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Comparison of Methods to Assess Psychiatric Medication Adherence in Methadone-maintained Patients with Co-occurring Psychiatric Disorder

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Abstract

Background—Adherence with psychiatric medication is a critical issue that has serious individual and public health implications. This is a secondary analysis of a large-scale clinical treatment trial of co-occurring substance use and psychiatric disorder.

Method—Participants (n=153) who received a clinically-indicated psychiatric medication >30 days during the 12-month study and provided corresponding data from Medication Event Monitoring System (MEMS) and Morisky Medication Taking Adherence Scale (MMAS) self-report adherence ratings were included in the analyses. Accuracy in MEMS caps openings was customized to each participant's unique required dosing schedule.

Results—Consistent with expectations, MEMS-based adherence declined slowly over time, though MMAS scores of forgetting medication remained high and did not change over the 12-month study. MEMS caps openings were not significantly impacted by any baseline or treatment level variables, whereas MMAS scores were significantly associated with younger age and presence of an Axis I disorder and antisocial personality disorder, or any cluster B diagnoses.

Conclusions—Results suggest that MEMS caps may be a more objective method for monitoring adherence in patients with co-occurring substance use and psychiatric disorder relative to the MMAS self-report. Participants in this study were able to successfully use the MEMS caps for a 12-month period with <1% lost or broken caps, suggesting this comorbid population is able to use the MEMS successfully. Ultimately, these data suggest that an objective method for monitoring adherence in this treatment population yield more accurate outcomes relative to self-report.

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Keywords

MEMS; medication adherence; co-occurring; opioid use disorder; psychiatric disorder

1. INTRODUCTION

More than 20% of adults in the United States have been prescribed at least one psychotropic medication (Medco Health Solutions, 2011). Psychiatric medication treatments are generally chronic treatment regimens, which have an increased opportunity for poor medication adherence to develop, and psychotropic medications are not taken as prescribed approximately 30–46% of the time (Bulloch and Patten, 2010). Poor medication adherence has been associated with poor outcomes and increases in medical costs and rehospitalizations in general medical conditions (Svarstad et al., 2001; Sokol et al., 2005), and in patients with serious mental illness specifically (Sun et al., 2007), and can obscure or confound the results of clinical trial evaluations of new medications or treatment indications (Blaschke et al., 2012; Vrijens and Urquhart, 2014). The World Health Organization has called poor medication adherence “a worldwide problem of striking magnitude (World Health Organization, 2003; Sajatovic et al., 2010), yet efforts to measure adherence are hampered by the absence of universally accepted standards for defining and measuring adherence.

Up to 50% of patients entering methadone maintenance (MM) for the treatment of opioid use disorder suffer with a co-occurring psychiatric disorder (Brooner et al., 1997; McGovern et al., 2006). Psychiatric disorders in this population have been associated with impairments in patient psychosocial functioning and quality of life (Cacciola et al., 2001; Compton et al., 2003; Carpentier et al., 2009), and illicit drug use has been associated with poor medication adherence (Keck et al., 1997; Olfson et al., 2000; Magura et al., 2002; Lacro et al., 2002; Weiss, 2004). Thus, methods to measure and ultimately increase adherence to psychiatric medications are especially important for these patients. Only one study has compared different methods to assess medication adherence in MM patients; patients (n=53) completed five concurrently administered self-report measures of antiretroviral adherence and rates of perfect adherence ranged from 22%–58% across the measures (Berg et al., 2012). No studies have compared different methods for measuring adherence to psychiatric medication within MM patients. One reason for this may be the diverse nature of the medications prescribed in clinical settings. For instance, in contrast to participants in randomized clinical trial evaluations of medication efficacy, clinical MM patients with co-occurring psychiatric disorder are often prescribed myriad psychiatric medications that entail different dosing schedules and frequencies.

