Drug Testing of Adolescents in Ambulatory Medicine

Physician Practices and Knowledge

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Objective: To determine physicians’ knowledge of urine drug testing and usual practices when performing drug testing on adolescent patients at a time when interest in drug testing of adolescents is on the rise and physicians may be consulted for advice and requests to perform tests.

Design and Participants: Multimodal survey conducted April to July 2004 consisting of 42 forced-choice response items. Participants were practicing physicians randomly selected from the national membership rolls of the American Academy of Pediatrics, Society of Adolescent Medicine, and American Academy of Family Physicians who provided care for 10 or more adolescents per week. We computed simple frequencies and sample design-adjusted 95% confidence intervals for each item.

Results: The survey was completed by 359 eligible physicians (response rate, 42%). More than 95% of respondents had ever ordered urine drug tests. Only 23% used an effective urine sample collection procedure, and only 7% used specific gravity and measurement of urine creatinine level to ensure validity of the sample, as recommended. When asked which drugs can be detected in routine panels, only 10% answered all items correctly, 47% did not know for 1 or more items, and 75% responded incorrectly for 1 or more items.

Conclusions: Primary care physicians do not always use proper urine sample collection and validation procedures, and they are not aware of important limitations of drug testing. The primary care workforce is not prepared to assist with drug testing programs. Physicians who order these tests need more training and access to consultation with experts.

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Drug testing has become increasingly popular in American society during the past 25 years. In 1995, the US Supreme Court ruled that high schools may require student athletes to undergo drug testing, and a subsequent decision in 2002 allowed testing for any student who participates in extracurricular activities. Although efficacy of drug testing by schools is unproven, the Office of National Drug Control Policy encourages schools to perform drug tests for all students, claiming that urine drug testing can help identify students with drug problems and act as a deterrent for others. In addition, several Internet drug-testing distributors encourage parents to perform the tests on their children at home. Schools and parents need support to use drug testing effectively, and many will seek the advice of a physician. Furthermore, physicians will likely receive more requests to perform tests on adolescents as interest in this procedure continues to increase.

Improperly conducted drug tests can result in false accusation (reporting illicit drug use where none exists) or false reassurance (failing to identify actual use). The federal government has established extensive national drug testing guidelines, including supervision of all federally mandated drug testing programs by a physician certified as a medical review officer by the Medical Review Officer Certification Council to protect employees and employers from the consequences of incorrect information. Adolescents, however, are far more likely to have drug testing performed by a physician who does not have medical review officer training. It is not known whether the primary care workforce is prepared to provide technical support to schools and parents or to manage an increase in drug testing requests. The objective of this study was to determine primary care physicians’ drug testing practices and knowledge.

METHODS

Surveys Instrument

To develop the survey instrument, the investigators conducted semistructured telephone interviews with 7 practicing physicians from different geographical regions selected at random from the membership rolls of the American Academy of Pediatrics (AAP) and the Society of Adolescent Medicine (SAM). The
interviewer presented clinical vignettes and elicited the respondents’ recommendation for drug testing, which test (if any) they would order, the sample collection procedure, and what they would say to the patient and parent. We then changed details of the vignette to determine at what point the respondent would change the management plan. For example, if the respondent initially would not order a drug test, the interviewer added details indicating that the teen had more significant problems than initially indicated. Two of us (S.L. and M.A.) recorded notes, and, immediately after each interview, reviewed and tabulated results. After all of the interviews were completed, the research team met and identified themes that were used to develop the questionnaire. One of us (J.R.K.) with extensive experience in adolescent substance abuse and another (S.K.H.) with extensive experience in questionnaire development reviewed the questions for face validity. We then distributed a draft of the questionnaire to 8 physicians for pilot testing and made final revisions for clarity. In a final step, we converted the survey to an electronic format. The final tool consisted of 42 forced-choice response items measuring practice variables (n=14), knowledge (n=11), attitudes (n=10), and personal and practice demographics (n=7). This article reports results of (1) the physicians’ usual urine specimen collection and validation procedures (“What special procedure, if any, do you use to collect a urine specimen for drug testing?”); (2) the physicians’ knowledge of common reasons for false-negative and false-positive results (“Can the following drugs be detected by the routine urine screen that your office orders?”); and (3) the physicians’ level of agreement with the use of drug testing in various situations (“I would recommend a teen have a drug test if a parent felt strongly that the child was using drugs and denying it.”).

