

Diagnostic Value of Self-Report of Alcohol Use in Patients Enrolled in a Methadone Maintenance Treatment Program (MMTP)

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ABSTRACT. Screening for ethanol use amongst the methadone maintained population has been the subject of some debate over recent years. Of particular concern is the diagnostic value of self report of alcohol use in patients enrolled in a methadone maintenance program (MMTP). This study demonstrates unequivocally that denial of alcohol use by MMTP patients is completely unreliable when compared to urine testing. Conversely, admission of alcohol use by this same population has some value. This study concludes that routine ethanol screening is justified at baseline and at frequent intervals thereafter for all patients enrolled in a methadone maintenance program. doi:10.1300/J069v26n03_09 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2007 by The Haworth Press, Inc. All rights reserved.]

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INTRODUCTION

It is estimated that alcoholism affects anywhere from 30% to 50% of patients enrolled in methadone maintenance treatment programs (MMTP).¹⁻⁴ The proportion of MMTP patients who continue to use alcohol despite warnings of its opiate-like sedating properties is likely much higher. This might explain the high proportion of accidental methadone-related overdoses associated with alcohol reported in multiple studies.⁵⁻⁷ In fact, one study reported that in over 97% of accidental overdose deaths, the

two of three most commonly used substances in combination were opiates (including methadone) and alcohol.⁸ It is essential, therefore, that methadone prescribers be aware of the alcohol use by their patients in order to minimize the risks of overdose.

To this end, the most commonly used method for detection of alcohol use is patient self-report. Self-report methods for alcohol use among MMTP patients are useful, convenient, inexpensive, and non-intrusive.⁹ Such methods can also be collected easily and can cover a wide range of time periods, namely, the past 24 hours, the

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past week or the past month.¹⁰ However, a significant drawback of self-report methods for substance use is that the validity of such reports is questionable.¹⁰⁻¹² For this reason, we conducted a study to measure the diagnostic efficacy of alcohol use in patients taking daily methadone.

METHODS

Objective

This study was designed to assess the diagnostic value of self report of alcohol use in patients enrolled in a methadone maintenance treatment program (MMTP).

Ethics

This is a quality assurance study that did not interfere with or alter standard patient care and was found exempt from formal ethics review by our local review ethic board. In order to protect patient privacy, the researchers had no access to individual or confidential information other than the summary data for each clinic collected by clinic staff.

Design and Setting

This is a retrospective, observational cohort study of a population-based sample of patients treated over a three month period at 23 methadone treatment clinics in Ontario, Canada. These clinics all share on-call physician coverage and a web-based patient charting system.

Population

All patients attending one of the 23 methadone treatment clinics during the study period participated in this study.

Personnel

Clinic nursing and support staff at each clinic.

Data Collection

Prior to providing a required (weekly or twice weekly) urine sample for testing of drugs

of abuse (which includes ethanol, cocaine, opiates, and benzodiazepines), each patient was asked by clinic staff how much alcohol he/she had consumed in the previous 12 hours. The patient's urine was then tested for the presence of alcohol using the DRI[®] Ethyl Alcohol Assay (which has a short acting detection time), which served as the reference standard to which self-reported alcohol use was compared. All samples had both creatinine and pH tested on it so correlation with dilution and possible adulteration could be made.

Collection of urine followed a procedure that was uniform throughout the numerous patient settings. All sample containers were labeled with a bar code that contained patient demographic information. This same container was then placed on a shelf near the toilet and in full view of a video camera. The patient, after washing his or her hands, was lead into the room. If male, there were asked to pick up the container in full view of the camera and pass a sample. Once completed, the full sample container was to be left on the same shelf, never leaving the view of the observer. For female patients, a female staff entered the washroom with the patient. A urine specimen was passed into a plastic 'hat' that was placed over the toilet. The female patient's hands were to remain in full view while the sample was being left. Once complete, the urine sample was transferred by the patient or staff into the urine collection container. For both male and female patients, the staff person carried the specimen out of the washroom and stored it for shipping to the laboratory where it was later analyzed on a Hitachi 911. Results were then automatically uploaded to a software application that allowed the treating physician to review and interpret the results.

Sensitivity, defined as the lowest concentration that can be differentiated from the negative sample, is 10 mg/dl (or 0.01%). The assay is linear up to a concentration of 600 mg/dl (or 0.6%). In terms of specificity, grossly hemolyzed (800 mg/dl hemoglobin), icteric (30 mg/dl bilirubin) and lipemic (1000 mg/dl triglycerides) samples were found to have no interference with the assay. Various structurally related organic compounds were tested from cross-reactivity in the assay. Table 1 summarized the results.

The results of the question and ethanol urine test for each patient were then entered into the patient's chart and later extracted to create a study-specific electronic database.