There is value in identifying effective methods to measure adherence with psychiatric medications in MM patients for both research and clinical settings. Self-report measures are conventional strategies that ask patients to recall their level of adherence over a period of time. These measures are relatively brief and inexpensive to administer, however results may be subject to problems with recall bias and are highly dependent upon the specific questions asked (Berg et al., 2012). A more advanced method is electronic adherence monitoring, which has been endorsed by the treatment community and Food and Drug

Administration (Osterberg and Blaschke, 2005; Food and Drug Administration (FDA), 2012). The Medication Event Monitoring System (MEMS™; WestRock), an electronic prescription bottle cap that records all bottle openings as a proxy measure of adherence, is one example of this technology. Though MEMS cannot certify that the correct amount of medication was extracted and consumed during each opening, blood plasma levels of drugs can be accurately predicted by the number of MEMS openings (Vrijens et al., 2005), which supports its use as a proxy measure.

Despite the potential for improved adherence monitoring, MEMS can be expensive and logistically complicated, so ensuring their use is necessary and appropriate for specific populations is important. Although a recent meta-analysis reported that MEMS and self-reported measures of adherence are highly correlated (Shi et al., 2010a), evidence suggests that patient population may significantly impact outcomes. For instance, some populations (e.g., diabetes; pregnancy) show strong correspondence between MEMS and other methods of adherence monitoring, suggesting these patients may not incur any additional benefit from MEMS caps monitoring (Gonzalez et al., 2013; Bosman et al., 2014); whereas other populations (e.g., depression, heart failure, schizophrenia) show major discrepancies between MEMS and other methods of adherence monitoring, suggesting these patients may benefit from MEMS caps over other monitoring approaches (Byerly et al., 2005; Parker et al., 2007; Wu et al., 2008; Lee et al., 2010; Nieuwenhuis et al., 2012). The degree to which MEMS and self-report measures are associated, and the degree to which MM patients with co-occurring psychiatric disorder can successfully utilize the MEMS caps, is currently unknown.

This is a secondary data analysis to compare medication adherence rates concurrently assessed using MEMS and a widely-used self-report measure of medication adherence among MM participants prescribed medication for a co-occurring psychiatric disorder. Psychiatric medications were prescribed as clinically indicated, which resulted in a range of different medications and dosing schedules, and patients were enrolled for a 12-month period, which provides a unique opportunity to compare the value of two adherence monitoring methods over an extended period of time in a real-world clinical setting. The study hypothesized that MEMS caps would provide a better method of tracking medication adherence in this population relative to self-report, and that participants would be able to successfully use the MEMS caps during the trial (i.e., low rates of loss or broken MEMs caps). These data will help inform the field on the utility and merits of monitoring psychiatric medication adherence via electronic versus self-report methods in clinical populations with co-occurring substance use and other psychiatric disorder.

2. METHODS

2.1 Participants

Participants (n=316) were recruited from the Addiction Treatment Services (ATS) program in Baltimore, MD to participate in a randomized controlled comparison of on-site/integrated versus off-site/non-integrated substance abuse and psychiatric care (Brooner et al., 2013). All participants were receiving MM as part of their overall treatment plan. To be eligible for the study, participants had to meet DSM-IV criteria for opioid dependence and federal

criteria for MM, meet DSM-IV criteria for a current psychiatric diagnosis that was eligible for treatment within Maryland's public mental health system, and to report an interest in receiving treatment for the psychiatric problem. Exclusion criteria were being pregnant, presence of an acute medical and/or psychiatric problem that required urgent attention, and presence of an organic mental disorder and/or other cognitive impairment that may interfere with comprehension of study procedures. For the purpose of these analyses, the two experimental groups were collapsed and only participants who received a MEMS cap for 30 days and had corresponding self-report data within the 12-month study period were evaluated. Reasons for not receiving a MEMS cap included never starting a psychiatric medication, treatment drop-out, or being prescribed a psychiatric medication not subject to tracking (e.g., symptomatic medications used when needed). The Johns Hopkins Institutional Review Board reviewed and approved the study and all participants provided voluntary written consent to participate.

2.2 Study Procedures

A full report of the study procedures and primary outcomes have been reported previously (Brooner et al., 2013); therefore, only procedures relevant to these analyses are described here.

