



CLINICAL REPORT

Testing for Drugs of Abuse in Children and Adolescents

abstract

FREE

Drug testing is often used as part of an assessment for substance use in children and adolescents. However, the indications for drug testing and guidance on how to use this procedure effectively are not clear. The complexity and invasiveness of the procedure and limitations to the information derived from drug testing all affect its utility. The objective of this clinical report is to provide guidance to pediatricians and other clinicians on the efficacy and efficient use of drug testing on the basis of a review of the nascent scientific literature, policy guidelines, and published clinical recommendations. *Pediatrics* 2014;133:e1798–e1807

INTRODUCTION

The recreational use of drugs is an underrecognized cause of mortality and morbidity in children and adolescents. It is, in fact, a public health priority.¹ Although annual surveys of drug use by children and adolescents may show fluctuation, the underlying rates remain high.² Numerous adverse consequences accompany use, not the least of which is the increased risk of dependence among those who began smoking, drinking, and using drugs before 18 years of age.^{3,4} Furthermore, most adults with substance use disorders initiated use during childhood or adolescence.⁵ Pediatricians are on the front lines for deterring, delaying, detecting, and diminishing the use of drugs by children. It is imperative that all pediatricians understand and are ready to use the tools and strategies effective for these endeavors.

Drug testing has been recommended in a variety of settings and clinical situations to avert substance use, to identify use as part of an assessment, or as part of treatment of individuals with substance use disorders. To date, there is little consensus among physicians regarding the indications for drug testing and little guidance on how to use this procedure effectively for any indication.⁶ The federal government has issued extensive guidance on the use of urine drug testing with federal and other employees,⁷ although this guidance is not applicable for all situations and age groups. Experts have called for further evidence-based studies to guide best practices with adolescents.⁸

The complexity and invasiveness of the procedure and limitations to the information derived from drug testing all affect its utility. The objective of this clinical report is to provide guidance on the efficacy and efficient use of drug testing on the basis of a review of the nascent scientific literature, policy guidelines, and published clinical recommendations.

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KEY WORDS

drug testing, drug testing results, positive and negative drug testing results

ABBREVIATIONS

AAP—American Academy of Pediatrics

THC—tetrahydrocannabinol

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The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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SPECIMEN TYPES

Six biological matrices are commonly used for drug assays: urine, blood, breath, saliva, sweat, and hair. Neonates may also be tested using meconium. The choice of sample is influenced by the cost, ease of sample collection, risk of adulteration, test type (instant or laboratory based), scope of drugs being tested, time frame (acute or chronic use), time since last use, and indications for testing. Practices and laboratories should only conduct tests for which they are certified by the Clinical Laboratory Improvement Amendments.

Breath testing is mainly used by law enforcement and alcohol treatment programs for detection of recent alcohol use; it is not, however, routinely used in primary care. It is an easy-to-use, non-invasive test that is considered a good proxy for blood alcohol concentrations; urine alcohol concentrations, on the other hand, do not correlate well with blood alcohol concentrations or corresponding central nervous system impairment. Alcohol mouthwash or breath sprays used immediately before testing may result in false-positive test results.

Carbon monoxide and a nicotine metabolite known as cotinine are the 2 products in tobacco that are used for screening. Carbon monoxide can be measured in the breath up to 24 to 48 hours after smoking and then falls to nonsmoker levels. Cotinine is regarded as the best biomarker of tobacco exposure because it has a long half-life and can be measured in blood, saliva, hair, and urine.^{9,10}

Blood concentrations are most useful for detecting alcohol and other drug use that occurred within 2 to 12 hours of the test and are best correlated with the level of impairment and morbidity seen in emergency situations. Blood testing is costly because of the need for specially trained personnel and equipment and is intrusive. Because of these

drawbacks, blood testing is rarely used in the primary care setting.

