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Driving Under the Influence



Driving Under the Influence: Counseling on the Effects of Prescription Drugs on Driving Performance



By Linda Hill, MD, MPH

Abstract: Motor vehicle crashes are a major cause of morbidity and mortality in the United States. Medical conditions and medications have the potential to increase crash risk. While medications can affect drivers of any age, older adults are more likely to be taking prescription medications. Pharmacists have an important role in educating patients on medication side effects that could affect driving. This report reviews the major prescription medications that affect driving and provides guidance on counseling.

Motor vehicles crashes are a leading cause of death in the US, with 33,561 fatalities in 2012. Prescribed medications, over-the-counter (OTC) medications, and abused drugs, including alcohol, have the potential to interfere with the ability to drive safely,^{1,2} with the risk increasing with the number of medications.³ Pharmacists have a responsibility to patients and the public to minimize this risk through their dispensing and counseling practices. In a 2003 professional standard statement, the International Pharmaceutical Federation provided guidance to pharmacists and reiterated that pharmaceutical organizations should provide clear guide-

lines on the side effects of medications with regard to driving and the operation of machinery.⁴

The potential for impaired driving due to medication can occur at any age, though older adults are more likely to be taking prescribed medication, including multiple pharmaceuticals, and could experience drug interactions. A study by the AAA Foundation for Traffic Safety found that over 90% of older drivers take prescription medications, and over two-thirds of those taking any medication take multiple medications.⁵ In an earlier study, AAA found that only half of these drivers (52%; 58% of women vs. 46% of men) on prescrip-

tion medication talked to a health care provider about the possible effect of these drugs on their ability to drive.⁶ In addition, increased age, low education, and widowhood are associated with less awareness, experience, and health professional warnings.⁷ However, studies have found that medical profession-

Objectives:

- Understand the effect prescription drugs can have on driving performance
- Demonstrate the importance of including the effects on driving as part of a consultation
- Understand the key classes of prescription drugs which can impair driving skills

als are generally unaware of medicines' effects on driving and are reluctant to discuss them with patients.

The classes of prescription drugs and their potential side effects are outlined in Table 1. The main side effects that impair driving skills include drowsiness, confusion, hypotension and possible associated syncope, hypoglycemia, and poor muscle tone or incoordination. Less common are problems such as double vision, nausea, blurred vision, and memory impairment. Specific drug effects on driving are reviewed here.

Anticonvulsants

Seizure disorders, when uncontrolled, can interfere with driving,⁸⁻¹³ though the risk may have been overestimated.¹⁴ Anticonvulsants may cause drowsiness, confusion, ataxia, nausea, and double vision. The response to the medication varies by individual and may not always be linearly correlated with dosage. Checking patients' blood drug levels are helpful with some drugs, such as phenytoin, where high blood levels are correlated with ataxia.

Antidepressants

Antidepressants are the second most frequently prescribed medications, according to the Institute for Health Care Informatics.¹⁵ There is evidence that the crash rate in individuals with depression is three times higher than unaffected individuals. However, the treatments for depression may be associated with side effects that interfere with driving as well. Even one psychotropic prescription drug increased the crash risk more than twofold for drivers over 45 years old, with dramatic increases to eightfold for more than two CNS-affecting drugs. The tricyclic antidepressants have higher rates of hypotension and drowsiness, one of the reasons they are prescribed at night to help with depression-associated insomnia. They have been associated with a more than twofold crash risk in the elderly.^{16,17}

Anxiolytics

Benzodiazepines can cause drowsiness, confusion, and amnesia, and may interfere with muscle tone and

coordination. Ten mg of Valium has been found to be equivalent to a blood alcohol concentration (BAC) of 0.10%. Benzodiazepines were shown to increase crash risk 60% in one study,¹⁸ and another case control study found an odds ratio of 5:2 with benzodiazepines in drivers 65 and older.¹⁶ Some studies have shown an effect for intermediate and long-acting benzodiazepines, but not short-acting ones.¹⁹

Antipsychotics

Both antipsychotics and psychosis can affect judgment, with the drugs causing nausea and drowsiness. Psychosis can impair driving due to lapses in judgment, impulsivity, and inattention. In one study, persons with schizophrenia were examined before discharge. Only 32% of these persons passed reaction testing prior to discharge. Persons on atypical antipsychotics and clozapine performed better than those on older antipsychotics.²⁰

Stimulants

This class of drugs is used to treat a variety of conditions, including hyperactivity. In a small study of attention deficit hyperactivity disorder (ADHD) subjects, they self-reported higher rates of crashes and citations, performed worse than non-ADHD subjects on the simulator, but they improved when taking Ritalin.²¹ Another study found increased crash rates in ADHD patients, with medications reducing the crash risk.

