Curious Case of Vanishing Cocaine

Ashima Lal1*, Raunak Mohan Nair and Danny Basri2

1 Dept of General Medicine and Geriatrics, Emory University School of Medicine, USA
2 Pharmacy Services, West Palm Beach VA Medical Center, USA

Abstract

Urine drug screens (UDS) are often utilized in patients requiring opioid therapy for pain management to assess compliance. We plan to discuss a case in which UDS was used to rule out diversion and abuse. Although there is a role for UDS in the workforce, this paper will discuss the use and consequences of UDS in clinical practice.

Introduction

We live in a society currently plagued by the opioid epidemic, a significant national public health issue with an increase in opioid overdoses. As practitioners, we all must remain cognizant of the consequences of our prescribing habits. That being said, many patients require opioids for their pain management especially in the setting of malignancy. While receiving treatment for their underlying cancer, whether curative or palliative in intent, many patients present with pain responsive to opioids. Although we must remain vigilant in our contribution to the opioid epidemic, we must also ensure our patient's pain is being adequately managed. We write this case report with the intention to increase awareness of urine drug testing to ensure we “first, do no harm”. We will discuss the different types of urine drug tests with false negative/positive results in addition to the role of the prescription drug monitoring program, pain contracts and opioid risk assessment tools.

Case Report

A 50-year-old female was diagnosed with infiltrative ductal carcinoma of her left breast for which she underwent neoadjuvant chemotherapy followed by modified radical mastectomy and radiation therapy. She was referred to the palliative care clinic by her oncologist for assistance with pain management. She has a significant past medical history of substance abuse with cocaine, alcohol, marijuana and tobacco along with schizophrenia, suicide attempts and hepatitis C. She signed a pain contract on her initial visit with the palliative clinic and had frequent visits for random urine drug screens prior to further refills of her oxycodone/acetaminophen and methadone. She described her pain as constant with a gradual onset after her surgery. She localized her pain to the left shoulder with radiation down the arm. Tearfully, she rated her pain as a 9/10, negatively affecting her quality of life and sleep. She reports adequate relief of pain utilizing her short acting pain medication 4-5 times per day.

She goes on to describe how she now relies on her daughter to help her apply makeup and due to numbness of her arm, has found herself dropping her phone when holding it with her left hand. Given her neuropathic pain complaints, she was started on long acting methadone after establishing in the palliative clinic. Given the new complaints, an electromyography (EMG) was ordered.

She reported an increase in her pain after electromyography was performed a few months into her treatment course with palliative care. Although the results of her EMG were negative, the patient is adamant that her neuropathic pain has flared since the testing. Her urine drug screens started to increase in frequency after she began displaying aberrant behaviors.

Most recently, she was admitted to an outside hospital for treatment of pneumonia. A few days after her discharge, she presented to the palliative care clinic where a routine urine drug screen was performed and found to be positive for cocaine. Upon discussing this with the patient, she became very upset and violent, hitting the walls, demanding a repeat test as she accused the lab of contaminating her sample.

Discussion

We assessed the patient in the above case to be a high risk given personal history of substance abuse and psychological disease. There are many types of screening instruments to stratify patients' risk of opioid misuse or aberrant drug-related behaviors; we utilized the Opioid Risk Tool (ORT). In this tool, we use the tallied score of each factor (which are given a point value) to assess an individual's likelihood of displaying aberrant behaviors. The ORT requires knowledge of patient's personal and family history of substance abuse (including alcohol, illegal drug or prescription

*Corresponding author: Ashima Lal, Assistant Professor, Dept of General Medicine and Geriatrics, Emory University School of Medicine, USA, E-mail: ashima.lal@emory.edu

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drugs), age (between 16-45), history of preadolescent sexual abuse, psychological disease (ADD, OCD, bipolar, depression) and sex [1,2]. Although we obtain pain contracts routinely from patients receiving pain management in our palliative clinic, we utilize the Opioid Risk Tool to assess which patient’s may need more frequent monitoring.

