How to correctly interpret a urine drug screen result

A Project RAMP Resource
Adam J. Gordon, MD MPH FACP DFASAM CMRO
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INTRODUCTIONS
CONFLICT OF INTEREST AND DISCLOSURE

• Dr. Gordon has no fiduciary conflicts of interest
• Some of the material presented herein has been previously published from work at the University of Pittsburgh, University of Utah, and the Veterans Health Administration
• The views expressed in this presentation are Dr. Gordon’s and do not necessarily reflect the position or policy any institution, agency, or government
TODAY’s GOALs

• Understand the role of urine drug screens in the monitoring of patients on opioids

• Understand the role of urine drug screens for patient on opioid agonist treatment

• Correctly interpret a variety of urine drug screen results
CASE 1: Adam’s Chief Complaint

- Adam is a 49 year old male who presents to your primary care clinic.
- He has been your patient for 10 years.
- He recently was diagnosed with stage 4 colon cancer.
- He has been placed on opioids for pain s/p a colon resection.
- Otherwise, he is healthy except he has had a “cold” recently.
- He admits to having a lot of stress and has been hanging out with his college “hippy buddies” recently. “My wife doesn’t like them”.
- You have called him in to discuss his urine toxicology report.
CASE 1: Adam’s history

• Past Medical History:
  • Nicotine use disorder – he smokes ½ pack per day

• Social history:
  • Divorced and remarried
  • Works in healthcare

• Family history:
  • Mother and Father are alive and well
  • Three children – no diseases
CASE 1: Adam’s Medications/Studies

• **Allergies:**
  • None

• **Medications:**
  • Oxycodone 5mg po q6 hours prn

• **Labs/Studies:**
  • Urine drug screen:
    • Morphine: **negative**
    • Cocaine: **negative**
    • Amphetamine’s: **positive**
    • 6-AM: **negative**
    • Marijuana: **negative**
CASE 1 : Adam’s conundrums

• Interpret the lab result.

• What would you say to Adam?
• What actions would you take?
TODAY’s GOALs

• Understand the role of urine drug screens in the monitoring of patients on opioids

• Understand the role of urine drug screens for patient on opioid agonist treatment

• Correctly interpret a variety of urine drug screen results
General Goals of Drug Testing

• Important and routine component of treatment for all patients on opioids.
• Testing is not meant to "catch" the patient
• A positive (or negative result) should be interpreted cautiously
• A positive test result should not simply lead to discharge from treatment, but an opportunity for reviewing the current plan

• Basically, drug testing procedures and follow up should be similar to other tests we routinely do
  • Are we punitive when someone’s glucose is high?
  • Are we punitive when someone’s cholesterol is high?
General Goals of Drug Testing

• Think of Urine Drug Screen results as a test on the PROVIDER’s treatment quality
  • Do you need to change care?
  • Do you need to intensify care?

• Think of Urine Drug Screens as akin to HBa1c results
  • Monitoring TREATMENT over time....
Drug Testing in the Office

• Ideally laboratory testing could be:
  • Random
  • Observed
  • Convenient for the patient
  • High quality
  • Able to offer timely result
Screening and Confirmatory Tests

SCREENING TESTS
• Relatively rapid
• Inexpensive
• Usually immunoassay
• Performed in lab or point-of-care testing (POCT)
• Results are PRESUMPTIVE until confirmed by a more definitive test
• Good for initial check (negative)

CONFIRMATORY TESTS
• Usually time consuming
• Expensive
• Usually chromatography and spectrometry
• Likely performed in certified lab
• More PRECISE and more SPECIFIC
• Results considered definitive
• Not needed all the time...
What IS in a typical screening test

- Opiates (detects morphine, codeine, and metabolites)
- Benzodiazepine
- Cannabinoids
- Amphetamines
- Cocaine metabolite (benzoylcegonine)
What is **NOT** in a typical *screening* test

- Buprenorphine (and nor-buprenorphine)
- Fentanyl
- Oxycodone
- Methadone
- Benzodiazepines
- Alcohol metabolite (ethyl glucuronide or ethyl sulfite)
Sample Authenticity

