data collected in a multicenter study of buprenorphine taper schedules (Ling et al., 2009) conducted by the National Drug Abuse Treatment Clinical Trials Network. We hypothesize that although some evidence indicates that PO users may do better in treatment generally, factors such as pain and psychological symptoms could make taper more difficult in this group.

METHODS

Design

The analysis uses data collected from June 2003 through November 2005 in an open-label study comparing 2 different buprenorphine taper schedules: 7 days and 28 days (Ling et al., 2009). Participants were inducted and maintained on buprenorphine for 28 days before randomization to taper schedule, with follow-up assessments at 1 and 3 months post-taper.

This study compares baseline characteristics and taper outcomes for 2 subgroups composed of (1) those who report only PO use and (2) those who report heroin use. The primary outcome measure is opioid use at the end of the taper regimen, assessed with opioid toxicology tests. The aim of this study was to examine taper outcomes as measured by toxicology tests at the end of the taper period, rather than to analyze opioid use across the entire taper period or at a follow-up point. We posit that the final urine toxicology test result will provide a more accurate account of outcome as compared to status across the entire taper period. Not extending the analyses to include the follow-up time periods is in recognition of the fact that detoxification regimens rarely produce lasting improvements and indeed, in the main study, it was found that most participants did not complete the follow-up assessments. From 516 participants who began the taper, only 254 completed the 1-month follow-up and 206 completed the 3-month follow-up.

Participants

Detoxification-seeking individuals were recruited through word of mouth, advertisements, and referrals to 1 of 11 participating treatment programs in 10 medium to large US cities in Colorado, Washington, Oregon, Connecticut, New York, Virginia, and North Carolina. Inclusion criteria included seeking treatment for opioid dependence and being at least 15 years old. Exclusion criteria included poor general health, allergies to buprenorphine or naloxone, pregnant or nursing, having a psychiatric or medical condition that would make participation medically hazardous, dependence on alcohol or any drug other than opioids, participation in an investigational drug study in the last 30 days, or participation in methadone or Levo-Alpha Acetyl Methadol (LAAM) maintenance or detoxification in the last 30 days.

Approval was obtained from each of the local institutional review boards. All participants provided written informed consent before the conduct of study procedures and were compensated with cash or gift cards for each assessment. This included $25 for screening, $10 for each weekly visit, and $25 each for the start of induction visit, start of taper visit, and follow-up visits.

A total of 894 participants were screened with 748 (83.7%) inducted onto buprenorphine, and 516 participants who completed the stabilization/maintenance phase were randomized to taper schedule. There were no differences in baseline demographic and drug use characteristics between those who dropped out before the end of the taper and the group who completed the taper (Ling et al., 2009). For this secondary data analysis, we include participants who were randomized, and categorize them into 2 groups on the basis of the self-reported type of opioid used in the 30 days before screening. Participants reporting heroin use comprise the "heroin" group ($n = 426$), even if they also reported PO use. Participants reporting only PO use comprise the "PO only" (PO) group ($n = 90$). This grouping was based on the finding that reporting any heroin use predicted different treatment outcomes in PO users (Weiss et al., 2011).

Study Drug

Buprenorphine was provided in the form of Suboxone, a combination sublingual tablets in a 4:1 ratio, buprenorphine to naloxone. Reckitt-Benckiser (Hull, UK) provided 2-tablet strengths (2 mg buprenorphine/0.5 naloxone and 8 mg buprenorphine/2 mg naloxone).

Measures

Selected assessments from the main study that were utilized in this secondary analysis were end-of-taper urine test results, and withdrawal and craving scores over the taper period.

Urine samples were tested on site with results coded as positive or negative for morphine, methadone, amphetamines, barbiturates, benzodiazepines, cocaine, methamphetamines, phencyclidine (PCP), marijuana, and tricyclic antidepressants. Sites used either Jant's Accutest MultiDrug Screen-10 or ABI's SureStep Drug Screen Card 10A. In addition, the use of oxycodone was assessed using ABM's Rapid One Oxycodone single dipstick.

The Addiction Severity Index-Lite (ASI-Lite; McLellan et al., 1992; Cacciola et al., 2007) was used to collect problem severity profiles at screening and at taper in 7 domains commonly affected in substance abuse, including

alcohol and drug use, medical, psychiatric, legal, family/social, and employment/support. The demographic, substance abuse, and employment domains were included in this analysis. Retention was measured by clinic attendance for each scheduled clinic visit.

