

Drug Screening in Addiction Treatment



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PROJECT ECHO

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Financial Disclosures



- The following session leader has no relevant financial relationships with ineligible companies to disclose:
 - Emily Buirkle, MD

Outline



- Purpose of drug screens
- Selecting a test
- Screening vs confirmation
- Interpreting results
 - Specific substances
- Example

Principles of drug screening



- Routine part of addiction treatment
- Monitor progress
 - Medication adherence
 - Substance use

Principles of drug screening



- Routine part of addiction treatment
- Monitor progress
 - Medication adherence
 - Substance use
- No strict guidelines

Principles of drug screening



- Routine part of addiction treatment
- Monitor progress
 - Medication adherence
 - Substance use
- No strict guidelines
- Frequency
 - Weekly → monthly

Principles of drug screening



- Routine part of addiction treatment
- Monitor progress
 - Medication adherence
 - Substance use
- No strict guidelines
- Frequency
 - Weekly → monthly
- Efficacy?
 - Contingency management

Stigma



- Patient provider relationship
- Patient perception

Stigma



- Patient provider relationship
- Patient perception

- Nonpunitive
- Facilitate conversation
 - Progress based on treatment goals
 - Adulterants
 - Focus on safety

Stigma



- Patient provider relationship
- Patient perception

- Nonpunitive
- Facilitate conversation
 - Progress based on treatment goals
 - Adulterants
 - Focus on safety
- Normalize lab testing
- Non-stigmatizing language

Picking a matrix



Window of detection

Reason for testing

Picking a matrix



- Short: Blood, breath
 - Minutes – hours
 - Intoxication



Picking a matrix



- **Short: Blood, breath**
 - Minutes – hours
 - Intoxication
- **Intermediate: Urine, oral fluid**
 - Hours – days
 - Treatment clinics



Picking a matrix



- **Short: Blood, breath**
 - Minutes – hours
 - Intoxication
- **Intermediate: Urine, oral fluid**
 - Hours – days
 - Treatment clinics
- **Long: Hair**
 - Weeks – months
 - Employment



Picking a matrix

- Urine
 - Most common
 - Easier to adulterate
 - ✦ Dilution
 - ✦ Adding medication
 - ✦ Non-urine sample
 - ✦ Friend's urine
 - Observed urine



Picking a matrix

- Urine
 - Most common
 - Easier to adulterate
 - ✦ Dilution
 - ✦ Adding medication
 - ✦ Non-urine sample
 - ✦ Friend's urine
 - Observed urine
- Oral fluid
 - Shorter window of detection
 - ✦ 1-2 days



Screen & confirm



- Immunoassay
 - Antibody detects a drug or metabolite
- Gas chromatography–mass spectrometry (GCMS)
 - Separate and identify substances

Screen & confirm



- **Immunoassay**
 - Antibody detects a drug or metabolite
- **Gas chromatography–mass spectrometry (GCMS)**
 - Separate and identify substances
- **Limitations**
 - Can't diagnose SUD
 - Window of detection
 - Concentration threshold
 - False + & False –
 - Adulteration

Interpretation



- Step 0
 - Patient ID and date of collection

Interpretation



- Step 0
 - Patient ID and date of collection
- Step 1
 - Temperature >90F
 - Validity testing

| TEST | MEASURED RESULT | REFERENCE RANGE | UNITS |
|------------------|-----------------|-----------------|-------|
| pH | 7.2 | 4.7 - 7.8 | |
| Specific Gravity | 1.015 | 1.003 - 1.035 | g/mL |
| Creatinine | 116.4 | 80.0 - 200.0 | mg/dL |

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| TEST | MEASURED RESULT | REFERENCE RANGE | UNITS |
|------------------|-----------------|-----------------|-------|
| pH | 5.9 | 4.7 - 7.8 | |
| Specific Gravity | 1.003 | 1.003 - 1.035 | g/mL |
| Creatinine | -0.5 | 80.0 - 200.0 | mg/dL |

Interpretation



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 - Patient ID and date of collection
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Interpretation