Participants enrolled this 12-month intervention completed assessments at screening and 30-day intervals. All participants were prescribed methadone for opioid use disorder as part of routine care and were provided with good and comparable access to prescribed psychiatric medications; medication costs for uninsured participants (n=158; 50.0% of total sample) were paid by the study. Prescriptions for psychiatric medications were submitted to a single pharmacy and medication was delivered to the treatment clinic within 48-hours. Participants who received medications were issued a wide-range of prescriptions with different dosing schedules, and it was possible for participants to have prescriptions that began and/or ended during the 12-month study.

2.3 Study Measures

2.3.1. Self-report and Observer-rated Measures—The Structured Clinical Interview for DSM-IV (First et al., 1997, 2002) was administered by a trained staff member at screening to diagnose the presence of drug and/or alcohol dependence and other Axis I & II psychiatric disorders; diagnoses were confirmed by a board certified psychiatrist or clinical psychologist. Participants also completed the Symptom Checklist-90 (SCL-90), a 90-item self-report measure that assesses functioning in 9 psychiatric symptom domains and produces a global assessment of functioning (Global Severity Index; GSI), at screening and at 30-day intervals and each subscale was normalized for age and gender to yield a T-score value. Self-reported adherence with prescriptions was collected every 30-days using the Morisky Medication Taking Adherence Scale (MMAS; Morisky et al., 1986), a frequently used 4-item dichotomous (yes/no) self-report measure of medication adherence (Shi et al., 2010b; Clifford et al., 2014). The items are “Do you ever forget to take your medication” (Forget); “Are you careless at times about taking your medication” (Careless); “When you feel better, do you sometimes stop taking your medication” (Stop/better); “Sometimes if you feel worse when you take the medication, do you stop taking it” (Stop/worse). Results were

summed to derive a total score, with a range of 0–4, and higher numbers indicated poorer adherence. Finally, participants provided periodic urine samples as part of routine care that were tested for recent opioid, cannabis, sedative, and cocaine use; urine collection was directly observed and temperature-tested by gender-matched staff.

2.3.2. MEMS Cap Monitoring—All participants who were prescribed a psychiatric medication were assigned two MEMS caps that were exchanged when participants returned one for downloading of the data. MEMS cap data were downloaded every 30-days, consistent with prescription refill periods. Participants prescribed more than 1 psychiatric medication only received MEMS for the medication considered the most important to the target disorder. Participants who changed medications during the study transferred the MEMS cap to their new prescription. For these analyses, MEMS cap adherence was defined as having opened the MEMS cap the correct number of times per study day. This value was customized to each individual participant based upon his or her own unique medication dosing schedule (ranging from one to three times per 24-hours), and a dichotomous (yes/no) variable was derived for each dosing day to signify daily medication adherence. Participants who opened their MEMS cap too few or too many times were rated as nonadherent for that day. Participants were not provided feedback on medication adherence from the monthly MEMS cap data downloads or the monthly self-report adherence measure during participation in the study, and no study-related contingencies were placed on psychiatric medication adherence.

2.4 Data Analyses

Only data from 30-day periods during which a participant received an active prescription and provided both MEMS and self-report data are included in these analyses. To control for prescriptions that may have ended at different points during the 12-months, all values were converted to a percentage of possible days and refer only to those participants who were receiving a prescription at each 30-day assessment. The dependent variable was mean percent medication adherence assessed via the MEMS caps and the self-report MMAS scores. MMAS values were inverted so that high levels represented better adherence, to enable direct comparison to the MEMS. Demographic and treatment-related variables were summarized to characterize the sample (Table 1). MEMS cap daily values were converted to produce a mean percent adherent value for each 30-day period to correspond with the MMAS reporting period, and a repeated one-factor model was used to examine changes in adherence across study months. Monthly ratings of MEMS and MMAS values were compared using correlations and were then correlated with other outcomes collected across the 12-month study (e.g., SCL-90 GSI scores, MM status, and percent positive urine samples). Traditional correlation coefficient methods were deemed unsuitable because they ignore the correlation structure of the repeated measures inherent within these data so linear mixed effect (LME) models with autoregressive correlation matrixes were used.

