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State Variation in Opioid and Benzodiazepine Prescriptions between Independent and Non-Independent APRN Prescribing States

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Abstract

Background—Many people lack access to primary care services in the U.S. One possible solution is to increase utilization of advanced practice registered nurses (APRN). A common patient safety concern about independent prescribing by APRNs is that prescribers will increase prescriptions for medications with abuse/dependence potential, such as opioids or benzodiazepines.

Purpose—To investigate the relationship in opioid and benzodiazepine prescribing rates between independent versus non-independent APRN prescribing states.

Methods—Tertiary analysis of a CDC study reporting state variation in prescribing rates of opioids and benzodiazepines using 2012 IMS Health retail prescription data representing 259,000,000 prescriptions. Analyses were performed using different definitions for independent states: 1) states allowing at least one APRN type independent prescribing, 2) states allowing all APRN types independent prescribing. ANOVA tests were used to test for differences in mean number of opioid and benzodiazepine prescribing rates/100 residents. ANCOVA tests were employed controlling for state characteristics previously determined to affect controlled substance prescribing rates (e.g., Medicare rates, race, SES, number of physicians/capita).

Results/Discussion—There were significantly higher opioid and benzodiazepine prescriptions in states with non-independent APRN prescribing laws than in states with independent APRN prescribing laws, and no significant differences in long-acting opioids or high-dose opioids. This study found no evidence to support the argument that independent prescribing increases prescriptions with abuse potential.

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Conclusion—Independent prescriptive authority, only one piece of APRN practice, has been one of the most controversial issues, but one with great potential to help ease access to U.S. healthcare problems. Empirical evidence demonstrating the safety of this practice can help promote this potential.

Keywords

advanced practice registered nurses; physicians; opioids; prescriptive authority; benzodiazepines

Introduction

The United States has an access to healthcare problem, particularly in primary care (Davis, Stremikis, Shoen, & Squires, 2014). Patients in the U.S. are more likely to have difficulties obtaining a primary care appointment than patients in other industrialized countries. These difficulties are expected to worsen due to population growth, an increasing number of insured patients under the Affordable Care Act (ACA), an aging population, and a shortage of primary care physicians (Health Resources and Services Administration [HRSA], 2013). One possible solution is to increase utilization of advanced practice registered nurses (APRN), however, many barriers prevent implementation of this solution (Auberbach, et al., 2013; Institute of Medicine [IOM], 2011; National Governors' Association [NGA], 2012).

State-based regulations restricting practice, specifically for prescribing medication, are one of the most frequently cited barriers to full utilization of APRNs in primary care (IOM, 2011; National Council of State Boards of Nursing [NCSBN], 2012; Safriet, 2011). Great variation exists in APRN prescriptive authority across states, with 16 states allowing fully independent APRN prescribing for all four APRN types: certified nurse midwives (CNM), certified nurse practitioners (CNP), certified nurse specialists (CNS), and certified registered nurse anesthetists (CRNAs) (NCSBN, 2015). Others restrict what type of medications may be prescribed, or impose physician supervision or collaboration requirements on prescribing authority on one or all of the APRN types. Many states are taking measures to reduce these barriers, with a record number of bills introduced in 2014 to reduce APRN practice restrictions (NCSBN, 2015). Common arguments against independent APRN prescribing involve the differences in education length between physicians and APRNs and concerns about patient safety (Nuzzo, 1998; Phillips, Harper, Wakefield, Green, & Fryer, 2002).

One commonly expressed patient safety concern is that independent APRN prescribing practices will increase the numbers of prescriptions for medications with abuse/dependence potential, such as opioids or benzodiazepines. One possibility is that increased prescriptions for opioids or benzodiazepines will exacerbate problems, such as increased overdoses or the resurgence of *pill mills* (Florida Medical Association [FMA], 2014). Deaths from drug overdoses are a leading cause of death in the United States (Centers for Disease Control and Prevention [CDC], 2015). Prescription medications, mostly opioids, are a major source of these deaths. Pill mills, or medical facilities that unlawfully prescribe and dispense controlled substances outside of sanctioned medical practices, have been implicated as a significant source of abused opioids (CDC, 2011). States have been aggressively undertaking actions to restrict these facilities. Reductions in the numbers of these facilities

have resulted from implementing Prescription Drug Monitoring Programs (PDMP) along with other policy changes. Although abuse of prescription medication is a serious problem, there is no empirical evidence that links independent APRN prescribing with higher rates of opioid or benzodiazepine prescriptions.