Saliva (oral fluid) and sweat testing provide similar information to blood testing but are less invasive and do not require extensive training for sample collection. Saliva allows for detection of drug excreted from the blood after recent use (ie, within 24–48 hours) that may not yet be detectable in urine. It is less subject to contamination than urine; smoking and methods used to stimulate saliva production to increase specimen volume may affect the results. Therefore, this method requires patient supervision in the 30 minutes before sampling.¹¹ Point-of-care tests are available for saliva testing.¹²

Sweat may be used to detect drug use in 2 ways. First is a patch that is worn from 3 to 7 days and detects drug use that occurred just before the patch was applied (most drugs will be excreted within 48 hours) and drug use that occurs while the patch is in place. Second, a swipe may detect drug use within the past 24 hours (collection device not approved by the US Food and Drug Administration). The collection is noninvasive and has a similar cost to urine. Although difficult, environmental contamination can occur and lead to false-positive results.¹³ Specimen volume may be affected both by the patient's sweat secretion rates or removal of the patch during the collection period. The sample size obtained with oral fluid and sweat patch tests limits the ability to repeat tests and perform confirmatory testing. Both saliva and sweat assays are less standardized than urine or blood tests, and the accuracy of sweat testing remains controversial.^{14–16}

Hair testing allows for detection of past use that has occurred over an extended time because drugs and metabolites are incorporated into the hair matrix over time. Hair cannot be used for detection of use in the pre-

vious 7 to 10 days. It is most reliable for heavy, frequent past use and not for detection of recent or occasional drug use. The hair needs to be cut as close to the scalp as possible, and usually the first 3 cm is used for testing, which covers a 90-day period (hair grows 1 cm a month). If longer hair is sent, the laboratory will cut it into segments before testing, and 4 tests will allow for screening over a period of a year. If the scalp is shaved, hair from other body areas may be sent instead. However, hair grows at a slower rate on the body, and a time frame cannot be used in this circumstance. Hair collection can be directly observed and is non-invasive, hair is easily stored and transported, and adulteration and substitution is difficult. However, hair testing is not useful clinically, because it has a long window of detection. In addition, hair structure, growth rate, melanin content, hygiene, and cosmetic treatment can affect the results. Drug concentrations in hair can be altered by shampoos, bleaches, or dyes, and false-positive results may be obtained with volatile drugs such as marijuana, which may adhere to hair.^{17,18} No point-of-care tests are available; laboratory testing is costly, and it takes a long time to obtain results.

Urine testing is invasive and highly susceptible to tampering. Nonetheless, because it is well standardized and studied, less invasive than blood testing, and provides a longer window of detection for some substances, it is the most common sample used for drug testing in primary care. A physician survey⁶ found that >90% of pediatrician and family physician respondents had used urine testing with adolescent patients in their office, suggesting that the practice is quite common. In the remainder of this report, "drug testing" will refer to urine drug testing unless otherwise indicated.

URINE DRUG TESTS

Two types of drug testing assays are available: qualitative tests usually used for screening and quantitative tests used for confirmation. Qualitative tests are point-of-care tests and home drug test kits. They are easy to perform, relatively inexpensive, and use immunoassays, such as enzyme-linked immunoassay or radioimmunoassay, that give instant positive or negative results. Although they are sensitive and function well as screening tests, they are susceptible to cross-reactions, resulting in false-positive results, which limit their specificity. Some laboratories use qualitative tests as a “screening procedure”; in this method, negative test results are discarded, and only positive test results are run through more expensive confirmatory testing, although the 2-step procedure has become less common as the cost of confirmatory testing has decreased. Confirmatory tests are performed in laboratories and not at the point of care. Most laboratories use a combination of gas chromatography and mass spectrometry and can positively identify a substance and generate quantitative concentrations.

INDICATIONS FOR DRUG TESTING

The illicit and often secretive nature of substance use may result in adolescents being unwilling to give accurate information about their substance use, and thus drug testing may yield important information, as in the various situations discussed below.

Emergent Clinical Care

Drug testing may identify possible toxins when a patient presents with altered mental status. In truly emergent situations, consent may be inferred, and testing should be considered in accident victims, after a suicide attempt, for unexplained

seizures, for syncope or arrhythmias, or in the presence of toxidromal signs and symptoms that render the patient incapable of informed consent. In the case of a toxidrome, physical findings should guide the clinician to test for a specific panel of substances, even with minimal or no history available. A positive test result for a substance suspected on the basis of clinical findings is less likely to be a false-positive or spurious result because of the higher pretest probability in this setting. However, drug testing has significant limitations, even in the emergency setting. Standard laboratory tests detect drug metabolites with an unreliable frequency and often have reference ranges far lower than therapeutic dosages; thus, they may identify substances that are present but not causing the observed symptoms. Emergency management of an obtunded patient, such as the decision to give naloxone, is made on clinical grounds and not on the basis of results of a laboratory test. Nonetheless, the results of a drug test may be helpful in determining management once the patient is stabilized.¹⁹