Statistical Analysis

From the data, we calculated the sensitivity, specificity, and likelihood ratios of self-reporting along with their respective 95% confidence intervals (95% CIs) using SPSS v.11 (Chicago, IL, USA).

RESULTS

A total of 46,072 ethanol tests were conducted on 3,817 patients. The total number of positive ethanol samples was 1,901 or 4.1%. The number of unique patients with at least one urine test positive for ethanol was 821 or 20%. The measures of diagnostic efficacy are listed in Table 2.

DISCUSSION

These results confirm that a denial of ethanol use by MMTP patients is unreliable while an

admission of ethanol use is somewhat reliable. This is of significant relevance since physicians and therapists alike have long utilized self report as a reliable method for accurately assessing ethanol use.

Ethanol use among MMT patients poses a major health risk, causes and/or exacerbates various mental disorders, is a barrier to recovery, and increases the risk of death by accidental overdose. Thus, it is of utmost importance that MMTP's be watchful in detecting ethanol use among such patients and take measures to assist them. Our evidence further suggests that there is little concordance between negative self-report and urinalysis in detecting substance use. Other studies have found similar findings showing that while patient self-report of substance use predicted a positive sample, a positive sample was not predictive of self-report because patients reported substance use only about half of the time.¹⁰ One compelling reason for this is that take home doses are usually contingent on continued demonstration of abstinence from illicit drugs, often including ethanol, and so it would be expected that patients would downplay any admission of using such drugs when asked. In fact, it has been shown that many patients who initially report their substance use at intake will later on in the program underreport their use, especially if there is a real or perceived consequence to what they report, including eligibility for take-home privileges.^{10,12-16} There is also a strong tendency to distort self-reports in a favourable direction.^{10,11,13,14,17,18} MMT patients in particular, may intentionally conceal and/or minimize their ethanol use for these reasons.

Interestingly, it has also been suggested that acute ethanol consumption increases the peak methadone concentration¹⁹ and therefore its use may be reinforcing. At the same time, chronic ethanol consumption reduces peak methadone levels¹⁹ and therefore may lead to further ethanol consumption in order to potentiate methadone's effect.

Clearly, if ever used, self-report methods should always be substantiated with other more objective data, in order to more accurately detect ethanol use among MMT patients. An example of such objective evidence has often pointed towards various biological biomarkers as possible indicators for excessive ethanol use.

TABLE 1. Substance Concentration Cut-Off and Cross Reactivity

Compound	Level Tested (mg/dL)	% Cross Reactivity
Acetaldehyde	2000	0
Acetone	2000	0
n-Butanol	2000	1.7
Ethylene Glycol	2000	0
Isopropanol	2000	0
Methanol	2000	0
n-Propanol	2000	10.7

TABLE 2. Diagnostic Efficacy of Self-Reporting of Ethanol Use

Measure	Estimate (95% CI)
Sensitivity	41.1% (95% CI: 39, 43.3)
Specificity	93.9% (95% CI: 93.8, 94.0)
Positive Likelihood Ratio	6.75 (95% CI: 6.32, 7.20)
Negative Likelihood Ratio	0.62 (95% CI: 0.60, 0.65)

This has occurred despite the well recognized ineffectiveness of mean corpuscular volume (MCV), gamma-glutamyl transferase (GGT) and other liver enzyme tests in screening for excessive ethanol consumption.²⁰ The continued wide use of these indirect biomarker tests in medical practice continues even in the face of more direct testing such as urine drugs screening (UDS) for ethanol. Yet, in spite of the tremendous evidence of problematic ethanol use among MMT patients and the ineffectiveness of indirect biomarkers, UDS for ethanol use remains under-utilized in the methadone community.

UDS is the gold standard for detecting substance use in methadone maintenance treatment programs.²¹ It is meant to serve a number of purposes, including verification of compliance, determining the adequacy of finding methadone or its metabolite (EDDP), and detecting the use of opiates or other substance use.²²

Urine ethanol assays detect ethanol if it is present in the urine. The duration of detection is directly proportional to the amount consumed. Ethanol is eliminated at the rate of about 18 mg/100 mL/h. One drink will give an average of about 23-25 mg/100 mL before metabolism - variables being gender, weight and height. Therefore, one drink can be expected to not be detectable after about 1.5 hours after consumed. On the other hand, if a lot of ethanol is consumed such that the blood ethanol concentration (BAC) is 180 mg/100 mL, ethanol in the urine may be detected for 10 hours. Experience has also shown us that urine can be positive for about one hour after BAC has gone to zero. This is due to the accumulation in the bladder until voiding. Therefore, UDS for ethanol offers an opportunity to provide objective evidence for relatively recent ethanol use. A negative self-report in the presence of a positive urine result for ethanol can be taken as evidence of recent ethanol consumption and of misrepresentation. While the exact quantity of ethanol consumed might remain elusive, given the expectation in some MMTP to remain free of ethanol given its potentially lethal effect when used in combination with methadone, any positive test is worrisome.