The purpose of the current study was to investigate the relationship between APRN prescribing status (non-independent versus independent) and opioid and benzodiazepine prescribing rates in the U.S. Specifically, we examined whether state-based regulations allowing for independent APRN controlled substance prescribing increase the amount of opioid and benzodiazepine prescriptions written in that state? Follow-up analyses were planned to examine if any differences remained after controlling for characteristics of states that might be related to prescribing rates, e.g., the number of practicing physicians in a geographic area (Paulozzi, Mack & Hockenberry, 2014), ethnicity (McDonald, Carlson, & Izreal, 2012; Olsen, Daumit, & Ford, 2006), Medicaid and Medicare rates (Olsen, et al., 2006; Luo, Pietrobon, & Hey, 2004), and socioeconomic status (McDonald, et al., 2012; Luo, et al., 2004).

Methods

Prescription Rate

The number of prescriptions per 100 people in 50 U.S. states and the District of Columbia (D.C.) was described in a recent CDC study (Paulozzi, et al., 2014), using the IMS Health Incorporated's National Prescription Audit (NPA), recognized as the world's largest health care data source (IMS Health, 2015). The data represents 258.9 million prescriptions written in 2012 (the most recent data available) from 57,000 retail pharmacies (Paulozzi, et al., 2014). Retail pharmacies account for about 90% of all opioids dispensed (McDonald, et al., 2012). Four categories were used: total opioids, long-acting opioids, benzodiazepines, and high-dose opioids. Long-acting (or extended release) opioids are those that should be taken only 2 to 3 times a day, such as methadone, OxyContin, and Opana ER. High-dose opioids are defined as the highest formulations available (e.g., total daily dosage of 100 morphine mg equivalents when taken at the usual frequency of 4–6 hours) (Paulozzi, et al, 2014).

Scope of Prescriptive Practice

A state is defined as independent if no restrictions are placed upon prescribing ability outside of length of time from APRN-licensed status to granting of prescribing authority (i.e. some states require a specified number of practice hours before an APRN can apply for unrestricted prescriptive authority). A state is considered non-independent, which is sometimes called reduced or restricted, if there are any restrictions to an APRN prescribing certain medications, or supervision/collaboration requirements by another profession (NCSBN, 2012). For the initial analysis, independent scope of prescriptive practice is defined as states with *any* APRN (i.e., nurse practitioner, nurse midwife, nurse anesthetist, or clinical nurse specialist) with no legal restrictions (see Table 1). In a follow-up analysis, a more restricted definition of independent states as those where *all* types of APRN have no legal restrictions was used.

Socioeconomic Status (SES)

Income per capita in \$1000 increments from each state and D.C. was taken from online estimates for 2012 from the U.S. Department of Commerce, Bureau of Economic Analysis, <https://bber.unm.edu/econ/us-pci.htm> (United States Department of Commerce Bureau of Economic Analysis, 2012).

Ethnicity

Ethnicity in each state and D.C. was assessed using the proportion of White, non-Hispanic residents in the state in 2012 as estimated by the U.S Census Bureau (Bureau of Business & Economic Research, 2013).

Medicare Beneficiaries

Number of Medicare beneficiaries as a percentage of the population from 2012 was taken from a state health facts report prepared by The Henry J. Kaiser Family Foundation <http://kff.org/medicare/state-indicator/total-medicare-beneficiaries/> using CMS data (The Henry J. Kaiser Family Foundation [KFF], 2012a).

Medicaid Enrollees

Monthly (December 2012) Medicaid enrollment of adults (in 1000s) was taken from a state health facts report prepared by The Henry J. Kaiser Family Foundation <http://kff.org/medicaid/state-indicator/monthly-medicare-enrollment-in-thousands/> compiled by Health Management Associates from state Medicaid enrollment reports (KFF, 2012b).

Number of Providers

The number of active licensed physicians (scaled per 1 million residents) in 2012 was taken from a state health facts report prepared by The Henry J. Kaiser Family Foundation <http://kff.org/other/state-indicator/total-active-physicians/>, (KFF, 2012c). The number of nurse practitioners in 2011 (the most recent data available) with active licenses (scaled per 100,000 residents) was also obtained from a state health facts report prepared by The Henry J. Kaiser Family Foundation <http://kff.org/other/state-indicator/total-nurse-practitioners/>. Both data sets were prepared from a data request from Redi-Data, Inc. (KFF, 2011).