Somniacs

Medications for sleep also have the potential to interfere with driving. Zopiclone (the stereoisomer eszopiclone (Lunesta)) is marketed in the US and was found to impair driving manifold over zaleplon.²² Another study found residual effects at eight-12 hours with zopiclone, but not with zolpidem or midazolam.²³ In a 2011 survey of drivers over 65, 22-27% of men took sleep medications, as did 33-35% of women. The use of pain medications was reported by 50-58% of men and 59-71% of women. However, the vast majority of respondents reported taking multiple medications, leading to

the potential for drug potentiation and interaction.⁵

Antihistamines

This class of drugs also impairs driving performance. This has been demonstrated in multiple studies, with one finding diphenhydramine more impairing than alcohol.²⁴ Only third-generation antihistamines, fexofenadine and levocetirizine, did not impair performance.²⁵

Hypoglycemics

With the increasing rates of diabetes, hypoglycemics are currently the sixth most commonly prescribed class of drugs. Type 1 diabetics are at highest risk of driving impairment due to hypoglycemia.^{26,27} Hypoglycemia can impair cognitive and motor skills, and diabetics should be cautioned to check their sugar before driving, as well as periodically on long trips.²⁸ While hypoglycemia is especially a risk during medication adjustments, it can occur at any time with changes in food intake, activity, or acute illnesses. Diabetic drugs have many interactions with other medication that can potentiate their hypoglycemic effects. In addition, diabetic patients are at risk of eye diseases, including retinopathy, cataracts, and glaucoma, with the potential to affect vision and driving safety.

Chemotherapy

Chemotherapeutics can also impair driving skills due to side effects that include nausea, confusion, drowsiness, poor muscle tone, and dehydration, with associated hypotension and syncope. The frailness alone associated with cancer and chemotherapy (and other treatments) alone reduces driving skill and increases crash risk. Individuals under acute care for cancer should be advised to find alternative transportation when the chemotherapy is associated with these common side effects.

Narcotic analgesics

Prescription narcotics, especially but not exclusively in the acute setting, are associated with impaired judgment, confusion, drowsiness, and nausea,

Table 1: Side Effects of Prescription Medications with the Potential to Impair Driving

	Drowsiness	Confusion, poor judgment	Syncope, hypotension	Hypoglycemia	Poor muscle tone, incoordination	Other side effects	Offending agents	Recommended alternatives
Anticonvulsants	X	X			X	Double vision, neuropathy, nausea, ataxia	class effect	
Antidepressants	X		X				tricyclics, trazodone, mirtazapine, MAOIs	SSRIs, SNRIs, bupropion
Antiemetics	X	X	X		X	Blurred vision	promethazine, metoclopramide, prochlorperazine, chlorpromazine	ondansetron
Antihistamines	X					Blurred vision, hyperkinesia	diphenhydramine, chlorpheniramine, hydroxyzine, dimenhydrinate, meclizine	loratadine, cetirizine, fexofenadine
Anticholinergics	X	X					atropine/diphenoxylate, benztropine, oxybutynin, trihexyphenidyl, dicyclomine, belladonna alkaloids	
Antihypertensive			X				b blockers, calcium channel blockers, clonidine	ACEIs, ARBs, thiazide
Antiparkinsonians	X	X	X		X	Dizziness, nausea, headache	trihexyphenidyl, benztropine, selegiline, rasagiline, ropinirole, pramipexole, rotigotine	entacapone, tolcapone, amantadine
Antipsychotics	X	X	X		X	Tremors, nausea	class effect	
Anxiolytics	X	X			X	Memory impairment	benzodiazepines, buspirone	
Chemotherapy	x	x			x	Nausea, weakness	class effect	
Muscle relaxants	X	X			X	Dizziness, nausea	class effect	
Narcotic analgesics	X	X			X	Nausea	class effect	
Stimulants		X				Emotional lability, tremors	amphetamine, methylphenidate	
Antidiabetics				X		Nausea	insulin, sulfonylurea, glinides (repaglinide, nateglinide), exenatide, liraglutide	metformin, gliptins (sitagliptin, saxagliptin, linagliptin), TZDs (pioglitazone, rosiglitazone)
α1 antagonist			X				prazosin, terazosin, doxazosin	tamsulosin, silodosin
PDE-5 inhibitors			X				class effect	
Marijuana	X	X			X		marijuana, dronabinol	