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- Step 3
 - Reviewing individual drugs

Buprenorphine



- Immunoassay
 - Target: Buprenorphine, norbuprenorphine
 - False +
 - ✦ Opioids: Morphine, codeine, methadone
 - False –
 - ✦ None
- Window of detection: 2 - 4 days

Buprenorphine



- Buprenorphine → Norbuprenorphine

| | | | | |
|------------------|----------|-------|------|-------|
| Buprenorphine | POSITIVE | 186.5 | 10.0 | ng/mL |
| Norbuprenorphine | POSITIVE | 525.5 | 25.0 | ng/mL |

Buprenorphine



- Buprenorphine → Norbuprenorphine

| | | | | |
|------------------|----------|-------|------|-------|
| Buprenorphine | POSITIVE | 186.5 | 10.0 | ng/mL |
| Norbuprenorphine | POSITIVE | 525.5 | 25.0 | ng/mL |

| | | | | |
|------------------|----------|-------|------|-------|
| Buprenorphine | POSITIVE | >1200 | 10.0 | ng/mL |
| Norbuprenorphine | Negative | | 25.0 | ng/mL |

Buprenorphine



- Buprenorphine → Norbuprenorphine

| | | | | |
|------------------|----------|-------|------|-------|
| Buprenorphine | POSITIVE | 186.5 | 10.0 | ng/mL |
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| | | | | |
|------------------|----------|-------|------|-------|
| Buprenorphine | POSITIVE | >1200 | 10.0 | ng/mL |
| Norbuprenorphine | POSITIVE | 33.4 | 25.0 | ng/mL |

Opioids & Opiates



- Immunoassay (opiate)
 - Target: Morphine, codeine



Opiates

heroin*
(diacetylmorphine)

6-monoacetylmorphine
(6-AM)

poppy seeds*

codeine

hydrocodone

morphine

norhydrocodone

hydromorphone

Opiates

heroin*
(diacetylmorphine)

codeine

poppy seeds*

6-monoacetylmorphine
(6-AM)