Analyses then evaluated whether MEMS and MMAS values were differentially associated with baseline and summary treatment-level measures. Baseline measures were selected from *a priori* hypotheses they may impact adherence and included demographic variables (age (<40/ 40), gender, race (Caucasian/non-Caucasian), education level (<12/ 12 years of

education)), psychiatric variables (presence of Axis I disorder with antisocial personality disorder or with any cluster B diagnosis, baseline SCL-90 GSI), and summary treatment-level variables (percent of scheduled psychiatrist visits attended and percent of individual, group, or psychiatrist visits attended). For these analyses, MEMS and the MMAS Forget item were operationalized as total percent adherence, collapsed across study months, and results were evaluated using linear regression models.

A p-value of $<.05$ was considered statistically significant and all analyses were conducted using SPSS versions 21 and 22.

3. RESULTS

3.1 Participants

Of the 316 study participants, 153 (48.4% of the total sample) were assigned a MEMS cap and provided corresponding MEMS and MMAS data for at least one 30-day period. Comparison of the two groups revealed that participants who did not receive a MEMS and/or provide corresponding data were significantly more likely to meet criteria for current alcohol dependence (12.8% vs. 6.5%, respectively, $\chi^2(1)=3.59$, $p=.04$), however there were no additional significant demographic (e.g., age, gender, race, marital status, HIV/HCV status, current pain), psychiatric (e.g., presence of current mood, anxiety, PTSD, or psychotic Axis I disorder, or antisocial personality disorder), or drug (current cannabis, sedative, cocaine dependence)-related differences between the groups.

The 153 participants who provided corresponding data were 40 years old (range 21–61), 34% male, and 61% Caucasian. Ninety-eight percent met criteria for a current Axis I psychiatric disorder, 43% met criteria for more than one Axis I psychiatric disorder, 57.5% met criteria for an Axis II disorder, and 61% percent met criteria for both Axis I and II psychiatric disorders. Additional characteristics of this sample are presented in Table 1. Only two of the 153 participants had any missing MEMS caps data (2.6 and 10.3% of daily openings were missing), representing less than one percent of data overall. As a result, no adjustments for missing data were made.

A total of 901 different 30-day prescriptions were followed during this study, averaging 1.54 (ranging from one to five) medications per participant. The following medications were prescribed at some point during the 12-month study evaluation period (listed in order of frequency): fluoxetine (15.1%), lithium (13.1%), bupropion (11.0%), paroxetine (9.8%), escitalopram (8.3%), citalopram (8.1%), venlafaxine (6.3%), sertraline (5.0%), divalproex sodium (3.3%), nortriptyline (3.2%), quetiapine (2.8%), mirtazapine (2.7%), duloxetine and risperidone (2.1%), lamotrigine (2.0%), gabapentin (1.9%), olanzapine (1.7%), buspar, imipramine, trazodone, amitriptyline, and doxepin (less than 1% each).

3.2 Medication Adherence

Overall, adherence measured via MEMS caps showed a different pattern than self-reported MMAS ratings. MEMS-based adherence declined gradually and in a linear manner across study months. Participants were more likely to open their MEMS caps the exact number of times expected (54.8%), versus opening too few (38.3%), or too many (6.9%) times. Less

than one percent of caps were reported lost or broken at each monthly visit and changes in adherence were significant across study month. Specifically, opening the MEMS cap the prescribed number of times declined significantly over study months ($F(1,11)=4.42$, $p<.001$), and almost exactly paralleled a significant increase in participants opening the cap fewer times than prescribed over study months ($F(1,11)=4.42$, $p<.001$). Opening the cap more times than prescribed did not change significantly over study months ($p=.48$).