all with the potential to impair driving safety. Individuals with these side effects are at risk of being charged with driving under the influence if stopped by law enforcement, even if they have prescriptions for these drugs. Driving should be stopped when

narcotics are first prescribed, and only resumed once the level of impairment is felt to be low enough not to interfere with safe driving. A large epidemiologic analysis found the crash rate in people taking narcotic analgesics increased by 1.7-2.4.²⁹ A recent analysis of fatal

crashes found an association between opiates and crashes in middle-aged but not older adults.³⁰

Alcohol

The effect of alcohol on driving safety is profound, due to both the

level of impairment and the high prevalence of use. Alcohol is estimated to be implicated in 60% of traffic fatalities, a greater influence than any other substance. Alcohol further impairs driving in persons taking many pharmaceuticals.¹⁸ While it is beyond the scope of practice of most pharmacists to counsel on isolated alcohol use, discussion of the accentuating effects of alcohol is appropriate.

Reporting and Support Systems

California is one of nine states requiring physician-mandated reporting to the Department of Health Services (DHS) for lapses of consciousness³¹ associated with an underlying condition. Lapses include loss of consciousness, dementia, seizures, or other conditions, including medication side effects that cause a reduction in alertness. Pharmacists are not mandated reporters; however, any healthcare professional or citizen can report concerns to the DMV.³² DMV websites provide forms online for reporting.

Pharmacists can help patients manage their medications and drug interactions by guiding them to online databases or paper systems, such as AAA's Roadwise program, Consumer Reports' My Medication Tracker app, ConsumerMedSafety.org, and SafeMedication.com.

Conclusions

Pharmacists should discuss possible drug interactions and side effects with all patients on one or more prescription medications. A counseling checklist is provided in Figure 1. Patients should be educated about the medications they are taking and whether these medications, in conjunction with their condition and OTC medications, can impair driving ability.

Resources for further information on the topic of medication, medical conditions, and driving include:

- Roadwise Rx: <http://www.roadwiserx.com/>, sponsored by AAA.
- The National Highway Traffic Safety Administration Report DOT HS 809 725, 2004.
- Medical Conditions and Driving: A Review of the Scientific Literature: DOT HS 809 690, 2005.

- www.treds.ucsd.edu
- Understanding Older Drivers: An Examination of Medical Conditions, Behaviors, Medication Use and Travel Behavior, AAA Foundation for Traffic Safety
- <https://www.aaafoundation.org/sites/default/files/Medication%20and%20Travel%20Behaviors%20--%20FINAL%20FTS%20FORMAT%20copy.pdf>
- Consumer Reports: <http://consumerist.com/2009/09/10/keep-track-of-your-prescriptions-with-this-free-app/>

About the Author

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References

1. Ray WA, Thapa PB, Shorr RI. "Medications and the Older Driver." *Clinics in Geriatric Medicine*. 1993; 9(2):413-438.
2. LeRoy AA, Morse LM. "Multiple Medications and Vehicle Crashes: Analysis of Databases." U.S. Department of Transportation, National Highway Traffic Safety Administration. May 2008. DOT HS 810 858.
3. Monárrez-Espino J, Laflamme L, Elling B, Möller J. "Number of Medications and Road Traffic Crashes in Senior Swedish Drivers: A Population-Based Matched Case-Control Study." *Injury Prevention*. 2013; 20(2):81-87. International Pharmaceutical Federation. FIP Guidelines: "The Supply of Medicines Affecting Driving Performance." 2014;1-4.
4. AAA Foundation. Understanding Older Drivers: An Examination of Medical Conditions,

Medication Use, and Travel Behavior. 2014. Available at <https://www.aaafoundation.org/sites/default/files/Medication%20and%20Travel%20Behaviors%20%20FINAL%20FTS%20FORMAT%20copy.pdf>