PARTICIPANT SELECTION

We selected 1085 physicians (doctors of medicine or doctors of osteopathy) who were members of the AAP (n=408), the SAM (n=300), or the American Academy of Family Physicians (AAFP [n=377]). For each organization, we obtained national membership rolls sorted by state. We weighted our sample by the proportion of physicians in a given specialty listed in each state, then used a random number list to select participants. Physicians who provided primary or urgent care to an average of 10 adolescents (aged 12-18 years) per week were eligible for the study; all others were asked to return the questionnaire unanswered. We entered all available contact information (address, telephone and fax numbers, and e-mail address) into a database. We called physicians’ offices and asked for a fax number if none was listed in the directory.

The study was conducted from April through July 2004 using the tailored design method. All participants received a prenotification letter explaining the purpose of the study, the URL address for the Web-based questionnaire, a unique identifier that allowed access to the Web site, and a $2 bill via US mail. One week later (week 1) we sent an e-mail reminder with the URL embedded to all nonresponders with an e-mail address in our database (n=361) or a cover letter and a copy of the questionnaire via fax for those with a fax number but no e-mail address (n=293). At week 2 we sent a second reminder via the same mode. At week 3 we sent a cover letter and a copy of the survey via US mail to all nonresponders. At week 7 we sent a final reminder letter, survey, and $2 to all nonresponders. The protocol was reviewed and approved by the Children’s Hospital Boston Committee on Clinical Investigations, Boston, Mass. Three hundred fifty-nine physicians (122 from the AAP, 126 from the SAM, 103 from the AAFP, and 8 who did not identify their affiliation) completed the survey, and 168 were ineligible, for a calculated response rate of 42%. This is similar to response rates in other published physician surveys.

The analytical sample was predominantly male (54%) and diverse in age (36% younger than 41 years). Thirty-four percent of our respondents were AAP members, 35% were SAM members, and 31% were AAFP members. Family physicians were more likely to be male (P<.001) and practice in rural settings, whereas adolescent specialists were more likely to practice in urban settings (P<.001).

ANALYSIS

We used MRIntervist software (SPSS Inc, Chicago, Ill) to create the online version of our survey tool, and all data from electronic surveys were exported directly into SPSS version 12.0 software (SPSS Inc) for analysis. All numerical data from surveys returned via fax or US mail were independently entered twice, compared, and reconciled by checking the original data source. Cleaned data were then imported into SPSS software for analysis.

We computed simple frequencies for all variables. All eligible physicians completed at least some answers, and we eliminated nonresponders to a particular question from the denominator for the unanswered question only. We considered physicians to be pediatricians if they belonged to the AAP, family physicians if they belonged to the AAFP, and adolescent-care providers if they belonged to SAM (whether or not they also belonged to 1 of the other 2 organizations). Eight eligible participants did not specify any affiliation but were included for group analysis. We used a chi² statistic to determine if there were differences in knowledge (eg, substances detected by drug screens) or practice variables (eg, urine collection techniques) by specialty, sex, or age. Our sample size yielded 80% power to detect with 95% confidence differences in proportions of 10% to 15% between specialties, for base comparison proportions of 10% to 50%, respectively. We did not find differences in knowledge by physician specialty. There were differences in practice variables for SAM, AAP, and AAFP members (percentage using an effective procedure for collection being 38%, 13%, and 25%, respectively [P=.003], and for validation, 9%, 2%, and 15%, respectively [P=.002]). Although these differences are statistically significant, the low rate of effective procedures used by any specialty makes the clinical significance of this finding questionable.