In contrast, adherence measured via the MMAS remained high with no fluctuations throughout the study (Figure 1). Participants reported adhering to medication 80.4% of the time on the MMAS. Reasons for nonadherence included forgetting to take their medication (40.3%), missing medication due to carelessness (20.9%), and intentionally discontinuing their medication due to feeling better (12.5%) or feeling worse (17.4%). There were no significant changes in MMAS adherence over study months on the MMAS scores for Forget ($p=.92$), Careless ($p=.19$), Stop/better ($p=.86$), Stop/worse ($p=.80$), or the MMAS Total score ($p=.86$).

Given the differences in reporting periods between the MEMS (daily) and the MMAS (monthly), the number of study months, collapsed across participants, during which a participant exhibited 100% adherence via the MEMS cap and reported adherence on the MMAS was assessed. Out of 901 total potential study months, 7% ($n=65$) evidenced 100% MEMS adherence, whereas 38% ($n=340$) evidenced 100% adherence on the MMAS. Less than one percent ($n=12$) of months were in complete agreement between the MEMS caps and the MMAS self-report ratings. This was supported by linear mixed effect modeling, which revealed that MEMS adherence was not significantly associated with the MMAS Forget item ($p=0.10$), though a significant association was observed with the MMAS Total score ($r=-.30$, $n=153$, $p<.001$).

3.3 Predictors and Associations with MEMS Adherence

Analysis of MEMS and baseline characteristics did not reveal significant associations between adherence and age, gender, race, presence of Axis I disorder with APD or with any cluster B diagnosis, baseline SCL-90 GSI, or attendance at individual, group, or psychiatrist visits combined.

Analysis of MEMS and 30-day treatment outcome variables also did not reveal significant associations between percent MEMS adherence and the SCL-90 GSI, methadone treatment status, or percent of urine samples testing positive for illicit drugs. Medication dosing frequency (ranging from one to three doses per day) was significantly negatively associated with MEMS cap-based levels of adherence ($r=-.307$, $n=153$, $p<.001$).

3.4 Predictors and Associations with MMAS Adherence

Analysis of MMAS Total adherence and baseline characteristics revealed significant correlations ($R^2=0.10$, $p=.03$) between MMAS and being younger than 40 ($\beta=-0.17$, $p=0.04$) and having an Axis I disorder with antisocial personality disorder ($\beta=0.22$, $p=.01$). Significant associations were still evident when this model was rerun ($R^2=0.12$, $p<.01$), substituting antisocial personality disorder with any cluster B diagnosis ($\beta=0.28$, $p<.01$); being younger than 40 remained significant in this model ($\beta=-0.18$, $p=.03$). No

significant associations were observed between MMAS Total adherence and gender, race, education, baseline GSI values, or attendance at individual, group, or psychiatrist visits.

Analysis of MMAS adherence and 30-day treatment outcome variables revealed the MMAS Forget ($r=0.10$, $n=153$, $p<.01$) and Total Score ($r=.21$, $n=153$, $p<.001$) were both significantly correlated with monthly SCL-90 GSI ratings. These correlations were likely driven by significant correlations between baseline SCL-90 GSI scores and the presence of an Axis I disorder with antisocial personality disorder ($r=-0.24$, $n=152$, $p<.01$) or any cluster B diagnoses ($r=-0.21$, $n=152$, $p<.01$), since ongoing changes in Axis I & II status were not evaluated at 30-day intervals and thus not entered into the linear mixed effects model. No significant associations were observed between MMAS and methadone treatment status or percent urine samples testing positive for illicit drugs. Neither the MMAS Forget ($p=.51$) nor Total ($p=.61$) scores were significantly associated with medication dosing frequency.

4. DISCUSSION

The present study compared MEMS cap-based medication adherence to the MMAS, a widely used self-report measure of medication adherence (Shi et al., 2010b; Clifford et al., 2014), in MM patients receiving treatment for co-occurring psychiatric disorder. This is the first comparison of MEMS and self-reported medication adherence among MM patients and the first evaluation of methods to monitor psychiatric medication adherence in MM patients. These data extend previous studies by tailoring the MEMS definition of adherence to individual patients who had a wide range of co-occurring psychiatric diagnoses and a more diverse set of psychiatric medications than those reported previously (Demonceau et al., 2013). Despite the clinical severity and impairment of this population, this study demonstrated that participants were able to utilize the MEMS caps for an extended duration (e.g., up to 12 months) with few lost or broken caps, suggesting that MM patients can successfully utilize MEMS caps.

