



# UNC SON **ECHO** for MOUD

Addiction and Behavioral Clinic for Medication for Opioid Use Disorder Treatment

## DECIPHERING THE DRUG SCREEN: BASICS OF UDS INTERPRETATION

LESLIE SHARPE, DNP, FNP-BC

ACKNOWLEDGEMENTS TO MICHAEL BACA-ATLAS AND ELISABETH JOHNSON

UNC SON ECHO for MOUD is made possible by funding from the Health Resources & Services Administration (HRSA) Grant numbers: T94HP30882 (2017-2027) and T14HP33207 (2019-2024)



UNC  
SCHOOL OF NURSING



University of North Carolina  
at Chapel Hill  
School of Nursing

# Disclosures

None

# Objectives

Distinguish between presumptive and confirmatory testing.

Interpret example laboratory UDS.

Recognize drug metabolites/contaminants that may be present in urine.

Identify common (or not so common) medications that may produce false-positives.

# Types

- **Presumptive--immunoassay**
  - Screening
  - Rapid results
  - Onsite (POC) or laboratory
  - Cost-effective
  - Use antibodies to detect presence of drug metabolites
  - False--positives due to detecting substances with similar characteristics
  - If unexpected results, need to use clinical judgment, patient history, and collaborative information
- **Confirmatory--Gas chromatography/mass spectrometry**
  - Can identify specific molecular structures and quantifies the amount of a drug or substance present in the sample
  - Takes longer
  - Expensive
  - Use when making legal, forensic, academic, employment, or other decisions that have significant ramifications.

# Case

50-year-old female with chronic pain

Current medications:

- Methadone, 20 mg [3X/d]
- Immediate release Morphine, 30 mg [5X/d]
- Gabapentin, 1200 mg [2X/d]
- Duloxetine, 60 mg/d

How do you interpret the following results?

Nagpal et al, 2017

# Example Laboratory Test Results

Nagpal, 2017

Test performed	Method of detection	Qualitative patient values	Quantitative patient values ng/ml	Assay cutoff, ng/ml
Opiates	Immunoassay	Positive	>800	50
Codeine	Mass spect	Positive	254	100
Morphine	Mass spect	Positive	>50,000	100
Hydrocodone	Mass spect	Negative		100
Hydromorphone	Mass spect	Positive	5792	100
Norhydrocodone	Mass spect	Negative		100
Oxycodone	Mass spect	Negative		100
Fentanyl	Mass spect	Negative		3
Methadone	Immunoassay	Positive	>500	130
Methadone	Mass spect	Positive	2911	100

# Test interpretation

- *Consistent* results
  - The test is positive for a drug that the patient confirms taking
    - ✓ Further testing for that drug not indicated
- *Inconsistent* results
  - The test is negative for substance(s) that the patient has taken recently (within window of detection)
  - The test is positive for a substance(s) that the patient denies taking recently
    - ✓ Further testing indicated (if urine, send out same sample)

Borrowed slide

**Table 2. Commonly Prescribed and Abused Opioids and Metabolites/Contaminants**

Opioid	Urine Metabolites	Contaminants	Comments
Codeine	Morphine; hydrocodone (<10%); norcodeine	None	Codeine is metabolized to morphine so both may be present <sup>2</sup>
Heroin	6-Monoacetylmorphine; morphine; normorphine	Codeine (if heroin is contaminated with acetylcodeine) <sup>3</sup>	Because the half-life for 6-monoacetylmorphine is 8 hours, morphine may be the only compound detected after heroin use <sup>3</sup>
Morphine	Normorphine; hydromorphone (<10%); morphine-6-glucuronide; morphine-3-glucuronide	Codeine	Codeine is a pharmaceutical contaminant of morphine at 0.04%-0.5% of the morphine concentration <sup>4</sup>
Hydrocodone	Hydromorphone; norhydrocodone; dihydrocodeine	None	Hydrocodone is metabolized in small amounts to hydromorphone so both may be present <sup>5</sup>
Hydromorphone	Hydromorphone-3-glucuronide	None	
Oxycodone	Oxymorphone; noroxycodone	Hydrocodone	Hydrocodone is a pharmaceutical contaminant of oxycodone at < 0.1% of the concentration of oxycodone <sup>6</sup> ; oxycodone is metabolized to oxymorphone so both may be present <sup>5</sup>
Oxymorphone	Oxymorphone-3-glucuronide; 6-hydroxy-oxymorphone	None	
Fentanyl	Norfentanyl	None	
Methadone	2-Ethylidene-1; 5-dimethyl-3; 3-diphenylpyrrolidine	None	
Buprenorphine	Norbuprenorphine	None	

Nagpal, 2017



# Definitions

## Cutoff values:

- The concentration of the substance needed to produce a positive result
- Established to help minimize false-positive results
  - Hydromorphone is minor metabolite of morphine—found at <10% of morphine urine concentration
  - Codeine not a metabolite, but can be an impurity in production of morphine
- Negative result does not mean that substance is not present, just below cutoff value

## Detection time (or window)

- is the amount of time a drug can be detected in the urine and still produce a positive result.