hydrocodone

morphine

norhydrocodone

hydromorphone



Opiates

heroin*
(diacetylmorphine) ✓

codeine ✓

poppy seeds*

6-monoacetylmorphine
(6-AM) ←

hydrocodone ✓

morphine ✓

norhydrocodone

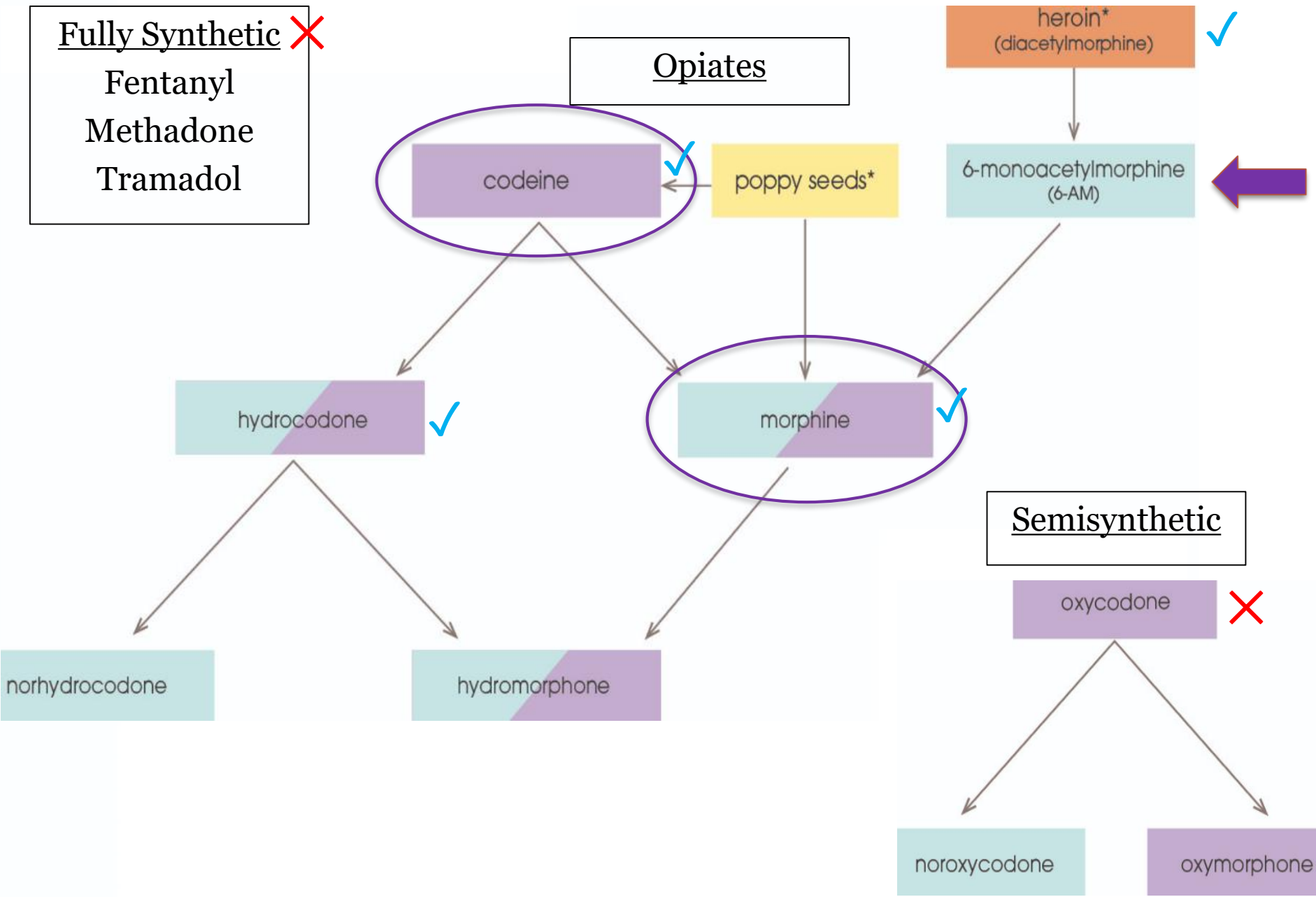
hydromorphone

Fully Synthetic ❌

Fentanyl
Methadone
Tramadol

Opiates

Semisynthetic



heroin*
(diacetylmorphine) ✓

codeine ✓

poppy seeds*

6-monoacetylmorphine
(6-AM)

hydrocodone ✓

morphine ✓

norhydrocodone

hydromorphone

oxycodone ❌

noroxycodone

oxymorphone

Opioids & Opiates



- Immunoassay (opiate)
 - Target: Morphine, codeine
 - False +
 - ✦ Poppy, naloxone, levofloxacin, rifampin
 - False –
 - ✦ Synthetic: Methadone, fentanyl, tramadol
 - ✦ Semisynthetic: Oxycodone
- Window of detection: 3 days