5. AAA Foundation for Older Driver Safety. "Senior Driving Survey." Senior Driving Omnibus. December 2011. <http://newsroom.aaa.com/wp-content/uploads/2012/09/AAA-Senior-Driver-Survey-Report.pdf>
6. Baker DW, Gazmararian JA, Sudano J, Patterson M. "The Association Between Age and Health Literacy Among Elderly Persons." *Journal of Gerontology: Social Sciences*. 2000; 55B(6):S368-S374.
7. Gastaut H, Zifkin BG. "The Risk of Automobile Accidents With Seizures Occurring While Driving: Relation to Seizure Type." *Neurology*. 1987; 37:1613-1616.
8. Taylor J, Chadwick C, Johnson T. "Risks of Accidents in Drivers With Epilepsy." *Journal of Neurology, Neurosurgery, and Psychiatry*. 1996; 60:621-627.
9. Krauss GK, Krumholz A, Carter RC, Kaplan P. "Risk Factors for Seizure-Related Motor Vehicle Crashes in Patients With Epilepsy." *Neurology*. 1999; 52:1324-1329.
10. Berg AT, Vickerey BG, Sperling MR et al. "Driving in Adults With Refractory Localization-Related Epilepsy. Multi-Center Study of Epilepsy Surgery." *Neurology*. 2000; 54:625-630.
11. Sheth SG, Krauss G, Krumholz A, Li G. "Mortality in Epilepsy: Driving Fatalities vs. Other Causes of Death in Patients With Epilepsy." *Neurology*. 2004; 63:1002-1007.
12. Beran RG, Gerber P, Devereux JA. "Usefulness of Austroads' Fitness-To-Drive Guidelines: Lessons From the Gillett Case." *Medical Journal of Australia*. 2009; 190:503-505.
13. Lossius R, Kinge E, Nakken K. "Epilepsy and Driving: Considerations on How Eligibility Should Be Decided." *Acta Neurologica Scandinavica*. 2010;122:67-71.
14. IMS Institute for Healthcare Informatics. "The Use of Medicines in the United States: Review of 2010." 2011:1-36.
15. McGwin G, Sims R, Pulley L, Roseman J. "Relations Among Chronic Medical Conditions, Medications, and Automobile Crashes in the Elderly: A Population-based Case-Control Study." *American Journal of Epidemiology*. 2000; 152(5): 424-431.
16. Leveille SG, Büchner DM, Koepsell TD, McCloskey LM, Wolf ME, Wagner EH. "Psychoactive Medications and Injurious

Figure 1. Counseling Checklist

	Yes	No	Provide driving counseling as follows:			
			Provide health education about side effects both verbally and in writing.	Advise against driving until side effects are known and manageable, especially when starting medications.	Counsel diabetics to check their sugar before driving and during long trips.	Report lapses of consciousness or other driving concerns to the Department of Motor Vehicles
The patient is on a medication with side effects that impair driving.			X	X		
The patient is on two drugs that may interact to impair driving.			X	X		
The patient is on medication where alcohol may potentiate the side effects.			"Avoid alcohol"			
The patient is over 65 years old.			X	X		
The patient reports a recent seizure or lapse of consciousness.						X
The patient has diabetes.					X	

Motor Vehicle Collisions Involving Older Drivers." *Epidemiology*. 1994; 5(6):591-98.