Assessment of Behavioral or Mental Health Symptoms

Drug use by teenagers often presents to medical attention with nonspecific signs and symptoms (such as fatigue, excessive moodiness, school failure) and, as such, may be hard to diagnose definitively. Voluntary drug testing may be a useful part of an assessment when a parent, clinician, or other adult suspects recent or ongoing drug use on the basis of observed symptoms. Like any other laboratory procedure, drug testing should be an adjunct to a thorough history rather than a replacement. In cases in which an adolescent denies use, a positive drug test result may afford an opportunity to begin an honest conversation. Drug testing may be unnecessary if a patient

is forthcoming regarding his or her drug use history. Unfortunately, significant limitations to laboratory drug testing limit the information garnered from the procedure (see “Sources of Error in Interpreting Urine Drug Tests”). Like any other laboratory test, drug test results must always be interpreted within the context of history, including both collateral and self-reports when possible.

THERAPY AND MONITORING

Drug testing programs that use contingency management strategies may be an effective therapeutic adjuvant for patients with substance use problems or disorders.^{20,21} Patients typically receive either positive reinforcement, such as cash rewards or small gifts, when a drug test result is negative or negative consequences when a drug test result indicates ongoing drug use.²² Research has consistently demonstrated the efficacy of these programs among adults, and emerging research suggests that drug testing is acceptable and effective with adolescents and young adults participating in drug abuse treatment programs.²³ Drug testing is also frequently used as a deterrent for juveniles in the probation system. Juvenile drug courts, which include frequent drug testing, have been shown to decrease substance use more so than traditional family courts. It has been suggested that even in the absence of additional therapies, the monitoring function of testing can be an effective discouragement from use.^{24,25} The effective drug testing programs that have been described in the literature are relatively expensive, are staff intensive, and may not be well suited for primary care. Engaging parents and supporting them in implementing appropriate contingencies could decrease the overall expenses of such

a program; when appropriate, parental monitoring may also serve as a contingency, with negative results intrinsically rewarding. One study found that a drug-testing program in which parents received test results from the physician would be acceptable to adolescents,²⁶ although to date, no study has demonstrated the effectiveness of such an approach.

SCREENING

A national survey of physicians found that few respondents use “suspicionless” drug testing as a means of screening for drug use in the medical home,⁶ and most experts agree that drug tests are not a useful screening procedure for general clinical populations because their sensitivity for detecting drug use in unselected populations is low.^{27,28} However, home-, school-, or employment-based programs may include a screening component (ie, unselected or general populations may be tested) to detect or deter drug use. Participant consent should be required for all of these programs, as it would be in a clinical setting.

Results of studies of school-based drug testing programs are mixed: drug testing has poor sensitivity for detecting drug use, although some studies have found a deterrent effect. The American Academy of Pediatrics (AAP) does not endorse widespread implementation of school-based drug testing because of the limited efficacy, its cost, and the potential for unintended effects, such as breach of confidentiality. School-based drug testing is discussed in greater detail in a separate AAP statement.²⁹

HOME DRUG TESTING

Drug tests have been commercially available and marketed to parents to prevent adolescent drug use for the

past 15 years. Marketing Web sites often include “home drug testing policies” that recommend drug testing on either a routine basis to prevent drug use or when a parent has specific concerns.³⁰ Home drug testing has been endorsed by several school districts and police departments around the country. To date, the efficacy of home drug testing for reducing substance use by adolescents has not been rigorously tested. The AAP does not endorse home drug testing because of concerns about the complexity of testing with significant potential for parents to misinterpret test results, limited evidence that home drug testing reduces drug use, and theoretical concerns about a negative effect on the relationship between parents and their children. A professional evaluation should be considered whenever a parent has concerns about substance use.³¹

SCHOOL CLEARANCE

Some schools require “medical clearance,” including a negative drug test result, before readmitting a student who has been suspended for drug use or possession. In these cases, the AAP suggests that the pediatrician conduct a thorough history to understand the student’s level of drug involvement. Although there are no specific guidelines for “medical clearance,” the AAP suggests that students who have been caught with drugs or paraphernalia or who were impaired at school should be allowed to return to school (after disciplinary consequences set by the school). At the conclusion of a medical evaluation, it is important to include a plan for follow-up and/or treatment in addition to considering a return to school, unless assessment suggests a serious substance use disorder requiring a more restrictive treatment setting, in which case the adolescent should be referred. The AAP cautions that “clearance” has no

uniformly accepted definition in the medical or legal literature; various individuals, such as parents, teachers, and school administrators may have different interpretations of clearance than do pediatricians. Pediatricians could, therefore, report the following as appropriate: (1) the student has received an appropriate medical evaluation and (2) reasonable medical standards indicate that return to school is a reasonable option. Furthermore, parents must consider their adolescent’s individual risks and benefits while continuing to monitor their adolescent’s behaviors.

