Prescription Substance Use and the Workplace

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Objectives:

- “It is better to be careful 100 times than to get killed once.” - Mark Twain
- Review accident prevention
- Discuss substance use
- Look at specific substances
- What to do with potentially impaired workers
7 Most Common Causes of Workplace Accidents

- Shortcuts
- Overconfidence
- Poor, or Lack Of Housekeeping
- Starting a Task Before Getting All Necessary Information
- Neglecting Safety Procedure
- Mental Distractions
- Lack of Preparation
Accident Prevention

- Hazard: any source of potential harm
- Risk: probability of harm occurring
- Risk assessment is the process where you:
  - Identify hazards, analyze or evaluate the risk associated with that hazard
  - Determine appropriate ways to eliminate or control the hazard
- Swiss cheese
- Acceptable risk < 1%
Example of Subtle Impairment: Merchant Marine Study

- Simulated merchant ship handling
- 38 deck officer cadets tested on a bridge simulator to obtain a baseline value. The following day they were given alcohol (0.04 to 0.05 gm% BAC) or placebo and retested.
- Performance was significantly impaired for the alcohol group relative to the placebo group.

- DOT policy change
Impairment

- 13% of US workforce test lab positive for opiates
  - Quest Diagnostics Drug Testing Database
- 17.8 - 39% of pain patients abuse medications
  - Manchikanti, et al., 2001 & 2005
- 30 - 80% of opiate abusers are cognitively impaired
  - Copersino, et al., 2009

Therefore 0.7 – 4.1% of workforce impaired from opiates
Comparison of Random and Post-accident Urine Drug Tests in Southern Indiana Coal Miners

- **Background:** relationship between amphetamines, barbiturates, benzodiazepines, cocaine, marijuana, methadone, opioids, phencyclidine and propoxyphene and coal mining accidents.

- **Methods:**
  - The control sample (n=215): miners random urine drug testing.
  - The study sample (n=100) miners post-accident urine drug testing.
  - Non-parametric Mann-Whitney U Tests of creatinine normalized urine drug levels were conducted to compare the medians of the groups.

- **Results:**
  - The mean drug concentrations were higher in the post-accident group for each drug tested except marijuana.
  - Two-tailed testing demonstrated statistically significant differences for marijuana (p=0.000), cocaine (p=0.008) and opiates (p=0.037).

- **Conclusions:** The study demonstrates statistically significant higher cocaine and opioid concentrations and lower marijuana concentrations in post-accident urine drug tests of coal miners when compared to random tests.

Workplace Risks of Opioid Use

Common workplace risks associated with prescription painkiller use:

- Driving vehicles to / from / at work
- Operating machinery / equipment
- Making critical errors
- Productivity (pace, focus and concentration)

National Safety Council, 2014
Workplace Costs of Opioid Misuse

When painkillers are misused in the workplace, there could be an increase in:

- Worker’s compensation costs
- Length of disability
- Risk for incidents, injuries, and errors
- Cost of insurance fraud
- Cost for screening and testing
- ER visits and other medical care
- Cost for intervention and treatment

National Safety Council, 2014
A Comparison of Random and Post-accident Urine Opiate and Opioid Tests

Background: The purpose of this study is to determine if there is a statistical association between opiate and opioid use and work related accidents as measured by urine drug tests.

Methods: case-control study comparing the proportion of opiate/opioid laboratory positive urine specimens for post-accident verses random samples. The prevalence of laboratory positive opiate/opioid tests, the odds ratio and 95% CI of accident involvement, Fisher’s exact probability test and the population attributable risk (PAR) were calculated for each of the comparisons.

Results: The odds ratio comparing the total confirmed laboratory positive opiate or opioid specimens after controlling for other substances was 4.45 (2.73-7.24) with a p-value < 0.0001 and PAR of 2.81%. Comparisons of the individual opiate and opioid concentrations demonstrated similar differences for morphine (OR=20.74, PAR=0.78%), hydrocodone (OR=4.90, PAR=0.92%) and propoxyphene (OR=4.89, PAR=1.08%).