Methadone



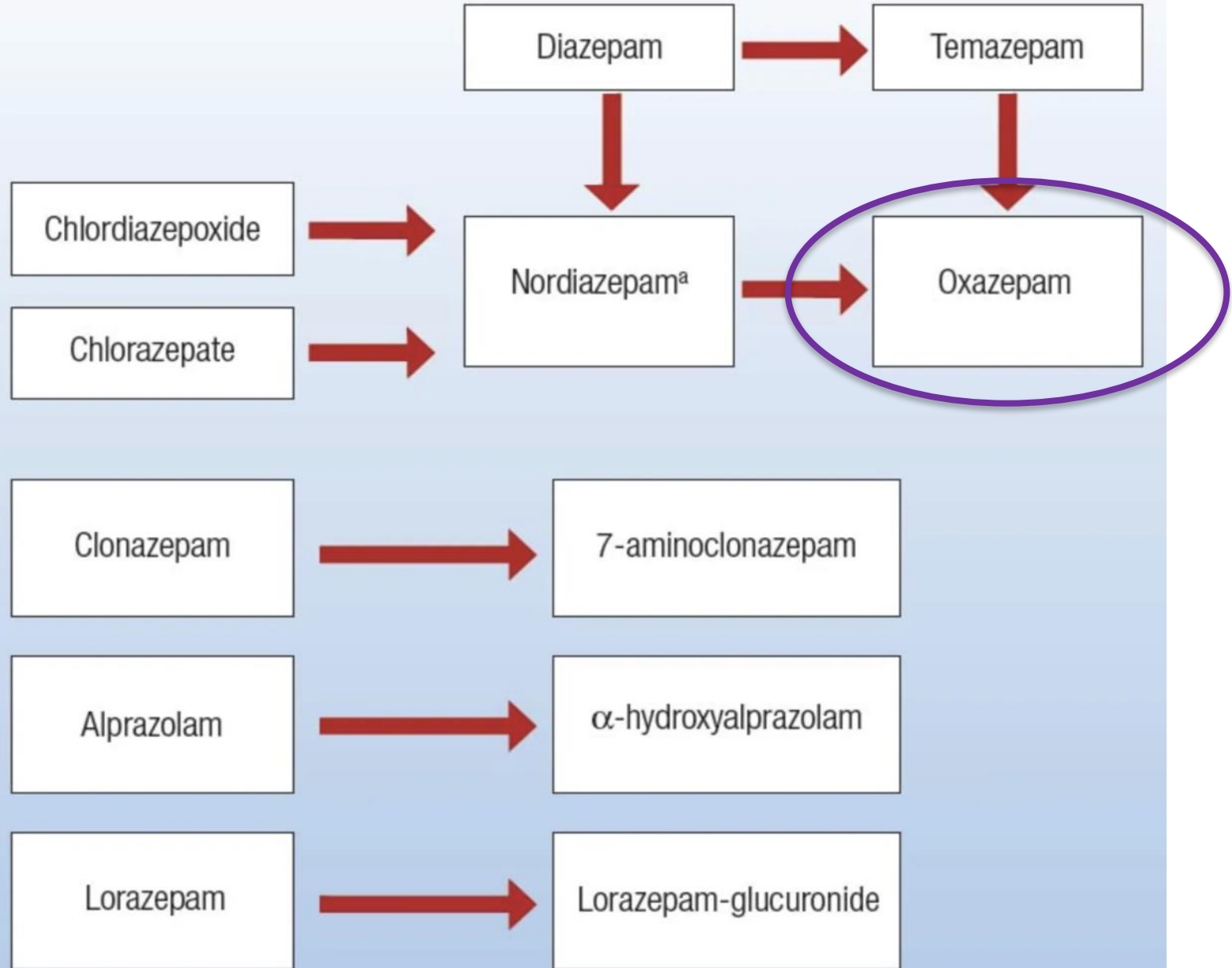
- Immunoassay
 - Target: Methadone, EDDP
 - False +
 - ✦ Diphenhydramine, quetiapine, verapamil
 - False –
 - ✦ None
- Window of detection: Up to 7 days

