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Short communication

Underreporting of illicit drug use by patients at emergency departments as revealed by two-tiered urinalysis

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Abstract

This study investigates the validity of questionnaire-based self-reports of illicit drug use by comparing with a two-tiered urinalysis among patients at emergency departments. Questions on the use of alcohol and drugs were administered to patients recruited on a continual basis for 2 weeks at the emergency department of two hospitals in northern Taiwan. Positive tests of initial urinalysis using fluorescence polarization immunoassay were further confirmed by gas chromatography/mass spectrometry. In a total of 1502 patients interviewed, 632 (42%) also provided a urine sample. Among those with urine samples, the positive rate of urinalysis was 1.4% for amphetamine-type drugs and 1.6% for opiates. Among those with positive urinalysis, a false-negative rate ranged from 66.6% for amphetamines to 70.0% for opiates. Meanwhile, all the self-reported current uses of either amphetamines or opiates were confirmed by urinalysis. The results indicate that the false-negative rates of questionnaire-based, self-reported current use of illicit drug are around two thirds and the false-positive rates are negligible, which might be useful for the calibration of estimates from epidemiological surveys.

Keywords: Amphetamines; Opiates; Illicit drug use; Self-report; Urinalysis; Validity

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1. Introduction

Patients visiting the emergency departments (EDs) have been important sources for monitoring the use pattern and trends of illicit drugs (Joranson, Ryan, Gilson, & Dahl, 2000). However, the accuracy of drug mentions has been challenged, with high false-negative rates being reported (Brookoff, Campbell, & Shaw, 1993; McNagny & Parker, 1992). On the other hand, using urinalysis for the detection of illicit drug use has different kinds of limitations, such as higher cost, short window of detection, and patients' unwillingness to provide a urine sample. Compared with other settings, however, the ED may still be more conducive to collecting biological samples for toxicology. Another limitation is that a confirmatory analysis such as gas chromatography/mass spectrometry (GC/MS) is needed to exclude the cross-reaction of enzyme immunoassay in screening urinalysis. Under these circumstances, a two-tiered urine test is a better arrangement. However, previous urinalytic studies examining illicit drug use in emergency patients did not supplement with confirmatory analysis (Brookoff et al., 1993; Macdonald, Wells, Giesbrecht, & Cherpiteal, 1999; McNagny & Parker, 1992).

In this study, we evaluated the validity of questionnaire-based interview for illicit drug use by comparing it with a two-tiered urinalysis among patients at EDs recruited on a continual basis in northern Taiwan. The two-tiered urinalysis consisted of an initial screening for five categories of psychoactive drugs and a subsequent confirmatory urinalysis.

2. Methods

Participants were recruited from patients aged 13 to 55 years presented to the emergency department at two hospitals located in Taipei City (National Taiwan University Hospital, on an average 250 ED admissions per day) and San-Shia Township (En-Chu-Kong Hospital, on an average 150 ED admissions per day), with the latter being a 1-h drive south from the former. Consecutive admissions around the clock were recruited during a 2-week period between August and September in 2001. The institutional review boards of both hospitals approved the study. After providing a written informed consent, a patient was interviewed in person with a structured questionnaire (including demographic characteristics, main reason for visiting the ED, and the history of psychoactive substances involvement; for each reported illicit drug use, further information about the amount, frequency, route of administration, and the most recent date of use was inquired), took a Breathalyzer test (Intoximeters, Inc., St. Louis, Missouri) for any level of alcohol drinking, and was asked to provide a urine sample. If a patient had been prescribed a urinalysis for medical check-up, an extra cup of urine was solicited for this study after the first cup. Some patients left hospital before they were able to provide a second cup of urine. Two research assistants were on duty at each 8-h session per day and instructed to recruit as many patients as they could.

The initial screening test was performed using the automated chemistry analyzer Abbott AxSYM® (Abbott Laboratories, Abbott Park, Illinois), which utilizes fluorescence polarization immunoassay (FPIA) technology, for the following five categories of drugs with their corresponding cut-off thresholds in parenthesis: amphetamine/methamphetamine II (500 ng/ml), benzodiazepines (200 ng/ml), cannabinoids (50 ng/ml), cocaine metabolite (300 ng/ml), and opiates (300 ng/ml). If a sample turned positive for any category of drugs except benzodiazepines, it would be further confirmed by GC/MS using an HP6890GC/HP5973MSD (Hewlett Packard, Palo Alto, CA) apparatus. Because many drugs have the

similar structure to that of benzodiazepines, positive screening results for benzodiazepines did not undergo further confirmation.

Owing to the small number of reported illicit drug use, the illicit drugs were grouped into two major categories for the subsequent analyses: amphetamine-type drugs (including amphetamine, methamphetamine, and ecstasy) and opiates (including morphine, heroin, and codeine). Two cancer patients who were taking morphine prescribed by their doctors were coded as negative for both self-report and urinalysis for the subsequent analyses. In comparing the patients between two groups, either χ^2 or Fisher's exact test was used.

3. Results

Among the 3079 eligible patients, 1502 (48.8%) agreed to be interviewed. Comparing patients who participated with those who did not, both groups were similar in the distribution of sex ($p=0.6$) but non-participants were on an average 2 years older than the participants ($p<0.001$).