A drug test may be particularly useful for adolescents who report limited or infrequent drug use. In these cases, a negative test result would be expected and would support the adolescent’s history. A brief period of monitoring with random tests may further support the student’s history of limited use. Adolescents who report heavy use, particularly of marijuana, are likely to have a positive drug test result even several days to weeks after termination of use. In these cases, a period of monitoring until a negative test result is obtained may be useful, although the AAP suggests that the adolescent return to school while awaiting a negative test result. Quantitative tetrahydrocannabinol (THC) concentrations may be followed to distinguish between prolonged excretion and ongoing drug use. These levels should be corrected for urine concentration to improve accuracy; one common method is to calculate a THC-to-urine creatinine ratio.³²

A student or parent may refuse a drug test and instead accept the school’s consequences or fight them. There is little legal precedent with regard to whether a school has the right to insist on a drug test from an individual student in this situation; however, 2 Supreme Court decisions both supported

a school's right to require drug testing for students who participate in sports or other extracurricular activities.^{33,34} The AAP suggests that the pediatrician advise the student and family in this situation to submit to a drug test and then advocate for returning to school as outlined previously, although ultimately, the student and his or her parent determine how to proceed.

SOURCES OF ERROR IN INTERPRETING URINE DRUG TESTS

False-Positive Results

Like any medical laboratory test, drug testing can yield false-positive or false-negative results. In urine drug testing, a "clinical" false-positive result (ie, drug detection in the absence of illicit drug use) is more likely to occur on a screening test because of cross-reactivity with an unrelated substance in the urine. For example, fluoroquinolone antibiotics have been reported to cross-react with immunoassay opiate screens.^{35,36} Confirmatory tests are highly unlikely to yield false-positive results but can yield a "clinical false-positive" result when a patient takes a certain prescription medication or ingests a food that metabolizes into a substance included in the drug testing panel. For example, a patient taking amphetamine and dextroamphetamine for attention-deficit/hyperactivity disorder will have a positive test result for amphetamines, which may be falsely positive for substance abuse. Unfortunately, drug testing cannot distinguish between appropriate use and misuse of prescribed medications. To interpret drug test results accurately, it is necessary to know an individual's complete medical history, including prescribed medications. In addition, the practitioner needs to know the limitations of the selected matrix, the substances for which the drug panel tests, and potential cross-reactivity. The practitioner should not

hesitate to ask for assistance in ordering the correct test or interpreting results.

False-Negative Results

A negative drug test result does not necessarily mean that an adolescent is not using a particular substance. The urine specimen submitted may not be a valid sample, as when an adolescent attempts to evade a positive test by submitting someone else's urine, dilutes his or her own urine, or adds an adulterating (or "masking") agent to the sample to interfere with the screening immunoassay (eg, soap, bleach, ammonia). Even in the absence of adulteration, use may escape detection because of the timing of use relative to the testing, or if the cutoff concentration for a positive test result is set too high, small amounts of drug or metabolite may be missed. Another example occurs when the psychoactive substance used is not part of the standard test panel, resulting in a "clinical false-negative" test result (eg, "spice" and newer designer drugs). Test panels often use a common metabolite to identify an entire class of substances (see Table 1). However, individual substances with variant metabolism can still be missed. For example, benzodiazepine panels that identify oxazepam will not identify clonazepam, which is commonly misused by adolescents but not metabolized through this pathway. Thus, interpreting drug test results can be exquisitely complex, even for experienced clinicians, and should be done with caution. Seeking assistance from the testing laboratory is important, particularly when test results do not correlate with clinical findings and when a physician suspects the use of a particular substance that is not included in a test panel.