These results suggest that MEMS caps are a more sensitive index of psychiatric medication adherence in MM patients relative to the MMAS self-report measure. This is evident by the linear decreases in MEMS-based adherence over time, consistent with trends reported in other medication-based treatments (see Blaschke et al., 2012 for review). The observed decreases in MEMS-based adherence as medication dosing frequency increased is consistent with previous studies and further strengthens the generalizability of these data. The fact that MMAS adherence scores remained around 80% and did not decline over time is consistent with a previous study in non-MM patients that reported low sensitivity in self-report adherence monitoring methods over time (Lee et al., 2007). Together these results bring into question the accuracy of self-reported medication adherence in MM patients and illustrate how sole reliance upon self-report ratings could obscure changes in adherence. Finally, failure to find the well-established association between medication dosing frequency and MMAS Forget or Total scores further emphasizes the decreased sensitivity of the MMAS relative to MEMS in this sample.

MEMS caps also conferred more flexibility and were able to be customized to each participant's specific medication dosing requirements, whereas the MMAS asked general questions pertaining to the past 30 days and was not able to more narrowly define adherence across medication types. MEMS also offered a more thorough estimate of adherence. The MMAS asks a single retrospective self-report question that refers to the entire preceding 30-day period, which means that forgetting medication on a single day causes the participant to be categorized as nonadherent for an entire month. That same event would represent 97% adherence on the MEMS cap, which highlights the extreme differences in sensitivities between the measures. This is further supported by our analyses that revealed only one percent of study months were in complete agreement between MEMS and MMAS, consistent with studies of adherence in other treatment populations (Byerly et al., 2005; Parker et al., 2007; Wu et al., 2008; Lee et al., 2010; Nieuwenhuis et al., 2012).

MEMS caps-based adherence was not influenced by any of the baseline variables evaluated, in contrast to the MMAS ratings that were significantly associated with participant age and presence of an Axis I disorder with antisocial personality disorder or any cluster B diagnoses. The degree to which antisocial personality disorder may have impacted reporting and contributed to the low sensitivity in monitoring on the MMAS is not known, but is likely associated with the high levels of impulsive behavioral traits inherent within antisocial and other Cluster B personality diagnoses within MM samples (Brooner et al., 1993). This finding warrants additional research attention. Neither the MEMS nor the MMAS were significantly associated with monthly assessments of MM status or urinalysis results, though the MMAS (but not the MEMS) was significantly associated with the SCL-90 GSI over time. This association was most likely driven by the high correlation between baseline GSI and presence of an Axis I disorder with antisocial personality disorder or any cluster B diagnoses. These results suggest that, in this population of MM patients with co-occurring psychiatric disorder, MEMS-based adherence was less impacted by the individual baseline characteristics and therefore may provide a more sound assessment of adherence relative to self-report.

A notable strength of MEMS caps is that they provide a method of reviewing daily adherence patterns that could be assessed monthly, weekly, or more frequently. Providers could use these data to more accurately identify patterns in adherence initially and over time, relative to self-report, and intervene with patients as necessary. More accurate detection and review of adherence issues would also facilitate assessment for reason(s) underlying nonadherence (e.g., negative side effects vs. forgetting), and the deployment of supportive resources or interventions to increase adherence, which may enhance overall treatment outcomes. This is particularly important with psychiatric medications, as nonadherence can produce withdrawal symptoms or rebound of psychiatric symptoms that could undermine substance use and/or psychiatric treatment attempts (see Blaschke et al., 2012 for review). Regular feedback on adherence could itself also function as an intervention by making the participant more aware of his/her adherence levels (Desplenter et al., 2006; Reich, 2013), and this general approach has been recommended for use in clinical practice (Julius et al., 2009). The low overall rate (55%) of MEMS cap based adherence in this study indicate that electronic monitoring by itself may not have been sufficient to promote high levels of adherence, and that patients may have benefited from feedback or other interventions

targeting low adherence. Since comparison of MEMS and the MMAS was a secondary aim within a larger study of integrated care, it was not experimentally sound for this study to provide feedback, though these results suggest that future studies in this population should consider that approach.