Conclusions: statistically significant difference (p<0.05) for opiate/opioid results favoring the post-accident group.

Price, J Addict Dis.; 2015
### Table 3. Odds Ratios and p-Values for GC/MS Confirmed Laboratory Positive Opiate/Opioid Urine Drug Tests Controlled for Other Potentially Impairing Medications

<table>
<thead>
<tr>
<th></th>
<th>Drug Positive</th>
<th>Drug Negative</th>
<th>Total</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>Z statistic</th>
<th>p-Value</th>
<th>95% CI</th>
<th>Z statistic</th>
<th>p-Value</th>
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<td>Morphine</td>
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<td>Hydrocodone</td>
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<td>Propoxyphene</td>
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<td>.3013–10.8855</td>
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<td>Methadone</td>
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</table>
| Population attributable risk = 2.81%.
| Population attributable risk = .78%.
| Population attributable risk = .92%.
| Population attributable risk < .01%.
| Population attributable risk < .06%.
| Population attributable risk = 1.08%.
| Population attributable risk < .01%.
Indication of Dose Response Relationship

TABLE 4. Odds Ratio and p-Value for Opiate/Opioid Urine Drug Screens After Being Controlled for Other Potentially Impairing Medications That Failed to Confirm GC/MS Laboratory Positive for Opiates/Opioids

<table>
<thead>
<tr>
<th></th>
<th>Drug Positive</th>
<th>Drug Negative</th>
<th>Total</th>
<th>Odds Ratio</th>
<th>2.1836</th>
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<tr>
<td>Post-accident</td>
<td>52</td>
<td>1,948</td>
<td>2,000</td>
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<tr>
<td>Random</td>
<td>30</td>
<td>2,454</td>
<td>2,484</td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>82</td>
<td>4,402</td>
<td>4,484</td>
<td></td>
<td></td>
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</table>

Population attributable risk = 2.60%.

Post-accident Mean Creatinine 127.90
Random Mean Creatinine 115.70
95% CI 1.3877–3.4358
Z statistic 3.377
p-Value .0007

Price, J Addict Dis.; 2015
Long Term Opioid Use

- N= 144 patients with chronic low back pain
- Mean age = 46 years
- Assesses prior to the start of oxycodone with acetaminophen and again after 90 and 180 days
- Neuropsych. Tests and mood measures
  - DSST, Trail making test part B
  - BDI, SF-36

Jamison, et al. *JPSM*; 2003
Mean Trail Making Test

Average Test Scores

Baseline
N = 131

90 Days
N = 129

180 Days
N = 94

Time

* P < 0.001, Change from baseline

Jamison, et al. *JPSM*; 2003
## Neuropsychological Performance: Chronic Low Back Pain

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pain-Free N=160</th>
<th>CLBP N=163</th>
<th>P value</th>
</tr>
</thead>
<tbody>
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<td>RBANS- Im. Mem</td>
<td>103</td>
<td>98</td>
<td>.002</td>
</tr>
<tr>
<td>RBANS- Visuos.</td>
<td>96</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>RBANS – Lang.</td>
<td>102</td>
<td>99</td>
<td>.004</td>
</tr>
<tr>
<td>RBANS- Attent.</td>
<td>105</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>RBANS- Del. Mem</td>
<td>97</td>
<td>94</td>
<td>.04</td>
</tr>
<tr>
<td>Trails B (T score)</td>
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<td>50</td>
<td></td>
</tr>
<tr>
<td>Grooved Pegboard</td>
<td>45</td>
<td>42</td>
<td>.04</td>
</tr>
<tr>
<td>NART-VIQ</td>
<td>98</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

(Weiner et al., Pain Medicine, 2006)
Benzodiazepines and Workplace Safety: An Examination of Post-Accident Urine Drug Tests

• **Background:** determine if benzodiazepine use as measured by drug tests is higher in post-accident drug tests than in random tests.

