Prescription Drug Use and Transportation Safety

John P. Holland, MD, MPH
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Affiliations - Disclosures

• Affiliations
  – Chief Medical Officer – Union Pacific Railroad
  – Clinical Professor – University of Washington

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Prescription Drug Use and Transportation Safety

Session Topics

• Scope of the Problem – Drug Use and Safety
• Methods for Studying Drug Effects on Driving / Work
• Pain Drugs and Safety
• Sedatives / Other Psychoactive Drugs and Safety
• Employer Approaches
• Legal / Regulatory Issues (DOT, ADA, liability)
• Importance for Transportation Safety: NTSB Perspective
Drug Use and Transportation Safety
Identification → Measurement → Control

Identify the problem
– Increased use of impairing drugs poses safety risks
– Transportation accidents can endanger workers, the public, property, the environment

Identify roles and responsibilities
– Worker / Employer / Prescriber / Government

Identify strategies to improve safety at work
– Restrict use of drugs that impair safe work
– Educate workers, prescribers, employers

Use of psychoactive prescription drugs is common and drugs impair driving

Data on psychoactive drug use by US adults
– Prescription pattern for psychoactive drugs
– ER visits and deaths from drugs (legal & illicit)
– Data from workplace drug screening programs

Data on motor vehicle accidents & drug use
– Traffic stop surveys - drugs used by all drivers
– Accident studies – unsafe driving actions & drug use
– Fatal accident studies – drug use of drivers who died


Misunderstood Opioids and Needless Pain
Chronic pain suffered by 30 million Americans robs people of their dignity, personality, productivity and ability to enjoy life.

Chronic pain...is seriously undertreated, largely because doctors are reluctant to prescribe [opioids]

[A pain specialist says] - “Politics, prejudice and our continuing ignorance still impede prescribing..... medical use of opioids does not create drug addicts”
Historical Perspective:
Changing patterns of pain drug use

Explosion of pain drug use - since 1990s
- Influence of advocacy groups, view pain as undertreated
- Rise of pain medicine specialties / pain clinics
- Relaxed restrictions by state licensing boards and DEA
- Increasing use of opioids / psychoactive drugs

Relaxed restrictions on pain drugs and driving
- Advocates claim no adverse effects on driving
- FMCSA regulations prohibit opioid use by CMV drivers, but Agency creates exception if doctor says OK to drive
- Other DOT agencies adopt similar exception language

Explosion in opioid use
Increase in prescriptions – U.S 1994 to 2003
- all controlled substances 63%
- all opioids 402%

Immediate release (IR) opioids
- hydrocodone 265%
- oxycodone 899%

Sustained release (SR) opioids
- fentanyl 496%
- methadone 1,214%


Increasing opioid deaths in chronic pain patients
US deaths from prescribed opioids
- greater than for heroin and cocaine combined
- higher death rate proportional to supply for each drug

Opioid-related deaths in US – 1999 to 2002
- heroin deaths increased 12%
- cocaine deaths increased 23%
- prescription opioid deaths increased 91%
- deaths from prescription opioid drugs 5,528

National Center for Health Statistics
Tightening the Lid on Pain Prescriptions

Opioids represent the most widely prescribed class of medications in the United States. Over the last decade prescriptions for the strongest opioids increased nearly fourfold, with only limited evidence of long-term effectiveness or risks.

“Doctors are prescribing like crazy” [Dr. Chapman, director of Pain Research Center - Univ. of Utah]

Hundreds of thousands of patients nationwide may be on potentially dangerous dosages.

Recent changes in attitudes on prescription pain drugs

Change in public opinion
  • Some pain experts, policy makers & media now view prescription drug abuse as a major problem

Response of government / medicine
  • Recommendations from
    – FDA (education on long-acting opioids)
    – White House drug office
  • Medical Society Guidelines (ACOEM, others)

Drug Use and Transportation Safety

Identification → Measurement → Control

Ways to study effects of drugs on driving

• Epidemiology Studies (identify risks / patterns)
  – Roadside surveys / prevalence studies
  – Hospital studies (post accident)
  – Collision / fatal crash studies

• Experimental Studies (measure level of effect)
  – Behavioral studies (neuropsychology / physical tests)
  – Driving simulator / controlled driving courses
  – On-road driving test studies
Psychoactive drug use & fatal motor vehicle accidents (MVAs)
Case-control study - Norway
- Cases - 204 drivers killed in MVAs 2003-2008
- Controls - 10,540 drivers random traffic stop survey
All tested for psychoactive drugs (blood/saliva)
Controls – random roadside survey 2005-2006
- 3.4% - positive for prescribed psychoactive drugs
- 1% - positive for illegal drugs

Gjerde (2011) - Accident Analysis and Prevention 43:1197-1203

Psychoactive drug use & fatal motor vehicle accidents (MVAs)
Odds Ratio (OR) odds drugs found in cases vs. controls
(adjusted for age, sex, time of day, season)
- Opioid OR = 5.7*
- Single illegal drug OR = 6.1*
- Benzodiazepine OR = 11*
- Two or more substances OR = 47*
- Alcohol only (> 0.2 g/l) OR = 69*
- Alcohol and drugs OR = 353*
*statistically significant

Gjerde (2011) - Accident Analysis and Prevention 43:1197-1203

Unsafe driving actions (UDAs) and opioid use preceding fatal crashes
Odds of UDA for combinations of drugs used