RESULTS

DRUG TESTING PRACTICES

More than 95% of all respondents reported ever ordering a urine drug test. Table 1 presents the procedures physicians used to collect urine samples and check validity. We considered effective procedures to include use of federal guidelines (ie, patient provides identification, empties pockets, and uses the bathroom without running water; blue dye is placed in standing water; and specimen temperature is checked immediately), directly observed urination, or the presence of a staff member inside the bathroom. We considered having a staff member outside the bathroom ineffective. Only 23% of respondents reported using an effective procedure.

According to the American College of Occupational and Environmental Medicine, urine creatinine level and specific gravity should be checked on every sample to prevent patients from defeating a screening test by providing diluted urine. Only 7% of respondents in our sample routinely checked both, and 61% reported checking nei-
tation. Federal workplace testing requires a confirmatory test for any positive drug screen results, yet only 26% of respondents reported doing so all or most of the time.

KNOWLEDGE

The percentages of physicians who correctly answered items on which drugs are detectable on results of a routine urine drug test screening panel and what substances can cause false-positive screen results (ie, would result in a false-positive drug test result although a teen did not use illicit drugs) are presented in Table 2. Inhaled nitrous oxide can be detected in blood or urine shortly after exposure using special techniques and precautions, but it is not detected on results of routine drug screening panels. Less than two thirds of physicians answered this item correctly. Ecstasy (3,4-methylenedioxymethamphetamine) is not reliably detected by preferred assays used in drug testing laboratories. Less than half of physicians answered this item correctly. Screening for oxycodone, a semisynthetic opioid whose use is rising among teens, must be specifically requested when ordering urine drug tests. Only 12% of physicians answered this item correctly. Overall, only 10% of physicians surveyed knew that none of these 3 substances are detected by means of a standard urine test. Physicians and parents may be falsely reassured and delay diagnosis of a serious drug disorder. Adolescents may try to evade urine testing by drinking a large volume of water, taking a diuretic, or adding water to the collection container to intentionally dilute a urine sample below drug detection thresholds. A sample can also be adulterated by adding soap or other chemicals that interfere with the assay. Proper collection and validation techniques will minimize adulteration and alert physicians to attempts at dilution.

Almost one third of physicians did not know that alcohol used in cooking will not cause a false-positive alcohol screening result. Forty percent of respondents answered the question about whether consuming large quantities of poppy seeds can produce a positive screening test result for opioids and a positive confirmatory test result for codeine and morphine incorrectly or with "don’t know." Pseudoephedrine and dextromethorphan preparations, medications commonly found in over-thecounter cold preparations, can cause positive drug test results when used as directed (dextromethorphan may cross-react with phencyclidine hydrochloride assays, but not with opioid assays). When questioned about each of these items, most of the respondents answered incorrectly or with “don’t know.” Respondents were almost equally split when asked whether passive exposure to marijuana smoke would cause a positive drug test finding. Incidental exposure to marijuana smoke has been shown to produce a detectable concentration of Δ⁹-tetrahydrocannabinol metabolite in the urine, but in concentrations below the standard cutoffs. In a practice known as “hot-boxing,” some adolescents expose themselves to very high concentrations of passive marijuana smoke with the intention of becoming intoxicated. This may produce a positive test result, although this finding would not be false positive by the definition given in our survey (positive even although a teen has not used illicit drugs). In total, less than 1% of physicians answered all of these questions regarding false-positive findings correctly; 89% answered 1 or more items incorrectly; and 74% said they did not know for at least 1 item.

When asked how long marijuana can be detected by a usual drug screening test, 330 respondents replied as follows: 8.9%, up to 48 hours; 24.5%, as long as 1 week; 31.5%, as long as 6 weeks; 7.3%, as long as 3 months; and 17.3%, as long as 6 months. The remaining 7.9% did not know.

COMMENT

This study shows that although most primary care physicians order urine drug tests, most do not use recommended procedures for urine test collection, validation, and confirmation and lack the knowledge needed to correctly interpret positive and negative results.