• **Methods:** case-control study comparing the proportion of benzodiazepine laboratory positive urine specimens for random verses post-accident samples. Any sample that tested positive for one or more substances other than benzodiazepines was eliminated. The group prevalence of benzodiazepine positive samples was compared via the odds ratio with 95% CI and the p-values.

• **Conclusions:** The results although suggestive of an association, did not achieve statistical significance.

Benzodiazepines and Workplace Safety: An Examination of Post-Accident Urine Drug Tests

**TABLE 4. Odds Ratios and P-Value for Confirmed Benzodiazepine Metabolite Positive Urine Specimens After Controlling for Polysubstance Positive Drug Tests**

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Postaccident (n = 2,016)</th>
<th>Random (n = 2,497)</th>
<th>Odds Ratio (0.95 CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordiazepam, oxazepam, and Temazepam</td>
<td>1</td>
<td>2</td>
<td>0.6191 (0.00561–6.8328)</td>
<td>0.6955</td>
</tr>
<tr>
<td>Nordiazepam and Temazepam</td>
<td>0</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Oxazepam and temazepam</td>
<td>4</td>
<td>3</td>
<td>1.6528 (0.3695–7.3932)</td>
<td>0.5110</td>
</tr>
<tr>
<td>Oxazepam and lorazepam</td>
<td>1</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Oxazepam and ethylfurazepam metabolite</td>
<td>1</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Alprazolam metabolite and ethylfurazepam metabolite</td>
<td>1</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Alprazolam metabolite and lorazepam</td>
<td>1</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Nordiazepam</td>
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<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Oxazepam</td>
<td>2</td>
<td>3</td>
<td>0.8256 (0.1378–4.9456)</td>
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<td>Diazepam</td>
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<td>0</td>
<td>No value</td>
<td>No value</td>
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<tr>
<td>Temazepam</td>
<td>1</td>
<td>1</td>
<td>1.2387 (0.0774–19.8172)</td>
<td>0.8797</td>
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<tr>
<td>Ethylfurazepam metabolite</td>
<td>1</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Alprazolam metabolite</td>
<td>3</td>
<td>0</td>
<td>No value</td>
<td>No value</td>
</tr>
<tr>
<td>Lorazepam</td>
<td>1</td>
<td>1</td>
<td>1.2387 (0.0774–19.8172)</td>
<td>0.8797</td>
</tr>
<tr>
<td>Total confirmed benzodiazepine positives</td>
<td>17</td>
<td>10</td>
<td>2.1150 (0.9663–4.6292)</td>
<td>0.0609</td>
</tr>
</tbody>
</table>

*Accounting for samples that were positive for more than 1 benzodiazepine metabolite.*

Cognitive Effects of Benzodiazepine Use:

- Long-term BZD users impaired in 12 categories
  - Sensory processing, verbal & nonverbal memory, speed of processing, visuospatial processing, attention, general intelligence, psychomotor speed, motor control, problem solving & verbal reasoning.
  - Effect sizes range -1.30 to -0.42 (mean -0.74, SD+/-0.25)
- Improve after stopping; DONOT return to “normal”
- Impairment may last > 6 years

Begman, et al., 1989; Baker, et al., 2004; Beracochea, 2006
Lorazepam: significant decline in word recall and reaction time

Wesness et al., *Eur. J. C. Pharm.*; 1995
Additional Medication Cautions

- Other medications and conditions can cause impairments in cognition and driving abilities
  - Age
  - Sleep apnea
  - Vascular conditions and heart medications
  - Sleep deprivation
  - Other medications and medical conditions - cancer, benzodiazepines, asthma - allergy medications
Impairment evaluation

- Ipse dixit: “He himself said it”
- Cognitively impaired patients are not adequately identified by clinical impression or self-reporting.
- FFD exam

Copersino, Fals-Stewart, Fitzmaurice, et al., 2009; Mitchell & Miller, 2008
Fitness for Duty Evaluation:

- The examination must meet the “Reasonableness Standard”
  - It is not unnecessarily intrusive and each element of testing is related to their essential job functions
- Written explanation of the employer’s concerns
- A written job description
- Any relevant medical records
The FFD Examination:

- Focused Physical Examination
  - Vision
  - Neurological
  - Hepatic

- Depression and Anxiety Screening
  - GAD-7, PHQ-9

- Possible Laboratory Studies
  - Thiamine, B12, Hepatic enzymes, Urine drug testing, Breath Alcohol Testing

- A Cognitive Screen

- Possible Further Testing
The Useful Field Of View Visual Attention Analyzer:

- A computer based visual test containing three subtests.
  - 1. Processing Speed: Determines a person’s threshold for discriminating stimuli presented in central vision.
  - 2. Divided Attention: Same as Subtest 1 but with the addition of a concurrent peripheral target location task.
  - 3. Selective Attention: Same as Subtest 2 but with the addition of distracters
UFOV:

On which spoke was the outside object located?

Indicate your answers by clicking the button which corresponds to the location of the target.
Trail-making Test:

- A measure of visual scanning, complex attention, processing speed, and mental flexibility
- Test interpretation requires comparing the subjects' test time to normative data stratified by age and education
Trail-making Test:
Psychomotor Vigilance Test:

- A sustained-attention, reaction-timed task that measures the speed with which subjects respond to a visual stimulus
- A simple task where the subject presses a button as soon as the light appears. The light will turn on randomly every few seconds for 5–10 minutes.
Psychomotor Vigilance Test: 

0453
Montréal Cognitive Assessment:

- Performance of 14 tasks that utilize multiple cognitive domains including attention, language, visuospatial, executive function, and memory.

- The Montréal Cognitive Assessment performs better (sensitivity, 94% specificity, 42%) than the Folstein Mini Mental State Examination, (sensitivity, 66% specificity, 97%) (Godefroy, et al., 2011)
MoCA:

**VISUOSPATIAL / EXECUTIVE**
- Copy cube
- Draw CLOCK (Ten past eleven) (3 points)

**NAMING**
- Lion
- Rhinoceros
- Camel

**MEMORY**
- Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes.
- 1st trial
- 2nd trial

**ATTENTION**
- Read list of digits (5 digits/sec.). Subject has to repeat them in the forward order
- Subject has to repeat them in the backward order
- Read list of letters. The subject must tap with his hand at each letter A. No points if > 2 errors
- Serial 7 subtraction starting at 100
- 4 or 5 correct subtractions. 3 pts, 2 or 3 correct. 2 pts, 1 correct. 1 pt, 0 correct. 0 pt

**LANGUAGE**
- Repeat: I only know that John is the one to help today.
- The cat always hid under the couch when dogs were in the room.

**ABSTRACTION**
- Similarity between e.g. banana - orange = fruit
- train - bicycle
- watch - ruler

**DELAYED RECALL**
- Has to recall words with NO CUE

**ORIENTATION**
- Date
- Month
- Year
- Day
- Place
- City

© Z. Nosraddine MD Version November 7, 2004

www.mocatest.org
MoCA provides a time-efficient and resource-conscious way to identify patients with SUDs and neuropsychological impairment.

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<th>Cutpoint</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Correctly classified (%)</th>
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<th>LR−</th>
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<td>1.0000</td>
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</tr>
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<td>100.00</td>
<td>81.67</td>
<td>—</td>
<td>0.9167</td>
</tr>
<tr>
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<td>80.00</td>
<td>—</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

*Note.* Bold row indicates cutpoint selected as optimal. LR+ = positive likelihood ratio; LR− = negative likelihood ratio.

Copersino, et al., 2009
What to do

Issue: Attention Only
- Screen: UFOV, PVT or Trail Making Test
  - Passed: Cleared for Duty
  - Failed: Restricted from Safety Sensitive Tasks

Failed
- Formal Neuropsychological Testing

Issue: More than Attention
- Screen: MoCA, MMSE or Cognistat
  - Passed: Cleared for Duty
Summary:

- Review accident prevention
- Discuss substance use
- Look at specific substances
- What to do with potentially impaired workers
Questions