URINE SPECIMEN COLLECTION

An accurate test result is dependent on obtaining a proper specimen. Direct observation is the most reliable

method for specimen collection. It is recommended that each treatment facility have a protocol in place that describes how urine specimens intended for drug testing will be collected from both male and female patients. It is also recommended that random specimens or those taken without supervision be labeled as such. Specimens that may have pertinence to a legal matter (eg, those taken after a motor vehicle crash or as part of a court-ordered program) may require collection in a tamper-proof container and also require chain of custody. When this is not practical, the patient should be referred to a laboratory facility that has this capability.

A less-invasive collection method involves excluding coats and bags and using a specially prepared restroom without running water, soap, or other chemicals. Toilet water should be tinted. The specimen's appearance and color should be documented and the temperature should be taken within 4 minutes, preferably by use of a collection container with a temperature-sensitive strip on the outside. The temperature should be recorded within 4 minutes of collection and should range from 90°F to 100°F (32°–38°C). The procedure should be explained to the patient before any collection. A national survey of physician practices found that most offices use none of these procedures (although many provide a staff member outside the door to listen for running water).³⁷ If unsupervised collection is used, results should be interpreted with caution.

Modesty

In all cases, the need to obtain information from a drug test must be balanced with protecting an adolescent's dignity. If a reasonable balance cannot be attained, the pediatrician might consider forgoing a drug test and basing

TABLE 1 Approximate Duration of Detectability and Common Cutoffs for Selected Drugs

Drug	Metabolite	Window of Detection	Comments
Alcohol	Alcohol	7–12 h	Ethyl succinate and ethyl glucuronide can persist in the urine up to 5 d after heavy alcohol use. However, use of hand sanitizer, mouthwash, cough syrup, etc, can result in low levels without “alcohol use.”
	Ethyl succinate, ethyl glucuronide	Up to 5 d	
Amphetamines			
Amphetamine (AMP)	MAMP	1–3 d	Note that methylphenidate is not detected on a routine amphetamine panel; therefore, a positive amphetamine test result cannot be explained by use of a methylphenidate preparation.
Methamphetamine (MAMP)	>100 ng/mL of AMP+MAMP	1–2 d	
3,4-MethylenedioxyAMP	MDA	1–2 d	
3,4-MethylenedioxyMAMP	MDMA	1–2 d	
Barbiturates			
Pento/secobarbital	Secobarbital	Short-acting, 4–6 d	
Butalbital	Secobarbital	Intermediate, 3–8 d	
Phenobarbital	Secobarbital	Long-acting, 10–30 d	
Benzodiazepines			
Triazolam	Hydroxyethyl flurazepam	Short-acting, 1 d	Most benzodiazepine screens identify oxazepam and will not pick up all benzodiazepines. If evaluating a patient for benzodiazepine use, it is important to find the specific drug on the test panel or speak with the laboratory personnel.
Clonazepam	7-amino Clonazepam	Intermediate, 1–12.5 d	
Diazepam	Oxazepam	Long-acting, 5–8 d	
Chronic use		Can last 30 d after last use	
Cocaine	Benzoylcegonine	1–3 d	
Cannabinoids	Carboxy-THC	Single use, 1–3 d	Note that synthetic cannabinoids will not be picked up on a cannabinoid screen. If use of synthetic cannabinoids is suspected, speak to the laboratory regarding availability of tests for these substances.
		Moderate use, 4 d; heavy use, 10 d	
		Chronic, 3–5 wk after last use	
Lysergic acid diethylamide (LSD)	Nor-LSD	4 h	
Methadone	Methadone and metabolite 2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine	1 d–1 wk	
Opiates			
Morphine (M)	Morphine	1–2 d	
Codeine (C)	Morphine and codeine	1–2 d	
Semisynthetic opiates	Hydrocodone	1–2 d	
	Hydromorphone	1–2 d	
	Oxycodone	1–3 d	
	Oxymorphone	1.5–2.5 d	
Heroin	6-acetyl-morphine +morphine	<24 h up to 1–2 d	6-acetyl-morphine is pathognomonic for heroin use but has a narrow time window and is most often not detected on a drug test. A test that is positive for morphine outside of the use of prescribed morphine is suggestive of heroin use.
Phencyclidine (PCP)	Phencyclidine	Casual use, 2–10 d Chronic use, several weeks	

clinical decisions on history and physical examination alone. This may include referring a patient for further evaluation or treatment on the basis of a high index of suspicion of drug use. Signs and symptoms of a mental health, behavioral, or substance use disorder

should not be discounted because of inability to obtain a drug test.