Analysis

The relationship between state prescriptive authority and number of prescriptions was tested using four separate ANOVA tests for different classifications of prescriptions: opioids, long-acting opioids, high-dose opioids, and benzodiazepines. A state was considered independent if it allowed at least one APRN type independent prescribing rights. Next, ANCOVA controlled for state characteristics previously linked with rates of opioid and/or benzodiazepine prescribing: SES, ethnicity, Medicare and Medicaid populations, and number of physicians in a geographic area. In follow-up analyses, a state was considered to have independent status only if all types of APRN had no restrictions on prescribing practice. Similar ANOVA and ANCOVA procedures were followed as previously described.

Findings

States with independent practice ($M = 76.82$, $SD = 9.79$) had significantly lower opioid prescriptions than states with non-independent practice ($M = 94.14$, $SD = 25.60$), $F(1, 49) = 8.32$, $p = .006$. There was a significant difference in long-acting opioid prescriptions between states with independent practice ($M = 13.39$, $SD = 4.36$) and non-independent practice ($M = 11.05$, $SD = 3.25$), $F(1, 49) = 4.83$, $p = .097$. There was no difference in high-dose opioids between states with independent practice ($M = 4.39$, $SD = 1.55$) and non-independent practice ($M = 4.59$, $SD = 1.66$), $F(1, 49) = 0.19$, $p = .662$. States with independent practice ($M = 34.49$, $SD = 9.22$) had significantly lower benzodiazepine prescriptions than states with non-independent practice ($M = 42.34$, $SD = 11.29$), $F(1, 49) = 6.76$, $p = .012$. Figure 1 shows the mean number of prescriptions in states with independent versus non-independent prescribing practice.

Next, ANCOVA was used to control for characteristics of states that have been previously linked with rates of opioid prescribing. Table 2 shows the full results of all ANCOVA with the four types of prescription medications tested. Differences between states with independent or non-independent opioid prescribing, $F(1, 43) = 14.78$, $p < .001$, and benzodiazepine prescribing, $F(1, 43) = 10.82$, $p = .002$, remained statistically significant, after controlling for all of the state characteristics. SES was related to opioid prescriptions, $F(1, 43) = 16.33$, $p < .001$. After controlling for state characteristics, the difference in long-acting opioids was no longer significant, $F(1, 43) = 3.30$, $p = .076$. The number of Medicare beneficiaries was significantly related to the number of long-acting opioids, $F(1, 43) = 8.18$, $p = .007$, high-dose opioids, $F(1, 43) = 4.46$, $p = .040$, and benzodiazepines, $F(1, 43) = 14.73$, $p < .001$.

In the follow-up analyses, states with independent prescribing practice of *all* APRN types ($M = 75.06$, $SD = 10.79$) had significantly lower opioid prescriptions than states with non-independent practice ($M = 90.72$, $SD = 23.67$), $F(1, 49) = 4.50$, $p = .039$. There was no difference in long-acting opioid prescriptions between states with independent practice ($M = 11.92$, $SD = 3.95$) and non-independent practice ($M = 11.98$, $SD = 3.89$), $F(1, 49) = 0.00$, $p = .965$. There was no difference in high-dose opioids between states with independent practice ($M = 4.19$, $SD = 1.81$) and non-independent practice ($M = 4.60$, $SD = 1.55$), $F(1, 49) = 0.57$, $p = .456$. States with independent practice ($M = 31.55$, $SD = 6.29$) had significantly lower benzodiazepine prescriptions than states with non-independent practice ($M = 41.38$, $SD = 11.27$), $F(1, 49) = 7.64$, $p = .008$.

There were no changes in the levels of significance, after controlling for state characteristics in follow-up ANCOVA. Differences between states with independent or non-independent practice in opioid prescribing, $F(1, 43) = 13.83$, $p = .001$, and benzodiazepine prescribing, $F(1, 43) = 10.56$, $p = .002$, remained statistically significant, after controlling for all of the state characteristics. The differences between states with independent or non-independent practices in long-acting opioid prescriptions, $F(1, 43) = 0.05$, $p = .823$, and high-dose opioid prescriptions, $F(1, 43) = 0.04$, $p = .851$, remained non-significant.