False-negative test results can give physicians and parents unwarranted reassurance and delay diagnosis of a serious drug disorder. Adolescents may try to evade urine testing by drinking a large volume of water, taking a diuretic, or adding water to the collection container to intentionally dilute a urine sample below drug detection thresholds. A sample can also be adulterated by adding soap or other chemicals that interfere with the assay. Proper collection and validation techniques will minimize adulteration and alert physicians to attempts at dilution.

Most of our respondents did not know that Ecstasy, oxycodone, and nitrous oxide are not detected by routine screens. Physicians and parents may be falsely reassured that their child is not using a particular drug when the child never underwent proper testing for it. Knowing which substances are tested for in a standard panel and ordering additional screening panels can prevent physicians and parents from missing a substance the adolescent is using.

Standard urine drug panels are immunoassay screens that are designed to eliminate urine specimens with negative findings from further consideration. These tests are relatively nonspecific and have the potential for false-positive results. Guidelines for federally mandated drug testing programs require a second analytical procedure using a more specific technique, such as gas chromatography/mass spectrometry, to confirm every urine drug screen with a positive finding. Misinterpretation of a false-positive finding can put adolescents at risk for false accusation of substance use and diminished trust from parents, school personnel, and counselors. In our survey, most respondents misidentified at least 1 substance that

Table 1. Procedures Used to Collect Urine Samples and Check the Validity of the Sample

<table>
<thead>
<tr>
<th>Procedures</th>
<th>% of Respondents (n = 334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal guidelines</td>
<td>10</td>
</tr>
<tr>
<td>Direct observation</td>
<td>7</td>
</tr>
<tr>
<td>Staff member inside bathroom</td>
<td>6</td>
</tr>
<tr>
<td>Staff member outside bathroom</td>
<td>19</td>
</tr>
<tr>
<td>No procedure</td>
<td>48</td>
</tr>
<tr>
<td>Do not know/send out</td>
<td>9</td>
</tr>
<tr>
<td>Procedures to check validity of the sample</td>
<td></td>
</tr>
<tr>
<td>Creatinine level measurement</td>
<td>2</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>29</td>
</tr>
<tr>
<td>Both</td>
<td>7</td>
</tr>
<tr>
<td>Neither</td>
<td>61</td>
</tr>
</tbody>
</table>
can cause a false-positive finding on a drug screening test, and only one quarter order a confirmatory test all or most of the time. Physicians ordering drug tests should be familiar with causes of false-positive results, and confirmatory testing should always be performed.

A urine drug test result typically remains positive for Δ9-tetrahydrocannabinol for 1 to 3 days after a single use of marijuana.12 However, because it is intensely lipophilic, and significant fat stores can accumulate, urine test results for Δ9-tetrahydrocannabinol can remain positive for 4 to 6 weeks in regular users.28 In our sample, one third of respondents thought that cannabis could be detected for 1 week or less. These physicians might falsely accuse an adolescent of continued drug use if urine testing were repeated. One quarter of our respondents believed that cannabis could be detected 3 to 6 months after use. These physicians might make the opposite interpretation error and could interpret positive urine test results as continued marijuana washout longer than physiologically possible. Physicians producing a manual to educate family physicians on testing may seek additional training through formal medical review officer training or as part of their postgraduate medical education. The California Academy of Family Physicians produced a manual to educate family physicians on the “proper methods, uses, limitations and evaluation of urine drug testing in order to rationally employ testing in clinical practice to improve patient care, protect himself/herself, and protect the patient,”26 but the manual is primarily intended for physicians who are treating patients receiving long-term opiate therapy for pain or addiction. Drug testing in the primary care situation, however, presents challenges and risks to the adolescent and physician. Adolescents who undergo drug testing at their parents’ request may be more likely to attempt to evade testing than adults who seek medical attention of their own volition. Physicians must be well versed in the nuances of proper drug collection procedures and false-positive and false-negative findings. Drug testing requested by parents may damage the therapeutic relationship between adolescents and physicians. Adolescents are also at risk of schools or parents using drug test results punitively. Few training materials address these issues.