CONFIDENTIALITY

Many national organizations, including the AAP, have consistently cautioned

against involuntary drug testing in adolescents.³¹ Adolescents should be engaged in their own care and, in most states, can consent to substance abuse treatment on their own.^{38,39} Drug testing of a competent adolescent without his or her consent is, at best, impractical

and without his or her knowledge is unethical and illegal. However, an adolescent's refusal to consent to a drug test should not prematurely conclude an evaluation of a substance use problem or disorder. If a pediatrician suspects that an adolescent is using drugs and that adolescent is refusing a drug test, his or her refusal should be documented, and referral to an addiction or mental health specialist is warranted. Pediatricians may also coach parents on appropriate limit setting or discipline. For example, a parent may suspend driving privileges if there is suspicion that an adolescent is using psychoactive substances; privileges may be restored if the teenager can reasonably demonstrate that he or she is not using substances.

Adults who have a long-term relationship with an adolescent are often aware of early behavioral, mental health, and physical changes that may prompt the request for drug testing. Before drug testing, the pediatrician should get a detailed description of the concerns to formulate a differential diagnosis and determine whether a drug test may be a helpful part of an assessment. If so, a discussion about the limited scope of information available from testing as well as the need to reach a consensus on an action plan for both positive and negative results should be undertaken. This will make any intervention easier to implement. The concerns raised by the adult and the recommendation for a drug test should then be discussed with the adolescent, and assent, including permission to share results, should be obtained before testing. If an adolescent refuses to consent to sharing the drug test results with a parent then they should not be shared. If the drug test was requested by the parents, the pediatrician should explain to them that their son or daughter has not consented to release

drug test results. However, as in all situations, if an adolescent's behavior puts him or her at acute risk of harm to self or others, the pediatrician should consider breaching confidentiality.

MANAGEMENT

Ideally, drug test results may reassure parents or lead to an honest conversation about drug use that can guide further intervention. Unfortunately, if managed poorly, drug test results may be contentious, cause friction between an adolescent and his or her parents, and create a difficult situation for the clinician to manage. The AAP believes good outcomes are more likely if the pediatrician reviews how test results will be managed *before* a test is sent to the laboratory.

In most instances in which a drug test is ordered for an adolescent patient, parents will want to know the results, and with few exceptions, sharing drug test results with parents is a helpful part of the process of drug testing. One exception would be a treatment-seeking adolescent who does not want to inform parents, and testing is used as a form of therapy. This situation is rare in primary care, but if encountered, the pediatrician should respect the engaged adolescent's autonomy. Adolescents younger than 18 years are able to consent to substance use treatment without parental consent in more than half of the United States. It is important for the practitioner to learn about laws governing confidentiality in the states in which they practice.

Positive Test Results

Because drug tests may yield false-positive test results, we suggest that the clinician always review positive results first with the adolescent to determine whether something other than substance misuse may explain the observed results. The

pedsiatrician should consider both the laboratory results and the history before assessing the likelihood of substance use and presenting information back to parents.

The pediatrician may begin the interaction by informing the adolescent that the drug test gave unexpected results (which could refer to a test interpreted by the physician as positive, dilute, or adulterated) and asking for more information. In some instances, the adolescent may report substances not detected on the panel, ultimately yielding more information than the test results alone conveyed. If the adolescent's report matches the drug test results, the pediatrician can begin a conversation about the next steps, which may include an abstinence trial, ongoing testing, and/or a referral to counseling or other treatment. If reports of drug use match the results of a point-of-care test, confirmatory testing, which adds considerable expense, could reasonably be omitted.

If an adolescent denies substance use despite a positive drug test result without a reasonable alternative explanation, the pediatrician can present available information to parents (assuming consent has been obtained). Laboratory testing is not perfect, and spurious results are possible. Repeat drug testing may be of value; adolescents with serious drug disorders are likely to ultimately have multiple positive drug test results.

Negative Test Results

A negative drug test result can support a history of no recent drug use and may be reassuring to parents and pediatrician. However, the pediatrician should not dismiss ongoing behavioral or mental health symptoms just because a drug test result is negative. Rather, a referral for a more in-depth mental

health evaluation is warranted in such cases.