Discussion

Significantly less opioid and benzodiazepine prescriptions are written in independent versus non-independent prescribing states. These differences remained significant after controlling for a number of state characteristics, such as number of physicians/1,000,000 population (McDonald et al., 2012; Webster, Cifuentes, Verma, & Pransky, 2009), race or ethnicity (McDonald, et al., 2012; Olsen, et al., 2006), Medicaid and Medicare rates (Olsen, et al., 2006; Luo, et al., 2004) and SES status (McDonald, et al., 2012; Luo, et al., 2004) that have been empirically or theoretically linked to controlled-substance prescribing rates. After controlling for state characteristics, in particular the number of Medicare beneficiaries, there was the difference in the number of long-acting opioids was no longer statistically significant. That is, the higher number of long-acting opioid prescriptions found in the initial analysis was likely due to differences in Medicare beneficiaries in those states. No differences were found in high-dose opioid prescribing rates among the states.

Follow-up tests were conducted with a different operational definition of independent prescribing practice to investigate whether differences in levels of prescriptions would be apparent with a stricter definition of a state with independent practice. The patterns of statistical significance were consistent, regardless of which definition of a state with independent practice was used. The first definition was a state with independent practice being defined as having any one of four types of APRN with no legal restrictions on prescribing. The second definition of a state with independent practice was having all of four types of APRN without legal restrictions. The operational definition in the follow-up analyses was chosen to examine whether increased opioid prescriptions would occur only if multiple types of APRN were prescribing legally in state. The results provided no evidence to support that proposition.

An international systematic review in 2014 investigated differences in physician and nurse prescribing and found comparable ways of prescribing, and similar or better health, perceived quality, and patient satisfaction with nurses (Gielen, Dekker, Francke, Mistiaen, & Kroezen, 2014). The current study adds to the body of knowledge by examining prescriptions rates for controlled substances, which were not considered in any studies reviewed by Gielen and colleagues. The findings of this study are consistent with those of a study in a community mental health setting, where APRNs were less likely than physicians to prescribe benzodiazepines (Fisher & Vaughan-Cole, 2003), and a second study that found APRNs less likely to prescribe opioids in chronic pain management (Upshur, Luchmann, & Savageau, 2006).

Several studies have cited geographic location as being a predictor of opioid prescribing, with Appalachian (McDonald, et al., 2012), southern (Paulozzi, et al., 2014; McDonald, et al., 2012; Olsen, et al., 2006; Webster, et al., 2009), and western (McDonald, et al., 2012; Olsen, et al., 2006) states having higher prescribing rates. The current study used a more fine-grained approach, examining characteristics of individual states, not geographic area. In Figure 2, visual inspection showed that states with independent APRN prescribing practices are predominantly located in, the Pacific Northwest, southwest, and northeast locations, and appeared unconnected to areas of noted high or low opioid prescribing. The only state

characteristic that was associated with opioid prescriptions was SES, defined here as per capita income in the state. It is plausible that geographic differences are explained by SES in the states. These results suggest that research examining geographic differences in prescribing rates should account for SES.

The number of Medicare beneficiaries was linked to the number of long-acting opioid, high-dose opioid, and benzodiazepine prescriptions. The Medicare population is primarily elderly (83%), and disabled (16%), (KFF, 2015). These two groups are patients who typically have a higher incidence of chronic pain, possibly due to cancer, and would be expected to have a greater number of opioid prescriptions (Morden, et al., 2014; Volkow, McLellan, Cotto, Karithanom, & Weiss, 2011; American Geriatrics Society, 2009). The authors recommend that future studies investigate the link between Medicare and numbers of prescriptions to explain this relationship more completely.

It has been posited that allowing for independent controlled substance prescribing for APRNs will lead to dangerous outcomes such as the reemergence of pill mills (FMA, 2014). This study found no evidence to support this claim. In fact, states with independent APRN prescribing laws prescribed significantly fewer opioid and benzodiazepines, the two classes of medications responsible for a significant portion of non-medical prescription use, abuse, overdose, and death (CDC, 2015). Parallel trends have been found between opioid prescribing rates and opioid overdose deaths, so it is plausible that these independent states experience less opioid-related deaths. Future research should examine whether higher levels of prescriptions are related to adverse outcomes, including deaths related to prescription medications, and whether independent prescriptive authority of advanced practice nurses is related to these adverse outcomes.