An important additional point to consider is that if UDS is performed too infrequently, test-

ing cannot establish whether MMT patients have an acute or a chronic substance use problem, i.e., whether substance use has been often, sporadic, or only a single time.^{21,23} For MMT patients with positive results for any substances, repeat urine screening at regular intervals could improve interpretation of substance use patterns, since multiple positive results during a period of time indicate ongoing substance use.²¹ This is further supported by some studies that suggest that more frequent urine testing in MMT programs results in overall higher rates of substance use detection.^{21,24} In particular, quantitative urine ethanol determination can detect patterns of ethanol use that is both acute and chronic. This allows for the identification of ethanol users who do not use excessive amounts but of sufficient quantity to pose a risk of overdose in the presence of methadone.

Another limitation of UDS is that while it can detect daily substance use it may not be able to detect infrequent use.²³ Further to this, for most drugs other than ethanol, too frequent urine sampling might lead to an overestimation due to carryover effects of a substance/substances remaining in the body from previous but discontinued substance use.²⁵ However, unlike substances such as cocaine (metabolites) and opiates, the detection time of ethanol is relatively short and therefore overestimation is not likely. This same short detection time may also yield a negative result if sampling rates are too infrequent. Limited by a shortened window of detection, negative UDS for ethanol offers little insight in ethanol use patterns. With increased sampling frequency, the opportunity to capture a positive sample is increased. That said, any positive sample is meaningful.

In this study, 20% of patients tested positive for ethanol at least once during the study period. This result is in contrast to other published reports mentioned earlier that allude to much higher rates.¹⁻³ One possible explanation is that the population of patients sampled in this study was already aware that ethanol use was unacceptable and would interfere with their ability to get take home doses. Consequently, compared to other cohorts, this cohort had likely already demonstrated decreased ethanol use compared to other groups. Another possible explanation lies in the short window of detection of current UDS for ethanol. No doubt, im-

proved assays with longer windows of detection (e.g., Ethyl Glucuronate or ETG), will more accurately demonstrate the true picture of ethanol use. If anything, the DRI® Ethyl Ethanol Assay utilized in this study underestimates the rate of ethanol use. Improved assays such as ETG would make our results even more dramatic.

The added value of quantification allows for the additional insight to be gained from positive admissions for ethanol. For instance, assuming a normal pH and creatinine, if a MMT patient states that a dozen alcoholic drinks were consumed the night before testing, we would expect a low positive value 10 hours later. If the quantitative value is markedly elevated, it implies ethanol use in much closer proximity to the time of testing. While both scenarios are worrisome, given the evidence that acute use of ethanol may potentiate the effect of methadone¹⁹ and has been strongly implicated as a major causative agent in methadone related overdose, further insights into the reasons for ethanol use may be learned and methadone doses adjusted accordingly.

An important caveat to interpreting positive ethanol results is to ensure that the result is not falsely elevated secondary to elevated blood sugar. In known diabetics, the fermentation of high glucose levels to ethanol can yield a falsely positive result. It is also important to note that both pH and urine creatinine should be checked in order to properly interpret the UDS in light of acid-base abnormalities and dilute versus concentrated urine.

In conclusion, this study strongly suggests that routine ethanol UDS (along with routine opiate, benzodiazepine and cocaine UDS) is justified at baseline and at frequent intervals thereafter for all patients enrolled in a methadone maintenance program. This is essential in order to properly interpret the misleading denials of ethanol consumption by patients enrolled in such contingency based programs and erroneously relying on them for treatment decisions. In addition, this is also essential to further treatment planning and intervention.

SUMMARY

This study demonstrates that the diagnostic value of self-report of ethanol use in patients

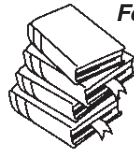
enrolled in a MMTP is meaningful only for positive admission of ethanol use. It also demonstrates unequivocally that denial of ethanol use by MMTP patients is completely unreliable when compared to urine testing.