Both patients who agreed to provide urine samples ($n=632$) and those who declined ($n=870$) did not differ in terms of gender, prior visit to psychiatric clinic, tobacco smoking, alcohol drinking, and current use of benzodiazepines (Table 1). However, those who agreed to provide urine were older, and had a higher proportion of self-reported current use of amphetamine-type drugs or opiates than those who did not agree. Of note, only one patient reported his current use of heroin to the attending physician.

The number of participants with a positive FPIA urinalysis was as follows: 38 for benzodiazepines, 12 for amphetamine-type drugs, 11 for opiates, 1 for cocaine, and none for cannabinoids. Confirmatory GC/

Table 1
A comparison of the demographic features and substance use history of those who provided urine samples with those who did not

Variable	Providing urine ($n=632$)	Not providing urine ($n=870$)
	N (%)	*N* (%)
Age (years)		
13–20	80 (12.7)	158 (18.2)[a]
21–30	196 (31.0)	280 (32.2)
31–55	356 (56.3)	432 (49.7)
Male	336 (53.2)	451 (51.8)
Prior visit to psychiatric clinic	47 (7.4)	47 (5.4)
Tobacco smoking (lifetime)	217 (34.3)	331 (38.1)
Alcohol drinking (lifetime)	144 (22.8)	167 (19.2)
Alcohol drinking prior to arrival		
Self-report	5 (0.8)	12 (1.4)
Breathalyzer test	5 (0.8)	12 (1.4)
Self-reported current use of drug		
Benzodiazepines	21 (3.3)	19 (2.2)
Amphetamine-type drugs	3 (0.5)	0 (0.0)
Opiates	3 (0.5)	0 (0.0)
Amphetamines or opiates	5 (0.8)	0 (0.0)[a]

[a] $p<0.01$, Fisher's exact test (two-tailed), comparing the distribution between those who provided urine and those who did not.

Table 2
A comparison of the self-reported current use of drugs with the urinalysis among 632 patients who provided urine samples

Self-reported current use	*N*	Urinalysis	
		Positive *N* (%)	Negative *N* (%)
Benzodiazepines[a]			
Yes	21	6 (15.8)	15 (2.5)
No	611	32 (84.2)	579 (97.5)
Amphetamine-type drugs			
Yes	3	3 (33.3)	0 (0.0)
No	629	6 (66.7)	623 (100.0)
Opiates			
Yes	3	3 (30.0)	0 (0.0)
No	629	7 (70.0)	622 (100.0)
Amphetamine-type drugs or opiates			
Yes	5[b]	5 (27.8)	0 (0.0)
No	627	13 (72.2)	614 (100.0)

[a] Confirmatory urinalysis was not performed.
[b] One subject reported use of both categories of drugs.

MS analyses revealed that there were false positives in the screening for amphetamines (3 out of 12), opiates (1 out of 11), and cocaine (1 out of 1). Overall, a total of 18 subjects (2.9%) tested positive for either amphetamine-type drugs or opiates, with one being positive for both.

The concordance between self-reported current use of drugs and urinalysis is displayed in Table 2. On the basis of positive urinalysis, more than one half of the patients did not admit their use of these drugs (i.e., false-negative rate of self-reported drug use). In contrast, among 17 patients who had a positive reading of Breathalyzer test, there was no denial of alcohol drinking prior to arrival in self-report.

4. Discussion

Via a combination of multi-drug screening with confirmatory urinalysis, we were able to determine the main source of inaccuracy of questionnaire-based self-report of illicit drug use by patients at EDs, i.e., a prominent false-negative rate, which was comparable to that of previous reports on drug mentions among the ED patients in the U.S. (72–100%) (Brookoff et al., 1993; McNagny & Parker, 1992). Many studies reporting a lower false-negative rate for self-report of illicit drug use were conducted in the treatment setting (Chermack et al., 2000; Darke, 1998; Kilpatrick, Howlett, Sedgwick, & Ghodse, 2000). Two recent studies in epidemiological setting compared the self-report with hair tests and found that the false-negative rate of heroin use were 66.7% (Colon, Robles, & Sahai, 2001) to 69% (Fendrich, Johnson, Sudman, Wislar, & Spiehler, 1999), which were in the same range of this study. In contrast, all the self-reported current uses of amphetamines or opiates in this study were confirmed by urinalysis. Taken together, these results might be used to calibrate to some extent the estimates that were obtained from epidemiological surveys of illicit drug use. That is, the true value might be 3 to 3.5 times the estimates for the prevalence of current use of amphetamines or opiates.

Although use of illicit drug was not necessarily equivalent to having a substance use disorder, a study among trauma center patients indicated that the likelihood of having a current drug dependence

diagnosis was much higher for those with positive toxicology screens (39%) than for those with negative screens (4%) (Soderstrom et al., 1997). Because ED visit might provide a special opportunity for a brief intervention for substance use disorders, a brief screening instrument for drug use disorders in the ED in Mexico City was recently developed (Cherpitel & Borges, 2004). Given the high false-negative rate of self-reported illicit drug use, however, whether such a screening approach is feasible in other countries warrants further investigation.

One limitation of this study is that the low response rate might render the false-negative rate of self-reported use of illicit drugs underestimated since that those who would not reveal their use of illicit drugs would be more likely to decline the provision of a urine sample. Another limitation is that we did not count a positive FPIA test for benzodiazepines as illicit drug use in this study since a confirmatory analysis was not pursued.

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