The Clinical Opiate Withdrawal Scale (COWS) (Wesson & Ling, 2003), a clinician-completed pen-and-paper scale that rates the presence/severity of 11 common opiate withdrawal signs or symptoms (eg, sweating, runny nose), was administered at each clinic visit.

The Adjective Rating Scale for Withdrawal (ARSW) (Amass et al., 2000), composed of 16 self-reported signs and symptoms of opioid withdrawal rated on a scale ranging from 0 (none) to 9 (severe), was completed at each clinic visit. Item examples include muscle cramps, painful joints, and fitful sleep.

The Visual Analog Scale (VAS) documented craving for opioids, withdrawal symptom severity. Participants marked a 100-point line anchored with "not at all" and "extremely" for each item at each clinic visit.

Procedures

Participants were inducted onto buprenorphine over the first 3 days of participation using standard induction procedures. Weekly clinic visits included assessments and medication dispensing with medication provided for self-administration between visits. Participants could be withdrawn from the study by the investigator was for missing 3 consecutive data collection visits.

The 4-week stabilization/maintenance phase included 3 weeks of flexible dosing to allow adjustments for individual responses to buprenorphine. All participants were on a fixed daily dose of 8 mg, 16 mg, or 24 mg by the fourth week.

On completion of the 4-week stabilization phase, participants were randomized to either the 7- or 28-day taper schedule. Randomization was stratified by dose (Ling et al., 2009). On randomization day, participants were assigned to taper schedule with instructions for dosing over the taper phase. Participants were followed up at 1 and 3 months posttaper.

As the groups attended weekly visits during the taper phase, and the primary outcome measure for this secondary analysis was measured at the final visit of the taper. The 7-day taper group attended 7 visits leading up to this point, compared with 10 visits for the 28-day taper group. There was no significant difference in the number of either opioid use groups randomized to each of the taper conditions.

Data Analysis

Baseline comparisons, dosing patterns, opioid use, treatment outcome, retention, and withdrawal and craving were compared between the 2 opioid-use groups. The primary outcome measure was opioid urine test results at the end of the taper. A successful taper was defined as the participant attending and providing an opioid-free urine at the end of taper visit. Baseline characteristics, opioid use, withdrawal symptoms, and craving were compared for each dose group using chi-square and t tests. Where Levene's test for Equality of Variances was significant ($P < 0.05$), equal variances were not assumed.

For analyses of opioid use and treatment retention, binary logistic regression was used to determine whether the effect seen was explained after controlling for the baseline demographic and drug use differences between the 2 comparison groups. Variables controlled for were race, employment, baseline buprenorphine dose, and differences in baseline nonopioid drug use (lifetime years of alcohol, cocaine, nicotine, and cannabis).

All statistical tests were performed at 95% significance level. Statistical analysis was performed using PASW Version 18.

RESULTS

Participant Baseline Characteristics

Demographic Characteristics

Table 1 shows baseline demographic and drug use characteristics by opioid-use group (PO or heroin). The groups did not differ by sex, mean years of education, or marital status. A higher percentage of the PO group was white, and more were either a student or employed full- or part-time as compared with the heroin group.

Opioid Use History

The groups differed in drug use history, including mean days of heroin use in the past 30 days ($t = 106.005$; $P < 0.01$). Mean days of other opioid use in the past 30 days also differed ($t = 39.637$; $P < 0.01$), with the PO group reporting 27.72 days (SD = 5.4) and the heroin group reporting 2.11 days (SD = 5.6).

The heroin group reported significantly more years of lifetime years of heroin use than the PO group (7.6 years vs 0.5 years, $t = 16.149$, $P < 0.0001$). The PO group reported significantly more lifetime years of "other opioids" compared with the heroin group (4.1 years vs 1.6 years, $t = 6.045$, $P <$ 0 .001) (Table 1).

Other Drug Use

The heroin group reported a greater mean number of lifetime years of regular use of alcohol, cocaine, nicotine, and cannabis as compared with the PO group (Table 1).

Mental and Physical Health

More of the PO group reported taking a medication for a physical condition (33%) as compared with the heroin group (14%; $\chi^2_{1,516}$, $P < 0.01$) and being troubled by any physical problem, 42% and 28%, respectively ($\chi^2_{1,516}$, $P < 0.006$). The PO group scored higher on the ASI Psychiatric composite score ($t_{119.3} = 2.299$, $P = 0.023$).