- Urine samples can be altered
  - Adding a substance so that it appears to have been ingested (adulterant)
  - Diluting with water to decrease chances of detecting that are substances present
  - Providing a sample produced earlier or by another person
Sample Authenticity

• Some of these can be detected by examining physical characteristics of the urine
  • Temperature
  • Specific Gravity
  • Creatinine

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Normal Range</th>
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<tbody>
<tr>
<td>Temperature*</td>
<td>90-100 F</td>
</tr>
<tr>
<td>pH</td>
<td>4.5 to 8</td>
</tr>
<tr>
<td>Creatinine</td>
<td>&gt; 20 mg/dL</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>&gt; 1.002 to 1.030</td>
</tr>
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</table>

* within 4 minutes of collection
Duration often results in urine drug tests

<table>
<thead>
<tr>
<th>Substance</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Alcohol</td>
<td>7-12 hours</td>
</tr>
<tr>
<td>Ethyl glucuronide</td>
<td>2-5 days</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>2 days</td>
</tr>
<tr>
<td>Benzodiazepines (short-acting, e.g. lorazepam)</td>
<td>3 days</td>
</tr>
<tr>
<td>Benzodiazepines (long-acting, e.g. diazepam)</td>
<td>30 days</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>4-10 days</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2-4 days</td>
</tr>
<tr>
<td>Ethyl glucuronide</td>
<td>2-6 days</td>
</tr>
<tr>
<td>Heroin or morphine</td>
<td>1-3 days</td>
</tr>
<tr>
<td>Marijuana (single use)</td>
<td>3 days</td>
</tr>
<tr>
<td>Marijuana (chronic use)</td>
<td>30+ days</td>
</tr>
<tr>
<td>Opioids</td>
<td>2-4 days</td>
</tr>
</tbody>
</table>

Moeller et al., Mayo Clinic Proc. 2017
Poppy Seeds and Opioids

• Poppy seeds can contain codeine and morphine in amounts detectable on UDT after ingestion, including after eating poppy-seeded baked goods such as bagels or pastries.

• Because morphine and codeine are actually present in the seeds:
  • positive results due to poppy seeds are chemically indistinguishable from those due to use of opiates, even with confirmatory testing.

• Patients being tested for opioids should be advised to avoid poppy seeds and foods containing them:
  • abstinence from poppy seed-containing foods may be included as part of a treatment agreement in order to allow informative testing for opioid use.

• Concentrations of codeine and morphine > 2000 ng/ml are generally considered to suggest opioid use rather than poppy seed ingestion:
  • Therefore consider confirmatory/quantification testing.

Moeller et al., Mayo Clinic Proc. 2017
Opioid metabolism

**FIGURE 1.** Metabolism of opioids.\(^{136, 141}\) Morphine is metabolized to hydromorphone in very small amounts.

Moeller et al., Mayo Clinic Proc. 2017
Benzodiazepine metabolism

**FIGURE 2.** Basic metabolism of benzodiazepines. 156-158 *Flunitrazepam is not available in the United States.

Moeller et al., Mayo Clinic Proc. 2017
CASE 1: Adam’s conundrums???

• Interpret the lab result

• What would you say to Adam?

• What actions would you take?

RECALL:

On oxycodone

UDS results:

- Morphine: negative
- Cocaine: negative
- Amphetamine’s: positive
- 6-AM: negative
- Marijuana: negative
What about Amphetamine result?

- False “positive”!

<table>
<thead>
<tr>
<th>Screening test</th>
<th>Reported causes of false positives (not comprehensive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td>amantadine, aripiprazole, bupropion, L-methamphetamine (present in some nasal sprays), phenylephrine, pseudoephedrine</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>sertraline</td>
</tr>
<tr>
<td>Cannabinoids</td>
<td>NSAIDs, proton pump inhibitors</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>trazodone</td>
</tr>
<tr>
<td>Methadone</td>
<td>diphenhydramine, doxylamine</td>
</tr>
<tr>
<td>Opiates</td>
<td>dextromethorphan</td>
</tr>
</tbody>
</table>

