Urine Drug Testing
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ASPMN Urine Drug Testing Task Force

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Objectives
- Describe 2 methodologies used for urine drug testing
- Discuss technical issues which may affect interpretation
- Discuss 2 alternatives to urine drug testing
- Explain ethical issues pertaining to urine drug testing
Why urine drug testing?

- monitor pharmacotherapy compliance
- identify individuals who may be at high risk
- a means of providing documentation to an agreed treatment plan

Characteristics of urine

- temperature 90° F to 100 ° F
- pH 4.5 – 8
- creatinine concentration > 20 mg/dl
- specific gravity 1.003 – 1.030

Creatinine adjusted drug levels

The measured drug level is adjusted to the level of creatinine detected and multiplied by 100 mg/dl

(patient’s directly measured THC level × average creatinine excreted ÷ patient’s directly measured creatinine level = creatinine adjusted drug level)
Medical drug monitoring

example, measured THC level 62ng/ml
creatinine level = 86
62 ng/ml x 100 mg/dl ÷ 86 mg/dl = 72
ng/dl

THC Levels

day 3 THC = 78
adjusted THC = 43
creatinine 180
day 7, THC = 84
adjusted THC = 35
creatinine 240
day 14 ,THC= 103
adjusted THC = 28
creatinine 398

Methods of urine drug testing

- Immunoassay drug tests
  - clarifies a substance as being present or absent
  - advantages:
    - rapid turn around time
    - inexpensive
    - high sensitivity
  - limitations
    - cross-reactivity

Point of Care Testing

- commercially available
- does not require instrumentation
- easy to use
- limited number of tests
- interpretation subjective
- limited or deficient quality control
POCT testing
- users of POCT devices should understand limitations
- used should be trained
- be aware of interferences from chemicals
- consider cutoff(s) in selection of device
- must use quality control material
National Academy of Clinical Biochemistry (NACB)

Confirmatory testing
- gas chromatography/mass spectrometry (GC/MS)
  - the gold standard
  - highly specific and sensitive

Adulterants
- dilution products
- cleansing products
- chemical adulterants
- prosthetic devices
Interpretation

- strong lines of communication between lab personnel or technical support
- detection time of drugs typically 1-3 days
- rate of excretion of drug varies
  - Dependent on differences in metabolism/urinary function

<table>
<thead>
<tr>
<th>Drug class</th>
<th>Drug</th>
<th>Drug and/or metabolite</th>
</tr>
</thead>
<tbody>
<tr>
<td>opiate</td>
<td>hydrocodone</td>
<td>hydrocodone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hydromorphone</td>
</tr>
<tr>
<td>benzodiazapine</td>
<td>alprazolam</td>
<td>alprazolam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alpha-hydroxylalprazolam</td>
</tr>
<tr>
<td>cocaine</td>
<td>cocaine</td>
<td>benzoylegionine</td>
</tr>
</tbody>
</table>

Data from Ameritox, Shurman & Backer, 2006

Interpreting urine drug levels

- urine drug levels don’t indicate strength of drug being used
- urine drug levels don’t indicate how frequently the drug is used
- blood alcohol as a model
Urine drug test report

- Drug not detected may be due to the following
  - patient didn’t take any of the medication
  - patient has not recently taken any of their medication
  - patient excretes medication and /or their metabolites at a different rate than normal
  - the test used was not sensitive enough
  - clerical error

Metabolism of Opioids

- heroin
  - 6-acetylmorphine
    - morphine
    - hydrocodone
    - hydromorphone
    - codeine

Adapted from Gourley, Caplan & Heit, 2006

Alcohol

- breath alcohol test or a blood alcohol concentrate reflects current state
- metabolite of alcohol  Ethyl glucuronide (Etg )
- OTC cough medications, mouthwashes can produce a positive result
Cross Reactivity

- substances with similar and sometimes dissimilar compounds, chemical composition
- may yield a false positive for the target drug

Amphetamines

- Includes:
  - diet agents
  - decongestants
  - medication for parkinsons

Cocaine

- Quinine can cross react with the following immunoassays: cocaine EIA but not cocaine FPIA
Marijuana

- Sustiva can cross react with THC EIA
- Immunoassays can’t distinguish between smoked marijuana and Marinol

Opiates

- can cross react with antibiotics, levofloxacin and ofloxacin
- can yield false positive results for:
  - imipramine
  - papaverine
  - rifampin

Benzodiazepines

- can cross react with oxaprozin (daypro)
- can cross react with diphenhydramine
- can cross react with sertaline (zoloft)

False/positive results
Barbituates

- primidone (mysoline) metabolized in the liver to phenylethylmalonamide and phenobarbital which are excreted in the urine
- phenytoin can cross react

Detection times of drugs in urine

<table>
<thead>
<tr>
<th></th>
<th>Cutoff (ng/ml)</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td>1000</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Benzoyleryamine after street doses of cocaine</td>
<td>300</td>
<td>2-3</td>
</tr>
<tr>
<td>Cannabinoids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>moderate smoker</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>heavy smoker</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>chronic smoker</td>
<td>50</td>
<td>≤ 28</td>
</tr>
<tr>
<td>Opiate</td>
<td>2000</td>
<td>1-2</td>
</tr>
</tbody>
</table>

Alternatives to urine testing

- serum opioid measurements
  - costly and invasive
  - limited detection windows and low drug concentrations
Oral fluid drug testing
- Drugs transferred to oral fluid by passive diffusion from blood and by deposits from smoking & intranasal or oral administration
- Drugs & metabolites in oral fluid proportionate to those in serum

Factors influencing drug deposition
- pH
- Degree of protein binding
- Lipophilicity of the drug

Providing a specimen
- Refrain from eating and drinking and smoking 10-20 minutes prior to providing a specimen
Ethical issues

Abandonment of Care

- unilateral termination by the health care practitioner of the patient-practitioner relationship without adequate notice
  - to obtain equally qualified replacement care
  - and at a time when medical care is needed

Clinician’s obligations

- clinician obligations
  - to provide treatment or
  - arrange for treatment to be provided elsewhere
  - cannot neglect the patient
Avoiding claims of abandonment

■ Steps to be taken
  ■ Communicate early and document
  ■ Is referring clinician able to accept patient
  ■ Review any guidelines for terminating relationship

Case Study

■ Mr. Smith- 40 y.o. male with hx of chronic back pain
■ Current RX- OxyContin, effexor, tizanidine and levaquin,
■ Urine drug testing results-Immunoassay
■ Opiates - oxycodone + amphetamines

Take Home Messages

■ Confirm a positive urine screen by another method
■ Urine drug testing is only a part of the whole monitoring process
■ Urine drug testing should be used to improve the care of patients