Withdrawal and Craving

The groups did not differ in baseline withdrawal and craving scores, as measured by the ARSW (PO group: $M =$ 61.7, SD = 31.1; heroin group: $M = 63.2$, = SD 32.4; $t_{513} =$ -0.140 $P = 0.889$); VAS craving (PO group: $M = 69.1$, SD = 26.8; heroin group: $M = 69.7$, SD = 23.8; $t_{513} = -0.245$; P = 0.806), VAS withdrawal (PO group: $M = 57.1$, SD = 24.8; heroin group: $M = 32.7$, SD = 23.7; $t_{513} = 1.579$, $P = 0.115$),

TABLE 1. Baseline Demographic and Drug Use Characteristics by Opioid Type

	Heroin User (n = 426)	PO-Only User (n = 90)	*P*
Sex, n (% male)	292 (69)	54 (60)	0.117
Mean age (SD), y	36.3 (10.4)	34.2 (10.6)	0.088
Years of education, mean (SD)	12.8 (2.1)	12.8 (2.3)	0.959
Student or employed (full- or part-time), n (%)	231 (54)	67 (74)	<0.01
Race, n (%)			0.005
White	309 (73)	84 (93)	
Black or African American	56 (13)	4 (4)	
Hispanic	47 (11)	1 (1)	
Other	14 (3)	1 (1)	
Marital status, n (%)			0.325
Married	96 (23)	29 (32)	
Widowed	7 (2)	2 (2)	
Separated	26 (6)	3 (3)	
Divorced	73 (17)	14 (16)	
Never married	224 (53)	42 (47)	
Buprenorphine stabilization dose, n (%)			0.002
8 mg	32 (8)	16 (18)	
16 mg	112 (26)	29 (32)	
24 mg	282 (66)	45 (50)	
Withdrawal measures at baseline, mean (SD)			
VAS craving	69.7 (23.8)	69.1 (26.8)	0.806
VAS withdrawal	57.1 (24.8)	27.1 (24.8)	0.115
ARSW	62.2 (32.4)	61.73 (21.1)	0.889
COWS	8.5 (4.0)	8.3 (4.0)	0.687
Taking a prescribed medicine for physical problem, n (%)	59 (14)	30 (33)	<0.001
Receiving a physical disability pension, n (%)	14 (3)	5 (6)	0.299
Troubled by any medical problems, n (%)	118 (28)	38 (43)	0.005
ASI Psychiatric Composite Score mean (SD)	0.17 (0.20)	0.23 (0.22)	0.023
Past 30-day opioid use (mean no. of days)			
Heroin	27.7 (5.4)	0.0 (0.0)	<0.01
Other opioids	2.1 (5.6)	27.7 (5.4)	<0.01
Years (SD) of lifetime use (ASI)			
Heroin	7.6 (8.3)	0.5 (1.7)	<0.001
Other opioids	1.6 (3.5)	4.1 (3.5)	<0.001
Prescribed methadone	1.1 (2.3)	0.2 (0.7)	<0.001
Illicit methadone	0.0 (0.2)	0.3 (1.4)	0.059
Alcohol	6.9 (8.9)	5.0 (7.1)	0.033
Alcohol to intoxication	4.1 (6.5)	3.5 (5.7)	0.395
Cocaine	3.6 (5.7)	1.5 (3.4)	<0.01
Amphetamines/methamphetamines	0.8 (2.9)	0.7 (2.3)	0.711
Nicotine	14.9 (11.2)	12.2 (10.3)	0.035
Sedatives/hypnotics	0.6 (2.1)	0.6 (1.6)	0.892
Cannabis	7.3 (8.5)	5.2 (6.3)	0.007

ARSW, Adjective Rating Scale for Withdrawal; ASI, Addiction Severity Index; COWS, Clinical Opiate Withdrawal Scale; VAS, Visual Analog Scale.

and COWS (PO group: $M = 8.3$, SD = 4.0; heroin group: $M = 8.5$, SD = 4.0; $t_{514} = -0.404$) (see Table 1).

Buprenorphine Dose

The groups significantly differed in buprenorphine dose ($\chi^2_{2,516} = 4.650$, $P = 0.002$) (Table 1). More of the PO use group was stabilized on 8 mg (18%) or 16 mg (32%), as compared with the heroin group (8% and 26%, respectively), whereas more of the heroin group was stabilized on 24 mg (66%) as compared with the PO group (50%).