- Dassanayake T, Michie P, Carter G, Jones A. "Effects of Benzodiazepines, Antidepressants and Opioids on Driving." *Drug Safety*. 2011;34(2):125-156.
- Dubois S, Bédard M, Weaver B. "The Impact of Benzodiazepines on Safe Driving." *Traffic Injury Prevention*. 2008; 9(5):404-413.
- Brunnauer A, Laux G, Geiger E, Möller HJ. "The Impact of Antipsychotics on Psychomotor Performance With Regards to Car Driving Skills." *Journal of Clinical Psychopharmacology*. 2004;24(2):155-160.
- Cox DJ, Merkel LR, Kovatchev B, Seward R. "Effect of Stimulant Medication on Driving Performance of Young Adults with Attention-Deficit Hyperactivity Disorder: A Preliminary Double-Blind Placebo Controlled Trial." *Journal of Nervous & Mental Disease*. 2000;188(4):230-234.
- Menzin J, Lang K, Levy P, Levy E. "A General Model of the Effects of Sleep Medications on the Risk and Cost of Motor Vehicle Accidents and its Application to France." *Pharmacoeconomics*. 2001;19(1):69-78.
- Leufkens T, Ramaeijers J, de Weerd A, Riedel W, Vermeeren A. "On-the-road driving performance and driving-related skills in older untreated insomnia patients and chronic users of hypnotics." *Psychopharmacology*. 2014;231(14):2851-65.
- Weiler J, Bloomfield J, Woodworth G et al. "Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa Driving Simulator." *Annals of Internal Medicine*. 2000;132(5):354-63.
- Verster J, Volkerts E. "Antihistamines and Driving Ability: Evidence From On-The-Road Driving Studies During Normal Traffic." *Annals of Allergy, Asthma, Immunology*. 2004;92:294-304.
- Cox DJ, Penberthy JK, Zrebiec J, et al. "Diabetes and Driving Mishaps: Frequency and Correlations From a Multinational Survey." *Diabetes Care*. 2003;26(8):2329-34.
- Songer TJ, Dorsey RR. "High Risk Characteristics for Motor Vehicle Crashes in Persons With Diabetes By Age." 50th Annual Proceedings: Association for the Advancement of Automotive Medicine. 2006;50:335-351.
- Senra Moniz C, Alves Serra F, Costa Ferreira R, Vasconcelos C, Machado Saraiva A. "Diabetes and Driving: Evidence and Recommendations." *Acta Médica Portuguesa*. 2013;26(4):428-32.
- Engeland A, Skurtveit S, Mørland J. "Risk of Road Traffic Accidents Associated With the Prescription of Drugs: A Registry-Based Cohort Study." *Annals of Epidemiology*. 2007;17(8):597-602.
- Dubois S Bédard M, Weaver B. "The Association Between Opioid Analgesics and Unsafe Driving Actions Preceding Fatal Crashes." *Accident Analysis and Prevention*. 2010;42(1):30-7.
- Hill L. "Mandated Disease Reporting Requirements: A Roadmap." *San Diego Physician Org*. 2011:18-19.
- California Department of Motor Vehicles. "Driver safety information lapses of consciousness disorders." Accessed: January 2015. <https://www.dmv.ca.gov/portal/dmv/detail/dl/driversafety/lapes>

CONTINUING EDUCATION QUIZ

Driving Under the Influence: Counseling on the Effects of Prescription Drugs on Driving Performance

1. **Motor Vehicle accidents are the leading cause of death in the United States.**
 - a. True
 - b. False:
2. **Pharmacists:**
 - a. Are responsible to educate the public on the effect on driving of only prescription drugs
 - b. Can provide clear guidelines on effects of medications in regards to operation of machinery
 - c. Have no impact on the minimizing the risk of persons driving under the influence through consultation
 - d. All the Above
3. **Potential for impaired driving due to medication only occurs with older adults since they take more medication.**
 - a. True
 - b. False:
4. **Antidepressants:**
 - a. Can increase crash risk twofold.
 - b. Are the most frequently prescribed drug which increases crash risks
 - c. Evidence that crash rate is higher in individuals with depression than unaffected individuals
 - d. a and c
 - e. All of the above
5. **The response to anticonvulsant medication varies by individual and may not always be linearly correlated with dosage.**
 - a. True
 - b. False:
6. **AAA found that:**
 - a. Only about half of the drivers on medications talked to a health profession about the effects of their medication on their ability to drive
 - b. Increased age, low education and widowhood was associated with less awareness of the effect of medication on the ability to drive
 - c. Medical professionals are generally unaware of medicine's effects on driving and reluctant to discuss them with their patients.
 - d. All of the Above
 - e.
7. **Benzodiazepines:**
 - a. Interfere with muscle tone and relax the driver to help with coordination
 - b. 5 mg of Valium is equivalent to a blood alcohol level of 0.10%
 - c. Can increase crash risk 60%
 - d. Increase crash risk only in those 65 years and older
8. **Hypoglycemics:**
 - a. Type 1 diabetics are at highest risk of driving impairment due to hyperglycemia
 - b. Hypoglycemia can impair cognitive and motor skills
 - c. Diabetic drugs seldom interact with other drugs, so there is no worry about additive effects
 - d. Eye diseases associated with diabetes does not affect driving safety
 - e. All of the above
9. **Alcohol:**
 - a. Is the number one substance implicated in traffic fatalities
 - b. Alcohol further impairs driving in persons taking prescription medication
 - c. Pharmacist should include in their consultation the accentuating effects of alcohol
 - d. All of the above
10. **Pharmacist should educate patients about the impact of their medication on their ability to drive.**
 - a. True
 - b. False:



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