Benzodiazepines

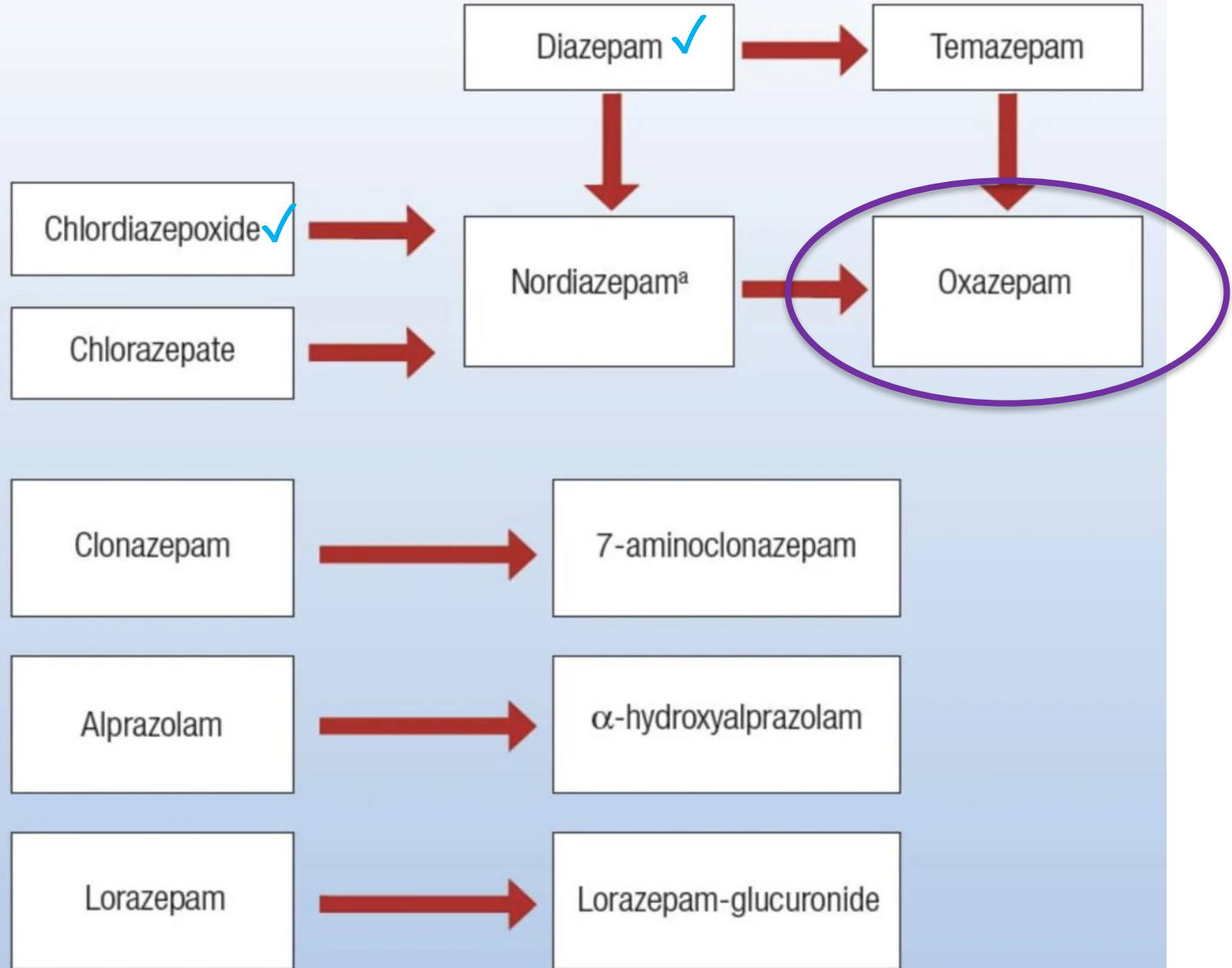


- Immunoassay
 - Target: Oxazepam

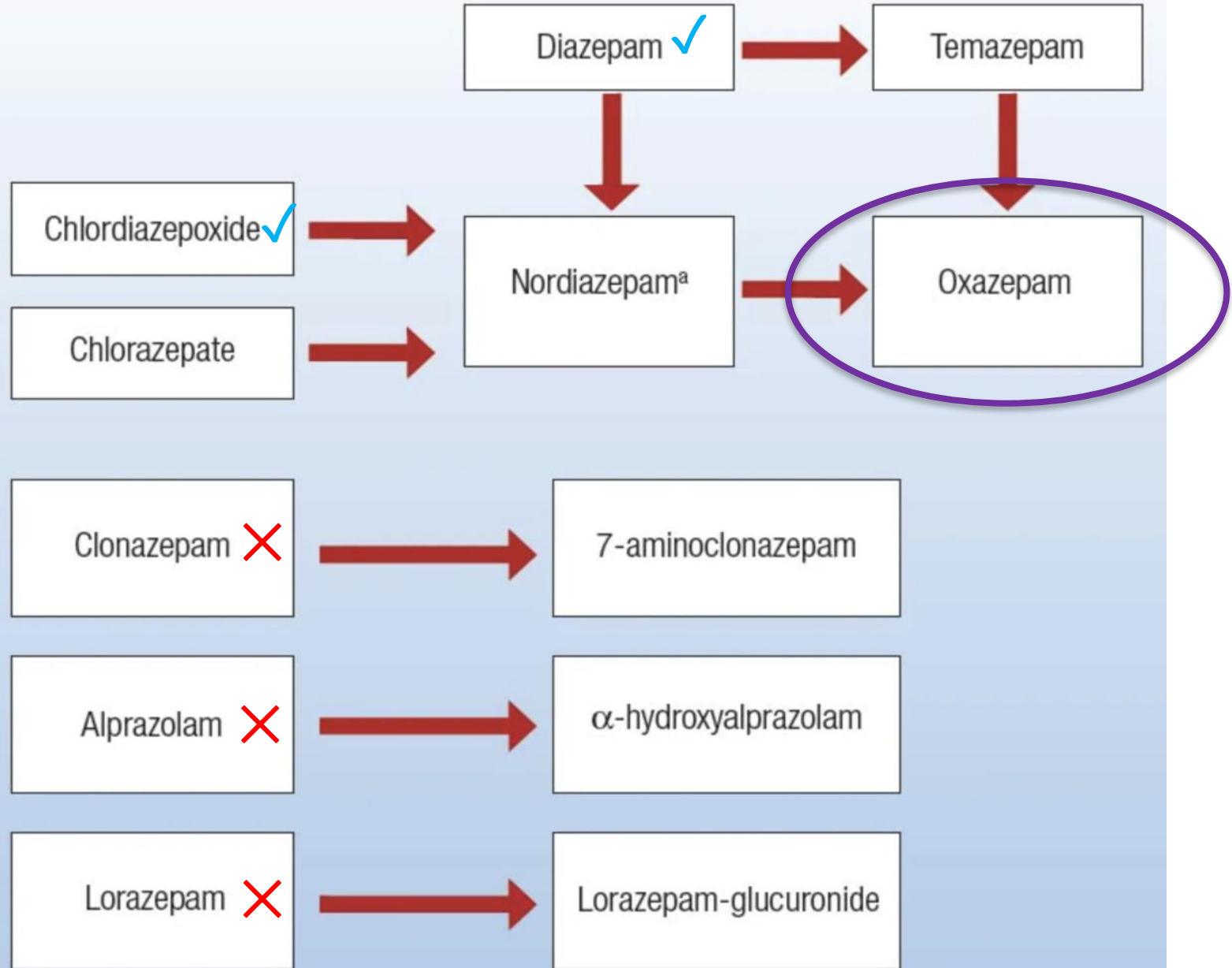
Benzodiazepine metabolism



Benzodiazepine metabolism



Benzodiazepine metabolism



Benzodiazepines



- Immunoassay
 - Target: Oxazepam
 - False +
 - ✦ Sertraline, efavirenz
 - False –
 - ✦ Alprazolam, lorazepam, clonazepam
- Window of detection: 5 days (diazepam 10 days)

Barbiturates



- Immunoassay
 - Target: Secobarbital
 - False +
 - ✦ NSAIDs
 - False –
 - ✦ None
- Window of detection: 3 – 15 days

Cocaine



- Immunoassay
 - Target: Benzoylecgonine
 - False +
 - ✦ Coca tea
 - Considered as accurate at GCMS
- Fluconazole → false – GCMS
- Window of detection: 5 days

THC



- Immunoassay
 - Target: 9-carboxy-THC
 - False +
 - ✦ NSAIDs, pantoprazole, promethazine, efavirenz
 - False –
 - ✦ Synthetic cannabis
- Window of detection: 3 - 30 days