Taper Outcome Differences

Taper Outcome

When collapsing the 2 taper groups, a significant difference in the primary outcome measure of attendance with opioid negative urine test was found (Table 2). Half

TABLE 2. End of Taper Outcomes by Opioid Type

End of Taper Outcomes	Heroin User (n = 426)	PO-Only User (n = 90)	*P*
Attended end of taper (EOT) visit			
All participants, n (%)	317 (74)	57 (63)	0.032
7-day taper group, n (%)	169 (82)	33 (69)	0.047
28-day taper group, n (%)	148 (68)	24 (57)	0.194
Attended EOT with opioid free UDS			
All participants, n (%)	147 (35)	44 (49)	0.010
7-day taper group, n (%)	85 (41)	28 (58)	0.030
28-day taper group, n (%)	62 (28)	16 (38)	0.204
VAS			
Craving, mean (SD)	23.0 (28.9)	29.4 (34.7)	0.193
Withdrawal, mean (SD)	15.8 (23.0)	23.3 (31.7)	0.096
COWS, mean (SD)	2.5 (3.2)	3.2 (3.9)	0.157
ARSW, mean (SD)	18.7 (23.8)	27.9 (32.4)	0.011

ARSW, Adjective Rating Scale for Withdrawal; COWS, Clinical Opiate Withdrawal Scale; VAS, Visual Analog Scale; UDS, Urine Drug Screen.

(n = 44; 49%) of the PO group attended and provided an opioid-free urine sample at the end of the taper compared with one-third (n = 147; 35%) of the heroin group ($\chi^2_{1,516} = 6.592$, $P = 0.01$).

Examining the individual taper conditions, a significant difference was found between the opioid use groups in the 7-day taper (Table 2). No significant difference was found between the opioid use groups in the 28-day taper condition ($\chi^2_{1,261} = 1.610$, $P = 0.20$).

Examining taper condition and opioid group in a single binary logistic model, both taper condition and opioid groups (PO or heroin) had a significant effect. Those in the 7-day taper group were almost twice as likely to complete the taper and provide an opioid negative urine sample (odds ratio = 1.85, 95% confidence interval [CI] = 1.29–2.66) compared with those in the 28-day taper group. Likewise, those in the PO group were almost twice as likely to provide an opioid negative urine sample at the end of taper (odds ratio = 1.79; 95% CI = 1.12–2.84) as those in the heroin group.

Collapsing the taper groups and, after controlling for demographic and drug use characteristics that differed at baseline, the association between opioid type and taper outcome was statistically significant, with more participants from the PO group providing an opioid-free urine sample at the end of taper ($P = 0.026$). The association was no longer significant ($P = 0.113$) after adding into the model baseline differences of being prescribed a medication for medical problems, being troubled by medication problems and the ASI psychiatric composite score into the model.

Retention

A significant difference was found between the 2 opioid-use groups with more of the heroin group being present at the end of taper (n = 317; 74%) compared with the PO group (n = 57; 63%) ($\chi^2_{1,516} = 4.573$, $P = 0.032$). This difference was not significant when controlling for differences in demographic and drug use characteristics at baseline ($\chi^2 = 2.805$; $P = 0.094$).

Reasons for early termination were examined for the 2 groups, with no difference found in the total percentage of study participants withdrawn by the investigator (52% for the PO group compared with 62% for the heroin group, $P = 0.264$). The most common reason for participants being withdrawn by the investigator was for missing 3 consecutive data collection visits (97% of all investigator-initiated early terminations). There was no difference between the groups in participant-initiated terminations (21% in the PO group compared with 14%, $P = 0.300$). The most common reason for participant-initiated early terminations was participants' no longer being willing or able to attend the clinic (41% of all cases).

Attendance at the end of taper visit did not vary by taper condition for the PO group (69% in the 7-day taper compared with 57% in the 28-day taper, $\chi^2 = 1.300$, $P = 0.254$). There was a difference in attendance in the heroin group with greater attendance in the 7-day taper group (82% compared with 67%, $\chi^2 = 11.053$, $P < 0.001$).

Withdrawal and Craving

No difference was found between COWS or VAS scores between the 2 opioid-use groups at the end of the taper (Table 2). A significant difference was found between the opioid-use groups on the ARSW at the end of the taper ($t_{67.319} = 2.060$; $P < 0.01$), with the PO group reporting significantly greater withdrawal symptoms as compared with the heroin group.

Results at Follow-up

At 1 month posttaper, 49% of participants attended a study visit. There was no difference detected in the opioid-free urine samples provided at the 1-month time point, with 22% (n = 20) of the PO group and 17% (n = 71) of the heroin group providing an opioid-free urine ($\chi^2 = 1.579$, $P = 0.209$). At 3 months posttaper, 40% of participants attended a study visit. The PO group provided a greater number of opioid-free urines at this time point (20%, n = 18, compared with 11%, n = 48, $\chi^2 = 5.079$, $P = 0.024$).