This study has a number of limitations. First, our sample was a national survey of physicians from the 3 specialties that provide most of the primary care to adolescents, namely, pediatrics, family physicians, and adolescent medicine providers. We used a variety of methods to contact physicians, including US mail, e-mail, and fax, to avoid the systematic exclusion of physicians who are difficult to reach by a given mode. However, we had a response rate of only 42%. Physician surveys tend to have lower response rates than surveys of the general population,31 and our response rate is in the middle range (19%-53%) of recently reported surveys of primary care physicians.8-11 However, we cannot exclude self-selection bias. It is possible that physicians who see fewer adolescent patients and are less familiar with laboratory testing for drugs would be less likely to complete the survey. Bias, if present, might therefore suggest that our estimates of provider proficiency and knowledge are overly optimistic. In addition, the demographic data for each professional group was similar to the demographic data of the corresponding society, making it unlikely that we systematically excluded any particular group. Furthermore, a strong demand characteristic exists in this study for physicians to present as knowledgeable, which may lead respondents to select an answer rather than select the “don’t know” choice. If this is the case, some correct answers may have been guesses, further inflating our estimates of provider proficiency.

We developed a new survey instrument rather than using a previous validated tool. This was necessary because we know of no other tool designed for this purpose. It is possible that physicians found some of the ques-

Table 2. Responses of 340 Respondents About Substances That Can Be Detected or Can Cause False-Positive Test Results

<table>
<thead>
<tr>
<th>Questions</th>
<th>% of Respondents*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detection of drugs†</strong></td>
<td></td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>1</td>
</tr>
<tr>
<td>Ecstasy (3,4-methylenedioxymethamphetamine)</td>
<td>19</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>74</td>
</tr>
<tr>
<td><strong>Cause false-positive results‡</strong></td>
<td></td>
</tr>
<tr>
<td>Foods prepared with cooked alcohol</td>
<td>6</td>
</tr>
<tr>
<td>Poppy seeds</td>
<td>59</td>
</tr>
<tr>
<td>Cold preparations containing pseudoephedrine</td>
<td>48</td>
</tr>
<tr>
<td>Cold preparations containing dextromethorphan</td>
<td>36</td>
</tr>
<tr>
<td>Passive exposure to marijuana smoke</td>
<td>38</td>
</tr>
</tbody>
</table>

*Percentages may not add to 100% owing to rounding.
†Indicates answers to the question “Can the following drugs be detected by the routine drug screen that your office uses?”
‡Some newer instrument-based assays can detect Ecstasy; however, preferred assays in standard drug-testing laboratories do not reliably detect it.
§Indicates answers the question: “Can the following cause false-positives on the routine drug screen that your office uses?”
tions confusing or misinterpreted them. For example, some respondents may have interpreted the question regarding whether secondhand marijuana smoke can cause false-positive drug test results as asking whether secondhand smoke contains cannabis, which it does. Physicians who interpreted the question in this way may also be misinterpreting drug test results as false positive when in fact the teenager with a positive drug test result due to secondhand marijuana smoke is exposed to the same risks as those who smoke marijuana. We pilot tested the questionnaire before the national survey and none of our pilot testers reported confusing questions or asked us to clarify any of the questions. All respondents were given the opportunity to provide feedback regarding the survey, and we did not receive any feedback regarding the clarity of questions. Few questions were skipped, and we did not identify a pattern of skipped questions that might be expected if questions were ambiguous or confusing.

CONCLUSIONS

Overall, our findings suggest that primary care physicians are not fully aware of the limitations of drug testing and do not use recommended procedures for collecting and validating urine drug test specimens. The primary care workforce is not prepared to provide guidance to schools, parents, or patients with questions regarding drug testing. We recommend that physicians who use this procedure frequently in their office seek further training, such as that available through the Medical Review Officer Certification Council. Professional societies such as the AAP or the SAM should consider producing training materials that address the challenges of office-based urine drug testing with adolescent patients. Physicians who order drug tests infrequently should consult with a specialist such as a toxicologist or addiction specialist.

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