We routinely obtain this written agreement between patient and physician so not to “stigmatize” at risk patients. When a patient is high risk for abuse or has a history of substance abuse, the Federation of State Medical Boards of the US recommends a written agreement [3-5]. The American Academy of Pain Medicine is a good source for agreement examples. Briefly, the pain contract discusses terms of treatment and consequences of misuse ie discontinuation of treatment. In order to monitor misuse, urine drug testing can be a useful tool [4-6]. Other measures which can be helpful to assess abuse/misuse include discussion with pharmacists (per pain contract, patients should be receiving all opioids from one pharmacy) and referring to the Prescription Drug Monitoring Program/database.

There are different methods – quantitative and qualitative, utilized in urine drug testing. In the setting of pain management, these tests can help monitor compliance of opioids ie assess adherence, diversion and identify misuse (ie positive results for illicit drugs) which can assist in medical decision making [7]. Unfortunately, studies have shown underutilization of urine drug testing by physicians despite data showing that patient self-reporting of illicit drug use and physician observation or judgment is insufficient to detect aberrant behaviors [8].

It should be mentioned that urine specimens are preferred due to ease of collection (mid-stream). In addition, drugs and their metabolites allow longer detection times in urine compared to serum. However, drug testing is not limited to urine and can include blood, hair, saliva, sweat and nails [9]. For the purposes of this paper, we will limit our discussion to urine testing. Although urine drug testing can provide information on a number of substances including but not limited to amphetamines, marijuana, phencyclidine, benzodiazepines, our discussion will be focused on identification of cocaine.

After discussions with the laboratory at Grady Memorial Hospital, we discovered that urine samples sent for initial drug testing are not kept unless specified. In addition, we learnt that while immunoassay is run on the urine sample, urine creatinine concentration, specific gravity and pH are not routinely run. In efforts to collaborate with the patient, we obtained another sample. Although it was not directly observed, the patient presented to clinic alone and would not have had the opportunity to obtain another sample as she remained in the clinic room while awaiting results of the first test. Surprisingly, the second sample returned negative for cocaine. Although she displayed aberrant behavior, clinical decision was made to give a 2 week supply of her opioids along with close follow up and repeat UDS.

When she presented to her follow up appointment, her UDS was negative for cocaine (positive for THC) however a review of her Prescription Drug Monitoring Program revealed that she had travelled over an hour away to obtain 30 tablets of Percocet. Her pain contract was again discussed with her and she was told that she would no longer be receiving short acting pain medications from the clinic but that with close monitoring we would continue her long acting methadone for neuropathic pain management. She remains high risk and discussions were held to refer her to psychiatry as well as addiction medicine however she currently refuses. Unfortunately, her current insurance will not cover physical therapy or rehabilitation services. Despite her dissatisfaction with the plan, she agrees to continue close follow up with palliative team for pain management along with oncology for surveillance imaging.

**Cocaine’s Specifics**

In the aforementioned case, the patient had a history of substance abuse. More specifically, she had admitted to smoking cocaine in the past. Although in this case, the method of ingestion was via inhalation, it should be mentioned that there are multiple ways of inhalation in addition to administration via intravenous methods and intra-nasal absorption. The peak plasma level will differ depending upon method of administration. Important in analyzing test results, intranasal route of administration has the longest metabolism followed by intravenous administration, with smoking having the shortest metabolism [9,10].

The half-life of cocaine depends on several factors, such as the route of administration, dosage, the frequency of administration, purity of product and individual factors. That being said, the half-life of cocaine is approximately 1 hour, with the half-life of benzoylecgonine being 7.5 hours. Benzoylecgonine is an inactive metabolite specific to cocaine which has a longer window of excretion. Therefore, the urine drug testing checks for the metabolite benzoylecgonine which can be detected in urine for 2-4 days after administration of cocaine [1,11].
Urine Drug Testing

As we noted in the above case, the patient provided a second urine sample while in the same clinic visit. Although this sample was not directly observed, it is not uncommon for patients to tamper with their urine sample to produce a false negative result. The different methods to tamper with their sample can include diluting the urine, adding additives or using urine substitutes.

In order to assess the validity of the specimen, the SAMHSA criteria can be used. Urine should also be tested for its pH, specific gravity, and temperature and creatinine concentration to assess the validity of the sample. For example, an adulterated sample will have a pH less than 3 or more than 11, nitrite concentration >500 mcg/ml, or presence of a halogen [1,12,13].