This study has some limitations. First, it did not assess the reason(s) for medication nonadherence on the MEMS caps and some participants may have intentionally missed doses due to untoward effects. For routine clinical use of MEMS it would be important to assess reasons for nonadherence as this could inform intervention strategies (Osterberg and Blaschke, 2005). Second, it is not possible to verify that the correct number of doses were removed at each MEMS opening, which is a common concern across electronic medication monitoring studies. Though efforts have been made to demonstrate associations between MEMS openings and blood values of medication (Vrijens et al., 2005), this was not addressed in this study. Third, given the diverse nature of the medications being prescribed and the fact that this study was a secondary analysis, biochemical confirmation of medication adherence was not collected, though it is important to note that reliable blood levels have not been established for some of the medications prescribed in the study. Finally, though the MEMS caps appears to be superior to the MMAS for monitoring psychiatric medication adherence in this study, these limitations (including the lack of a non-monitored control group) make it impossible to definitively conclude that the MEMS caps produced more accurate ratings of medication adherence relative to self-report.

The present study supports the use of MEMS cap technology to evaluate psychiatric medication adherence in MM patients with co-occurring psychiatric disorder, a challenging population who routinely suffers from poor adherence. These data suggest that MEMS caps provide sensitive detection of medication adherence in this population, and may help guide therapeutic interventions to improve treatment outcome.

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Highlights

- Medication Event Monitoring System (MEMS) outperforms self-report in patients with opioid use and psychiatric disorder
- MEMS is less impacted by baseline characteristics relative to self-report
- MEMS can be customized to the participant

Figure 1.

Adherence Over Time. Total Adherence as rated on the MEMS caps (filled circles) or the MMAS Total Score (open circles) over the 12-month study period. MMAS values are presented as the percent of total score to enable comparisons across the two measures. Mean percent adherence is on the left Y-axis.

Table 1

Demographic and Psychiatric Characteristics

	N=153
Demographic Characteristics	
Age (yrs)	39.9 (9.0)
Range (yrs)	21–61
Male (%)	34.0
Caucasian (%)	60.7
Married (%)	14.4
HIV positive (% self-reported)	3.9
Hepatitis C positive (% self-reported)	51.0
SCL-90 Baseline Global Severity Index (GSI) ^a	48.4 (9.4)
DSM-IV Current Substance Dependence (%)	
Opioid	100
Cocaine	25.4
Sedative	10.5
Alcohol	6.5
Cannabis	3.3
Psychiatric Diagnoses (based on SCID ratings)	
Both Axis I and Axis II disorder (current, %)	61.0
Axis I Disorder (current, %)	98.9
Any mood disorder	78.4
Any anxiety disorder	49.7
Any psychotic disorder	4.6
More than 1 Axis I disorder	43.1
Axis II (current, %)	57.5
Cluster A	10.5
Cluster B	43.8
Cluster C	24.8
Antisocial Personality Disorder	31.4
Treatment Variables	
Visit Attendance (%)	54.3
Substance Abuse Counseling	
Overall visits attended	3.89 (0.32)
Overall Adherence (%)	70.2
Adherence with Individual visits (%)	84.7
Adherence with Group visits (%)	68.3
Psychiatric Counseling	
Overall visits attended	3.96 (0.23)

	N=153
Overall Adherence (%)	39.9
Adherence with Individual visits (%)	41.3
Adherence with Group visits (%)	5.2
Visit with Psychiatrist	
Overall visits attended	1.87 (0.75)
Overall Adherence (%)	67.8

Values represent Mean (Standard Deviation) unless otherwise specified

^aValues represent normalized t-scores