# Windows of detection

- Depends on drug, type of specimen (urine, blood, hair, etc.),
- Urine
  - Heroin: 1-2 days
  - Cocaine: 2-4 days (low use), 10-22 days (heavy use)
  - Marijuana: 1-3 days (low use), up to 30 days (heavy use)
  - Benzodiazepines: 1-3 days (short acting), up to 6 weeks (long acting)
  - Methamphetamines: 1-2 days

Borrowed slide

# Evaluating the urine sample

- Early morning specimens tend to be the most concentrated and therefore may contain higher levels of substance.
- Temp of urine should be tested within 4 minutes of collection and should be between 90 - 100 degrees F.
- pH should be between 4.5 and 8.
- Specific gravity should be between 1.002 and 1.030.
- Urine creatinine should be >20 mg/dL.

**\*Unexpected findings are an opportunity for conversation, not accusation.**

# POC (presumptive) test interpretation

- Lots of substances trigger a “false positive” for Methamphetamines or amphetamines
  - Over the counter sold/allergy or heartburn meds
  - Some antidepressants (Prozac, Wellbutrin)
- Some benzodiazepines may not be detected unless they are at high levels
  - Clonazepam (Klonopin), Lorazepam (Ativan)
- Some opioids will not be detected with a general opioid (morphine screen), they require specific tests
  - Buprenorphine, Methadone, Oxycodone, Fentanyl

Borrowed slide

TABLE 3

### Common Medications That Can Cause False-Positive Results on Urine Drug Testing

Drug	Cross-reactive medications/substances
Amphetamines	Amantadine, benzphetamine (Regimex), bupropion (Wellbutrin), chlorpromazine, clobenzorex (not available in the United States), desipramine, dextroamphetamine, ephedrine (Akovaz), fenproporex (not available in the United States), isometheptene (component of Prodrin), labetalol, levomethamphetamine (active ingredient in some over-the-counter nasal decongestant inhalers), methamphetamine, 3,4-methylenedioxymethamphetamine (MDMA), methylphenidate (Ritalin), phentermine (Adipex-P), phenylephrine, promethazine, pseudoephedrine, ranitidine (Zantac), selegiline (Elderyl), thioridazine, trazodone, trimethobenzamide (Tigan), trimipramine (Surmontil)
Benzodiazepines	Oxaprozin (Daypro), sertraline (Zoloft)
Cannabinoids	Dronabinol (Marinol), efavirenz (Sustiva), hemp-containing foods, proton pump inhibitors, tolmetin and other nonsteroidal anti-inflammatory drugs
Cocaine	Coca leaf tea, topical anesthetics containing cocaine
Opioids	Dextromethorphan, heroin, quinine, quinolones, rifampin, verapamil
Phencyclidine	Dextromethorphan, diphenhydramine (Benadryl), doxylamine, ibuprofen, ketamine (Ketalar), meperidine (Demerol), thioridazine, tramadol, venlafaxine

Adapted with permission from Smith MP, Bluth MH. Common interferences in drug testing. Clin Lab Med. 2016;36(4): 665-666.

# Amphetamine false positives

Amphetamine/MDMA most prone to false positives (3.9 – 9.9%)

- Beta blockers (atenolol, bisoprolol, metoprolol)
- Antipsychotics (aripiprazole)
- Antidepressants (sertraline, bupropion)
- Antiarrhythmics (procainamide, mexiletine)
- PDE5 (Sildenafil)
- H2 blocker (Ranitidine)
- Opioid (Tapentadol, tramadol)

Pope et al., 2023

# Possible causes for unexpected results

Result	Possible cause
Illicit substance present	Illicit substance use, false positive
Low creat and specific gravity	Deliberate dilution of urine, low body mass, renal dysfunction
Non-prescribed drug present	Nonmedical use of medication, false positive
Prescribed drug absent	True negatives: patient has not taken medication in the detection window; rapid metabolizer False negatives: urine concentrations below cutoff levels; contaminant present that interferes with test
Prescribed drug present in high concentration and/or metabolites absent	Recent dosing; concentrated urine (high creatinine level); unsanctioned dose escalation; concurrent use of prescription and illicit substances; “shaving” (i.e., adding a small amount of drug to the urine to demonstrate compliance)

Kale, 2019



# Take home-point about testing

- Ask about any prescribed or over-the-counter medications as well as vitamins and herbal supplements
- Point-of-care (presumptive) tests and Confirmatory (definitive) tests each have pros and cons
- Testing results are just one set of information needed to guide clinical decision making

Borrowed slide



# References

- Kale, N. (2019). Urine Drug Tests: Ordering and Interpreting Results. *American Family Physician*, 99(1), 33-39.  
<http://libproxy.lib.unc.edu/login?url=https://www.proquest.com/scholarly-journals/urine-drug-tests-ordering-interpreting-results/docview/2454360646/se-2>
- Moeller, Karen E, PharmD., B.C.P.P., Kissack, Julie C, PharmD., B.C.P.P., Atayee, Rabia S, PharmD., B.C.P.S., & Lee, Kelly C, PharmD, M.A.S., B.C.P.P. (2017). Clinical Interpretation of Urine Drug Tests: What Clinicians Need to Know About Urine Drug Screens. *Mayo Clinic Proceedings*, 92(5), 774-796.  
<https://doi.org/10.1016/j.mayocp.2016.12.007>
- Nagpal G, Heiman H, Haymond S. Interpretation of Urine Drug Screens: Metabolites and Impurities. *JAMA*. 2017;318(17):1704–1705. doi:10.1001/jama.2017.10910
- Pope, J. D., Drummer, O. H., & Schneider, H. G. (2023). False-Positive Amphetamines in Urine Drug Screens: A 6-Year Review. *Journal of analytical toxicology*, 47(3), 263–270. <https://doi.org/10.1093/jat/bkac089>