<table>
<thead>
<tr>
<th>Opioid</th>
<th>+Depressant</th>
<th>+Stimulant</th>
</tr>
</thead>
<tbody>
<tr>
<td>No opioids found</td>
<td>0.97</td>
<td>1.75</td>
</tr>
<tr>
<td>Opioids found</td>
<td>1.66</td>
<td>2.29</td>
</tr>
</tbody>
</table>

Increased risk of UDAs os also associated with
- Younger age, males, poor driving record and use of other medication (depressants, stimulants)
- Regardless of sex, highest risk is at age 35

Dubois (2010) - Accident Analysis and Prevention 42: 30-37
Experimental studies – to assess drug effects on driving

**Control exposure** (dose of drug)
- Control dose, time since ingestion, confounders

**Ways to measure outcomes** (effect on driving)
- *Behavioral tests* of driving-related skills in lab
  - reaction speed, memory, psychomotor effects
- *Driving simulator / test track* test multiple/integrated skills
- *On-road driving tests* in real traffic, best measure of driving abilities when using drug, “Gold Standard”

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Behavioral tests of driving impairment

![Figure](image)

Figure shows tests of skills and abilities related to driving and corresponding BAC, more than half of behavioral tests showed significant impairment.

Driving simulators and on-road tests measure integration of skills, effects of divided attention, etc.

Verster (2009)

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Psychoactive drugs – duration and type of drug effects

**Biological half-life of drugs**
- time for 50% reduction in pharmacologic effects
- impairment minimal after about 2-1/2 half-lives
- classify as “short-acting” or “long-acting”

**Type / intensity of drug effects vary by**
- specific drug, dose amount and frequency
- use of other drugs (including alcohol)
- health conditions, fatigue, environment
Drug half-life - duration of effects

<table>
<thead>
<tr>
<th>Drug</th>
<th>Half-life - hrs</th>
<th>Effects last – hrs (2-1/2 half-lives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain drugs (opioids)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxycodone (Percocet)</td>
<td>3 – 4.5</td>
<td>8 – 12</td>
</tr>
<tr>
<td>Hydrocodone (Vicodin)</td>
<td>4 – 6</td>
<td>10 – 16</td>
</tr>
<tr>
<td>Methadone</td>
<td>15 – 60</td>
<td>40 – 160</td>
</tr>
<tr>
<td>Sedative / hypnotics / muscle relaxants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zolpidem (Ambien)</td>
<td>2 – 3</td>
<td>5 – 8</td>
</tr>
<tr>
<td>Alprazolam (Xanax)</td>
<td>11</td>
<td>28</td>
</tr>
<tr>
<td>Meprobamate (Equanil, Soma)</td>
<td>11-13</td>
<td>28-32</td>
</tr>
<tr>
<td>Clonazepam (Klonopin)</td>
<td>18-50</td>
<td>45 - 125</td>
</tr>
<tr>
<td>Diazepam (Valium)</td>
<td>20 – 100</td>
<td>50 – 250</td>
</tr>
</tbody>
</table>

On-road driving test
Standard Deviation of Lateral Position (SDLP)

Overview
- Test of psychoactive drug effects on driving ability
- Done in Netherlands
- Studies over 50 drugs over 30 years
- Objective / quantitative outcome measure (SDLP)
- Allows comparison of drug effects to alcohol
- Well validated


On-road driving test
Standard Deviation of Lateral Position (SDLP)

Experimental Protocol
- RTCs – vary dose of drug
- Test 10 & 16 hours after bedtime dose
- Highway driving for 60 miles at 60 mph
- Monitor has clutch/brake, stops test if unsafe
- Roof camera measures weaving of car (SDLP)
Standard Deviation of Lateral Position

**Figure 2** - Increased weaving of car (higher SDLP values) represents reduced vehicle control and out of lane excursions.

Impairment from specific drugs during on-road driving tests

- Standard Deviation of Lateral Position (SDLP) scores for on-road driving test studies of sedative drugs, showing equivalent Blood Alcohol Concentration (BAC).
- Light blue is 10-11 hours and dark blue 16-17 hours after a bedtime dose.

ICADTS - Categories of drugs for impairment of driving performance

**Category I** - equivalent to BAC <0.05%
- negligible or no impairment of driving performance
- unlikely to be dangerous based on pharmacology profile

**Category II** - equivalent to BAC of 0.05 to 0.08%
- minor to moderate impairment of driving performance
- low potential for adverse drugs effects

**Category III** - equivalent to BAC >0.08%
- gross impairment of driving performance
- potentially dangerous based on pharmacology profile
ICADTS Categories of drugs for driving impairment

International Council on Alcohol, Drugs and Traffic Safety (ICADTS)

Reports / lists:
www.icadts.nl/reports/medicinaldrugs1.pdf
www.icadts.nl/reports/medicinaldrugs2.pdf

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain Drugs</td>
<td></td>
</tr>
<tr>
<td>fentanyl</td>
<td>III</td>
</tr>
<tr>
<td>tramadol</td>
<td>III</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td></td>
</tr>
<tr>
<td>alprazolam (Xanax)</td>
<td>III</td>
</tr>
<tr>
<td>Neuroleptics</td>
<td></td>
</tr>
<tr>
<td>risperidone</td>
<td>II</td>
</tr>
<tr>
<td>Hypnotics</td>
<td></td>
</tr>
<tr>
<td>zolpidem (Ambien) &lt; 10 hr</td>
<td>II</td>
</tr>
<tr>
<td>zolpidem (Ambien) &gt; 10 hr</td>
<td>I</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>I</td>
</tr>
<tr>
<td>citalopram (Celxa)</td>
<td>I</td>
</tr>
</tbody>
</table>