Amphetamine



- Immunoassay
 - Target: Amphetamine, methamphetamine
 - False +
 - ✦ Amantadine, atomoxetine, bupropion, pseudoephedrine, metformin, labetalol, trazadone
 - False –
 - ✦ MDMA, cathinones (bath salts)
- Window of detection: 3 days

PCP

- Immunoassay
 - Target: PCP
 - False +
 - ✦ Dextromethorphan, ketamine, diphenhydramine, ibuprofen, lamotrigine, venlafaxine, tramadol
 - False –
 - ✦ None
- Window of detection: 8 days

LSD

- Immunoassay
 - Target: LSD
 - False +
 - ✦ Fluoxetine, buspirone, doxepin, amitriptyline, sertraline, bupropion, haloperidol, risperidone, trazadone, labetalol, diltiazem, verapamil, fentanyl
 - False –
 - ✦ None
- Window of detection: 5 days

Example



Patient presents seeking treatment

Report history of OUD

Daily heroin use

Last use this morning

Opioid dependent?

DRUG SCREENING

| TEST NAME | RESULT | FLAG | CUTOFF | NOTES |
|------------------------|----------|-----------------|--------|---|
| Barbiturates Screen | NEGATIVE | | | < 200 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Benzodiazepines Screen | NEGATIVE | | | < 200 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Buprenorphine Screen | NEGATIVE | | | < 5 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Cocaine Screen | POSITIVE | POSITIVE | | < 300 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Ethanol Screen | NEGATIVE | | | < 50 mg/dL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Ecstasy Screen | NEGATIVE | | | < 300 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Methadone Screen | NEGATIVE | | | < 300 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Opiate Screen | NEGATIVE | | | < 300 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Oxycodone Screen | NEGATIVE | | | < 100 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| PCP Screen | NEGATIVE | | | < 25 ng/mL is considered a NEGATIVE result |
| Notes: ^ | | | | |
| Cannabinoid 50 Screen | NEGATIVE | | | < 50 ng/mL is considered a NEGATIVE result |

Confirmation



Fentanyl Confirmation (LC-MS/MS)

| | | | | |
|------------------|----------|-------|------|-------|
| 3-Methylfentanyl | Negative | | 10.0 | ng/mL |
| Acetyl fentanyl | Negative | | 5.0 | ng/mL |
| Carfentanil | Negative | | 10.0 | ng/mL |
| Fentanyl | POSITIVE | 382.7 | 10.0 | ng/mL |
| Norfentanyl | POSITIVE | >1200 | 10.0 | ng/mL |
| Sufentanil | Negative | | 10.0 | ng/mL |

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| Norfentanyl | POSITIVE | >1200 | 10.0 | ng/mL |
| Sufentanil | Negative | | 10.0 | ng/mL |

Opiates Confirmation (LC-MS/MS)

| | | | | |
|----------------|----------|-------|------|-------|
| Codeine | Negative | | 50.0 | ng/mL |
| Hydrocodone | Negative | | 50.0 | ng/mL |
| Hydromorphone | Negative | | 50.0 | ng/mL |
| Morphine | POSITIVE | 123.7 | 50.0 | ng/mL |
| Norhydrocodone | Negative | | 50.0 | ng/mL |

Opioid dependent?

DRUG SCREENING

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| Hydromorphone | Negative | | 50.0 | ng/mL |
| Morphine | POSITIVE | 123.7 | 50.0 | ng/mL |
| Norhydrocodone | Negative | | 50.0 | ng/mL |

References



Jarvis M, Williams J, Hurford M, Lindsay D, Lincoln P, Giles L, Luongo P, Safarian T. Appropriate Use of Drug Testing in Clinical Addiction Medicine. *J Addict Med.* 2017 May/Jun;11(3):163-173. PMID: 28557958.

Nelson ZJ, Stellpflug SJ, Engebretsen KM. What Can a Urine Drug Screening Immunoassay Really Tell Us? *J Pharm Pract.* 2016 Oct;29(5):516-26. Epub 2015 Apr 27. PMID: 25917168.