Moeller et al., Mayo Clinic Proc. 2017
CASE 2: Angry Adam’s Chief Complaint

• Adam is a 49 year old male who presents to your primary care clinic
• He has been your patient for 10 years
• He is on buprenorphine/naloxone for opioid use disorder
• You have called him in to discuss his urine toxicology report
CASE 2: Angry Adam’s history

• Past Medical History:
  • Opioid Use Disorder (OUD)
  • Nicotine use disorder – he smokes ½ pack per day

• Social history:
  • Divorced and remarried
  • Works in telecommunication

• Family history:
  • He is adopted
  • Three children – no diseases
CASE 2: Angry Adam’s Medications/Studies

• **Allergies:**
  • None

• **Medications:**
  • Buprenorphine/naloxone 8/2mg qd

• **Labs/Studies:**
  • Urine drug screen:
    • Morphine negative
    • Cocaine negative
    • Amphetamine negative
    • 6-AM **positive**
    • Marijuana negative
    • Buprenorphine **positive**
    • Nor-buprenorphine negative
CASE 1: Angry Adam’s conundrums

- Interpret the lab result.
- What would you say to Adam?
- What actions would you take?
Drug Testing in the Office for Medication Treatment

• Laboratory testing for evidence of substance use has several roles in treatment for opioid use disorder
  • Initial assessment
  • Treatment planning
  • Screening to identify non-prescribed substances/medications
  • Monitoring adherence to pharmacotherapy
  • Evaluating efficacy of treatment and assist in treatment planning
Testing for Buprenorphine

• Testing for buprenorphine can be useful to monitor adherence and detect possible diversion
• Buprenorphine is **not** detected by screening tests for opiates
• Confirmatory testing will distinguish buprenorphine and its metabolite norbuprenorphine
• Individuals vary in the ratio of buprenorphine to norbuprenorphine due to individual metabolism and co-administered inducers or inhibitors of CYP3A4
  • buprenorphine with little or no metabolite (i.e. a ratio of norbuprenorphine:buprenorphine: < 0.02) suggests that a sample was tampered by adding buprenorphine directly to the urine
Testing for Buprenorphine

Nor-Buprenorphine is an active metabolite
So what if the test result is wrong? Talk to your team!

• Develop policies ahead of time of specific consequences of positive tests specified by presence or absence of prescribed medications
• Incorporate policy into the signed treatment agreement
• Consider additional steps
  • Review medication dose – may need to increase dose
  • Intensity of treatment
    • More frequent visits
    • observed dosing
    • additional evidence-based counseling
    • addressing co-occurring disorders
  • Frequency of testing can be increased
• Discuss with multi-disciplinary treatment team in clinic
So what if the test result is wrong? Talk to patient!

• Discuss rationale for testing
  • Means of supporting recovery, not for punitive purpose
• Review test?
  • Results, pH, urine concentration
• Review medication list?
  • Consider possibility of false-positive
  • Consider discussing with an expert (pathologist, pharmacist, chemist)
• Confirmatory testing?
• Review Goals of Care
  • Discuss changes in treatment plan
  • Review consequences of continued use of illicit/non-prescribed substances
Frequency of Testing in MAT Controversial

• No strict, established guidelines or specific evidence to guide frequency
• Frequency of UDT depends on several factors:
  • Stage of Treatment
    • Monthly testing has been suggested as a minimum during ongoing addictions treatment
    • More frequent testing may be more appropriate early in treatment or if there is concern for diversion or recurrence of substance use
  • Stability of Patient
  • Half-life of drugs being tested
  • Treatment setting
    • Office based
    • Opioid Treatment Programs: Federal law mandates a minimum of eight drug tests per year
• Random testing, rather than at appointments or other pre-scheduled times, is recommended in order to obtain a representative sample
CASE 1: Angry Adam’s conundrums

• Interpret the lab result.

• What would you say to Adam?

• What actions would you take?

RECALL:

Patient on buprenorphine

Urine drug screen:
- Morphine: negative
- Cocaine: negative
- Amphetamine: negative
- 6-AM: positive
- Marijuana: negative
- Buprenorphine: positive
- Nor-buprenorphine: negative
DISCUSSION