DISCUSSION

Consistent with previous research (Brands et al., 2004; Moore et al., 2007), PO users seemed to have at least comparable outcomes compared with heroin users after buprenorphine taper. A greater proportion of the PO-use group provided an opioid-free urine at the end of the taper as compared with the heroin-use group. It was observed that once indicators of physical and mental health were included in the model, the differences in opioid-free urines seen between the 2 groups were no longer significant. This is consistent with our hypothesis that these characteristics may be important factors in treatment outcomes. Given the high prevalence of these comorbidities in PO users, this finding suggests that these factors should be taken into account when planning taper for this group.

Although the PO use group provided a higher percentage of opioid-free urine samples at the end of the taper, the heroin group had higher rates of attendance at the end of taper visit. Possible reasons for higher rates of retention may be related to participants' motivation for attending research visits. This may be an artifact of engagement in the study, or be a result of greater salience of the amount of compensation provided for study visits in the heroin group, where lower rates of employment were reported. It is not possible to confirm this from study data available. Greater subjective withdrawal symptoms at the end of the taper were reported by the PO group. Lower levels of opioid withdrawal symptoms reported by the heroin group may be due to recent and ongoing opioid use as indicated by higher rates of opioid-positive urine test results.

The main analysis has focused on a single time point, being the end of the taper period. It was observed that a greater number of PO users were able to provide an opioid-free urine at 3 months posttaper also, although because of low follow-up rates and the nonsignificant difference at 1 month, this may not be a meaningful difference. Although it can be argued that our primary outcome measure does not take into account longer-term outcomes, there is consistent evidence that high rates of relapse occur after taper, including recent research with PO users (Weiss et al., 2011). For this reason, the aim of this analysis was not to examine longer-term outcomes, but to

focus on the taper period to inform clinicians about outcomes for PO users compared with heroin users under these taper conditions at the end of taper time point. It is noted that even though this single time point was identified as the primary outcome, the results at 3 months were consistent with those at the end of the taper period.

Limitations of this study include the use of urine drug screen data for the primary outcome. Not all drug use will be detected in drug testing, and long-acting POs may be more likely to be detected as compared with shorter action opioids such as heroin. The urine tests included in this study are also not highly sensitive to the full range of POs that may have been used by study participants. Differences may, in part, reflect different drug-testing sensitivities for detecting heroin versus POs. Although both groups reported PO use at baseline, one group comprised those who reported only PO use. Detection of a wider range POs may be considered with future studies, as well as ensuring that cutoffs for heroin and POs are comparable, and the use of self-report substance use data in addition to urine drug test results. An additional limitation is the assumption that those not providing a urine sample at the end of taper are not opioid free. This assumption is commonly used in research studies and provides a conservative approach to addressing missing urine tests. Because a higher percentage of the PO group did not provide an end-of-taper urine sample, this approach may have resulted in a more conservative estimate of participants who were able to complete the taper. Finally, the withdrawal scales used in this study have not been specifically validated for use in PO users, although the COWS has been used previously in studies with PO users (Weiss et al., 2011).

One other consideration for discussion is the grouping of the PO and heroin users. The PO group in this study reflected a group that reported no recent heroin use, based on the finding in previous studies that the report of any heroin use was associated with differing treatment outcomes (Weiss et al., 2011). The low reporting of days of PO use among heroin users in the previous 30 days indicates that this was a reasonable classification. Although it is possible that an occasional heroin user with a predominant pattern of PO use could appear in the heroin group, this is not reflected in the mean days of PO use in the heroin group. As the goal of this study was to examine taper for PO users, selecting a "pure" PO-using sample enabled us to describe outcomes for this group.

CONCLUSIONS

The findings of this study are clinically relevant, demonstrating that PO users are able to taper off buprenorphine comparably to heroin users. Although buprenorphine taper is not indicated as a stand-alone treatment, and longer-term abstinence after buprenorphine taper among PO users would not be expected (Weiss et al., 2011), there are clinical scenarios where it may be required to taper a patient off buprenorphine, making the findings of this study an important addition to the evidence base in the management of PO dependence with buprenorphine.

Consistent with the main study findings, results of this secondary analysis confirm that there seems to be no benefit in prolonging the taper period for PO users beyond 7 days, with 58% of the PO group completing the 7-day taper and providing a clean urine, compared with 38% of the PO group in the 28-day taper condition. Should a taper be indicated for a medical reason (for example for opioid rotation for pain management, or to commence an extended release naltrexone injection), a 7-day taper seems to be an appropriate taper schedule.

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