A single negative drug test result does not exclude the possibility of drug use or a substance use disorder. If a substance use disorder is highly suspected on a clinical basis, the pediatrician should consider the possibility of a substituted, adulterated, or diluted sample; use of a substance not detected by the test panel; or a missed window of detection. If one of these conditions is suspected, other testing considerations include repeating the urine test serially, using a different matrix, changing the method (eg, to laboratory testing if a point-of-care test was used), adding specimen validity testing, or changing/adding to the test panel. In addition, the pediatrician should consider referral to an addiction or mental health specialist for further evaluation. Paradoxically, a “falsely” negative drug test result (ie, a test result that is negative despite ongoing drug use) might inadvertently delay detection and treatment of a substance use disorder if symptoms are dismissed and further evaluation is not pursued.

Dilute Specimens

All urine drug test orders should include a check for specimen integrity. Creatinine, which is a product of muscle metabolism, is used as a marker of urine concentration and should be ordered with each sample. Urine samples with a random creatinine concentration between 2 and 20 mg/mL should be considered dilute. Some of these samples may be positive for one or more 1 substances and should be considered both positive *and* dilute because it is possible to miss substances present in lower concentrations (eg, a urine specimen may test positive for marijuana

but be too dilute to identify low levels of cocaine).

Dilute specimens present a difficult clinical challenge in interpreting drug test results. Smaller adolescents or those with less muscle mass are more likely to have lower random urine creatinine concentrations. Adolescents may consume a large volume of fluid before the test either spuriously to be able to produce a urine specimen rapidly, or intentionally to attempt to defeat the test. These different scenarios cannot be distinguished on the basis of drug test results alone, and clinical correlation is warranted. In these cases, a repeat drug test may also be helpful. First-morning specimens generally result in samples with adequate concentration. If a first-morning specimen is not possible, the adolescent can limit fluid intake in the few hours before providing a specimen.

Substituted or Adulterated Specimens

Urine specimens that have been substituted or adulterated in vitro should always be considered “positive” and may represent a serious substance use disorder and/or co-occurring mental health or behavioral disorder. In these cases, referral to an addiction specialist or mental health expert is warranted. Substituted specimens may be cold, may have a urine creatinine concentration ≤ 2 mg/mL, or may be found in the adolescent’s possessions. Adulterated specimens may have an unusual color or smell, may have out-of-range pH, or may result in a positive “adulterant panel” (available from some commercial laboratories). In these cases, if drug testing is to be repeated, observed urine collection may reduce the opportunity to tamper with the specimen.

Managing Confidentiality Between Patients and Outside Entities

Care should be taken to protect all information about substance use, including historical reports and drug test results that are recorded in the medical record. In primary care, the Health Insurance Protection and Accountability Act of 1996 (Pub L No. 104-191) stipulates how all medical records must be protected and can only be released via signed informed consent or other legally authorized means. For care provided in a substance abuse treatment program, federal substance abuse confidentiality regulations (CFR 42 Part 2) supersede the Act and provide even more stringent criteria for release of information (the form must designate the specific information to be released).

Before releasing any information to any outside entity, the AAP recommends that the clinician consider potential advantages and risks of doing so. Pediatricians often have an opportunity to play the role of an intermediary between schools, probation officers, or other organizations and their adolescent patients, and having information pass through the pediatrician can offer a number of advantages. For example, the pediatrician can interview the adolescent and parent to help interpret drug test results before releasing information from the laboratory. In the case of a true positive result indicating recent drug use, the pediatrician can discuss a plan for monitoring and/or treatment that can be provided along with the drug test results. The recipient of the information will likely appreciate expert advice on level of care, and this type of input may help to prevent consequences such as school expulsion or custody for probation violations and instead direct adolescents into appropriate care for substance use disorders. Ultimately, however, patients, in conjunction with parents, decide to whom drug testing and other information may be released.

SUMMARY

Drug testing is a complex procedure that, when used properly, may have a number of clinical indications. However, drug testing also has a number of drawbacks; it can be invasive, it yields only limited information, and results are easily misinterpreted. Drug testing should never be the sole basis for making a diagnosis of a substance use disorder; rather, test results should be used to supplement information obtained by history and physical examination. Signs and symptoms of

a mental health, behavioral, or substance use disorder should not be dismissed solely on the basis of a negative drug test result or inability to obtain a test; these symptoms always require further evaluation, and referral to a specialist should be considered.

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