Several possible explanations exist for the difference in prescribing rates between independent and non-independent states. It has been suggested that APRN training is more holistic, wellness-focused and less disease-oriented and cure-focused (Moody, Smith, & Glenn, 1999), so nurses may be more likely to incorporate non-opioid pharmacologic and non-pharmacologic treatment modalities to treat pain (D'Arcy, 2009). There is evidence from previous research that advanced practice nurses were less likely than physicians to recommend or prescribe medications (Avorn, Everitt, & Baker, 1991). Moreover, upon initiation of independent prescribing status, many states instituted mandatory pharmacology or controlled substance education before an APRN could attain prescribing privileges, and continuing education to maintain the privilege (Oregon State Board of Nursing, 2015; State of Rhode Island and Providence Plantations Department of Health, 2012), which could also impact APRN prescribing. This requirement is not always required of physician-prescriber counterparts.

Another plausible explanation is that pain is undertreated in patients of APRNs. McDonald and colleagues, in their description of county-level variation in opioid prescribing rates, cautioned that "...low treatment rates may indicate undertreatment," and "...high rates may indicate overprescribing." (p 988). The possibility that patients who need opioid and benzodiazepine treatment are not receiving it in independent prescribing states must be entertained, and one study reviewing APRN versus physician opioid prescribing after state

dosing guidelines were instituted found APRNs were twice as likely to have stopped prescribing them overall (Franklin, Fulton-Kehoe, Turner, Sullivan, & Wickizer, 2013). The data evidencing high levels of patient satisfaction with APRN care, even as compared to physician care, seems to render this possibility unlikely for the majority of patients (Newhouse, et al., 2011). The authors recommend further investigation of pain and prescribing to understand these possibilities on a patient-level.

Limitations

This study has several limitations which must be taken into account. The data reviewed was limited to retail pharmacy opioid and benzodiazepine prescriptions, and does not account for medications dispensed from pain clinics or other sources of opioid and benzodiazepine medications. Additionally, the data is aggregated by state in which the medication is filled, and cannot account for prescriptions obtained by individuals outside of their home state, nor account for variations in opioid prescribing within states, e.g., at the county level. Patient acuity and diagnosis or condition data is not accounted for. Although a significant relationship was identified between state APRN prescribing laws and opioid and benzodiazepine prescription rates, a causal relationship cannot be established with the cross-sectional data used in this study.

Conclusion

The fact that opioid and benzodiazepine prescribing rates are significantly lower in independent APRN states, even after controlling for state characteristics, provides empirical evidence that states with independent APRN prescribing are not linked to greater prescribing rates of these commonly abused medications. These findings show it is not likely that APRN prescribing authority is linked to pill mill activities in a state through this mechanism. These results hold whether states with independent practice are defined as those that permit any single type of APRN independent prescriptive authority, or those that allow all four types of APRN independent prescriptive powers. Prescriptive authority, although only one piece of APRN practice, has been one of the most controversial legal issues, but one with great potential to help ease access to healthcare problems the United States is currently facing.

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Bibliography

- American Geriatrics Society Panel on the Pharmacological Management of Pain in Older Persons. Pharmacological management of persistent pain in older person. *Journal of the American Geriatrics Society*. 2009; 57:1331–1346. <http://dx.doi.org/10.1111/j.15325415.2009.02376.x>. [PubMed: 19573219]
- Auerbach DI, Chen PG, Friedberg MW, Reid R, Lau C, Buerhaus PI, Mehrotra A. Nurse-managed health centers and patient-centered medical homes could mitigate expected primary care physician

shortages. *Health Affairs (Millwood)*. 2013; 11:1933–1941. <http://dx.doi.org/10.1377/hlthaff.2013.0596>.

Avorn J, Everitt DE, Baker MW. The neglected medical history and therapeutic choices for abdominal pain: A nationwide study of 799 physicians and nurses. *Archives of Internal Medicine*. 1991; 151:694–698. <http://dx.doi.org/10.1001/archinte.151.4.694>. [PubMed: 2012450]

Bureau of Business & Economic Research. Per capita personal income by state, 1990–2012. 2015 Jun 1. Retrieved from <https://bber.unm.edu/econ/us-pci.htm>.