As previously mentioned, there are different types of UDT. The below outlines the different types of testing along with their advantages and disadvantages.

**UDS Interpretation**

Typically, results of urine drug screens will come back as positive or negative on electronic medical records. Most of the tests are able to be completed at the hospital themselves; however confirmatory tests may need to be sent out to a specialized lab. This will vary upon the laboratory at individual locations.

In a clinical setting, false positive UDT could prevent the patient from getting access to legitimate pain medications that he/she might require for their condition. GC/MS are specific tests which could be employed to confirm cases of positive UDT [15]. Prescription medications, over the counter and herbal medicine are capable of cross reacting with the immunoassays to produce a false positive result [16]. Taking a detailed history with particular importance to current medications being taken is important before interpreting any result. The UDS for detecting cocaine or its metabolites has a very high positive predictive value [17]. However, topical anesthetics containing cocaine and coca tea consumption can produce false positive results [18].

**Conclusion**

Urine drug screens are an important part of clinical practice, especially for patients requiring opioids for pain management. This has been of particular interest in the palliative care setting in the management of malignant pain. It should be emphasized that urine drug screens should be used in ensure compliance and rule out diversion especially in patients displaying abhorrent behaviors. However, these screening methods are not sufficient without clinical correlation and confirmatory testing when results are not in line with the goals of the treatment plan. It should be noted that all results of urine drug testing should be discussed with the interdisciplinary team caring for the patient along with the patient themselves. These discussions should be documented in the electronic medical records to alert cross covering providers who may be requested to refill medications. We strongly recommend discussion with your institutions laboratory to assess which screening methods and confirmatory testing are available. At our institution, we learned that confirmatory testing would be sent out to a different laboratory. In addition, we learned that urine is not routinely tested for creatinine concentration, pH or specific gravity when a urine drug screen is ordered. Thus it may be necessary to order a urine analysis alongside UDS. Through our discussion with the laboratory we were able to set up a treatment plan with the above patient. She continues to comply with the pain contract and has now been tapered to monthly urine drug screens along with following with a psychologist for addiction.

### Table 1: Diluted vs Substituted Urine (12)

<table>
<thead>
<tr>
<th>Urine Type</th>
<th>Creatinine Concentration</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluted</td>
<td>2 to 20 mg/dl</td>
<td>1.001 – 1.003</td>
</tr>
<tr>
<td>Substituted</td>
<td>Less than 2 mg/dl</td>
<td>&lt;1.001 or &gt;1.020</td>
</tr>
</tbody>
</table>

### Table 2: Types of UDS and comparison (1, 14,15)

<table>
<thead>
<tr>
<th>Types of UDS</th>
<th>Mechanism</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Immunoassay</td>
<td></td>
<td></td>
<td>1. Low Specificity</td>
</tr>
<tr>
<td>a. Cloned enzyme donor immunoassay</td>
<td>They are based on the principle of competitive binding, and use antibody to detect the presence of drug or metabolites in urine.</td>
<td>1. Rapid</td>
<td>2. higher chance of cross reactivity with other substances.</td>
</tr>
<tr>
<td>b. Enzyme multiplied immunoassay technique</td>
<td></td>
<td>2. Cheaper</td>
<td></td>
</tr>
<tr>
<td>c. Fluorescence polarization immunoassay</td>
<td></td>
<td>3. Requires less expertise</td>
<td></td>
</tr>
<tr>
<td>d. Immunoturbidimetric assay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Radioimmunoassay</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Gas Chromatography-Mass Spectrometry</td>
<td>This technique uses GC to separate the analytes in a specimen, and MS to identify the specific molecular structures of the drug and metabolites.</td>
<td>1. High Specificity</td>
<td>1. Expensive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Can quantify the amount of drug/metabolite in the sample.</td>
<td>2. Time consuming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Can also report drugs that are not readily detected by screening tests.</td>
<td>3. Requires expertise to perform</td>
</tr>
<tr>
<td>3. Liquid chromatography</td>
<td>Similar to GC, but uses liquid instead of gas (during the mobile phase) to separate the contents of the mixture.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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References