REFERENCES

1. Kreek MJ. Opiate-ethanol interactions: implications for the biological basis and treatment of combined addictive diseases. *NIDA Res Monogr.* 1988;81:428-439.
2. Kreek MJ. Medical complications in methadone patients. *Ann. NY Acad. Sci.* 1978; 311: 110-134.
3. National Institute on Alcohol Abuse and Alcoholism No. 1 August 1988. Methadone Maintenance and Patients in Alcoholism Treatment Retrieved on May 31, 2006 from <http://pubs.niaaa.nih.gov/publications/aa01.htm>
4. Stimmel B, Vernace S, and Tobias H. Hepatic dysfunction in heroin addicts: The role of alcohol. *JAMA* 1972; 222:811-812.
5. Fischer B, Brissette S, Brochu S, Bruneau J, El-Guebaly N, Noel L, Rehm J, Tyndall M, Wild C, Mun P, Haydon E, Baliunas D. Determinants of overdose incidents among illicit opioid users in 5 Canadian cities. *CMAJ* 2004; Aug 3; 171(3): 235-239.
6. Joseph H, Apple P. Alcoholism and methadone treatment: consequences for the patient and program. *American Journal of Drug and Alcohol Abuse.* 1985; 1(1-2):37-53.
7. Zador S, Sunjic D. Deaths in methadone maintenance treatment in New South Wales, Australia 1990-1995. *Addiction.* 2000; Jan; 95(1):77-84.
8. Coffin PO, Galea S, Ahern J, Leon AC, Vlahov D, Tardiff K. Opiates, cocaine and alcohol combinations in accidental drug overdose deaths in New York City, 1990-1998. *Addiction.* 2003; June; 98(6): 739-747.
9. National Institute on Alcohol Abuse and Alcoholism, NIAAA. Screening for Alcoholism. No. 8 *PH 285 April* 1990; <http://www.niaaa.nih.gov/publications/aa08.htm> Retrieved on August 9, 2005.
10. Preston KL, Silverman K, Schuster CR, Cone EJ. Comparison of Self-Reported Drug Use with Quantitative and Qualitative Urinalysis for Assessment of Drug Use in Treatment Studies. *NIDA Research Monograph.* 1997; 67: 130-145.
11. Richter L, Johnson PB. Current methods of assessing substance use: a review of strengths, problems and developments. *Journal of Drug Issues.* 2001; 31(4): 809-832.
12. Sherman MF, Bigalow GE. Validity of patient's self-reported drug use as a function of treatment status. *Drug and Alcohol Dependence.* 1992; Apr;30 (1):1-11.
13. Chermack ST, Roll J, Reilly M, Davis L, Kilani U, Grabowski J. Comparison of patient self-reports and urinalysis results obtained under naturalistic methadone treatment conditions. *Drug and Alcohol Dependence.* 2000; 59: 43-49.

14. Harrison L, Hughes A. The Validity of Self-Reported Drug Use: Improving the Accuracy of Survey Estimates. *NIDA Research Monograph*. 1997; 167: 1-16.
15. Hser YI. Self-Reported Drug Use: Results of Selected Empirical Investigations of Validity. *NIDA Research Monograph*. 1997; 167: 320-343.
16. Teplin D, Raz B, Daite J, Varenbut M, Plater-Zyberk C. Screening for alcohol use patterns among methadone maintenance patients. *American Journal of Drug & Alcohol Abuse*. 2007; 30(1): 179-183.
17. Crown DP, Marlowe D. A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*. 1960; 24: 349-354.
18. Paulus DL. Two-component models of socially desirable responding. *Journal of Personality and Social Psychology*. 1984; 46: 598-609.
19. Clark N, Dietze P, Lenne M, Redman J. Effect of opioid substitution therapy on alcohol metabolism. *Journal of Substance Abuse Treatment*. 2006; 30: 191-196.
20. Bean P. State of the art: contemporary biomarkers of alcohol consumption. *Medical Laboratory Observer*. 2005; Nov; pp. 10 -17.
21. Wasserman DA, Korcha R, Havassy BE, Hall SM. Detection of illicit opioid and cocaine use in methadone maintenance treatment. *American Journal of Drug and Alcohol Abuse* 1999; Aug;25(3):561-571.
22. Goldstein A, Brown BW. Urine testing in methadone maintenance treatment: applications and limitations. *Journal of Substance Abuse Treatment*. 2003; Sept; 25(2): 65-73 (discussion).
23. Carlson GA, Crosby RD, Specker SM. Patterns of drug use vs. frequency of urine drug screens: what is cost effective? Poster presented at: AATOD Conference. 2004; October 16-20; Orlando, FL.
24. Compton PA, Ling W, Wesson DR, Charuvastra VC, Wilkins J. Urine as an outcome measure in drug abuse clinical trials: must every sample be analyzed? *Journal of Addictive Disorders*. 1996; 15(2):85-92.
25. Cary PL. Urine drug concentrations: the scientific rationale for eliminating the use of drug test levels in drug court proceedings. *Drug Court Practitioner Fact Sheet*. 2004; Alexandria, VA: National Drug Court Institute.

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