Centers for Disease Control and Prevention [CDC]. [Retrieved June 1, 2015] Prescription drug overdose in the United States: Fact Sheet. 2015 Mar 2. from <http://www.cdc.gov/homeandrecationalsafety/overdose/facts.html>

Centers for Disease Control and Prevention [CDC]. [Retrieved June 1, 2015] Overdoses of Prescription Opioid Pain Relievers, United States, 1999–2008. 2011 Nov 4. from CDC Vital Signs website <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6043a4.htm>

Centers for Disease Control and Prevention [CDC]. [Retrieved May 20, 2015] Prescription painkiller overdoses in the US. 2011 Nov. from CDC Vital Signs website <http://www.cdc.gov/VitalSigns/PainkillerOverdoses/index.html>

D'Arcy Y. Be in the know about pain management. *The Nurse Practitioner*. 2009; 34(4):43–47. <http://dx.doi.org/01.npr.0000348322.40151.2f>. [PubMed: 20075803]

Davis K, Stremikis K, Shoen C, Squires D. Mirror, mirror on the wall: How the US health care system compares internationally. *The Commonwealth Fund*. 2014 Jun. from <http://www.commonwealthfund.org/publications/fund-reports/2014/jun/mirror-mirror>.

Fisher SE, Vaughan-Cole B. Similarities and differences in clients treated and in medications prescribed by APRNs and psychiatrists in CMHC. *Archives of Psychiatric Nursing*. 2003; 17(3): 101–107. [http://dx.doi.org/10.1016/s0883-9417\(03\)00053-0](http://dx.doi.org/10.1016/s0883-9417(03)00053-0). [PubMed: 12840802]

Florida Medical Association [FMA]. Oppose scope of practice expansion fact sheet. 2014 from www.ircms.org/ARNP_Ind_Practice_with_Logos_FINAL.pdf.

Franklin GM, Fulton-Kehoe D, Turner JA, Sullivan MD, Wickizer TM. Changes in opioid prescribing for chronic pain in Washington state. *Journal of the American Board of Family Medicine*. 2013; 26(4):394–400. <http://dx.doi.org/10.3122/jabfm.2013.04.120274>. [PubMed: 23833154]

Gielen SC, Dekker J, Francke AL, Mistiaen P, Kroezen M. The effects of nurse prescribing: A systematic review. *International Journal of Nursing Studies*. 2014; 51:1048–1061. <http://dx.doi.org/10.5580/11e>. [PubMed: 24398118]

Health Resources and Services Administration Bureau of Health. [Retrieved June 1, 2015] Projecting the supply and demand for primary care practitioners through 2020. 2013. from <http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/primarycare/index.html>

IMS Health. About IMS Health. IMS health. 2015 Mar 21. from <http://www.imshealth.com/portal/site/imshealth/menuitem.051a1939316f851e170417041.ad8c22a/?vgnnextoid=7311e590cb4>.

Institute of Medicine [IOM]. The future of nursing: Leading change, advancing health. Washington, DC: The National Academies Press; 2011. from <http://www.iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx> [Retrieved May 3, 2015]

The Henry J. Kaiser Family Foundation [KFF]. Medicare at a Glance. 2015 from <http://kff.org/medicare/fact-sheet/medicare-at-a-glance-fact-sheet/>.

The Henry J. Kaiser Family Foundation (KFF). State health facts: Total number of Medicare beneficiaries. 2012a from <http://kff.org/medicare/state-indicator/total-medicare-beneficiaries/>.

The Henry J. Kaiser Family Foundation (KFF). State health facts: Monthly Medicaid Enrollment. 2012b from <http://kff.org/medicaid/state-indicator/monthly-medicaid-enrollment-in-thousands/>.

The Henry J. Kaiser Family Foundation (KFF). State health facts: Total professionally Active Physicians. 2012c from <http://kff.org/other/state-indicator/total-active-physicians/>.

The Henry J. Kaiser Family Foundation (KFF). State health facts: Total number of nurse practitioners. 2011 from <http://kff.org/other/state-indicator/total-nurse-practitioners/>.

Luo X, Pietrobon R, Hey L. Patterns and trends in opioid use among individuals with back pain in the United States. *Spine*. 2004; 29(8):884–891. <http://dx.doi.org/10.1097/00007632-200404150-00012>. [PubMed: 15082989]

- McDonald DC, Carlson K, Izrael D. Geographic variation in opioid prescribing in the U.S. *The Journal of Pain*. 2012; 13(10):988–996. <http://dx.doi.org/10.1016/j.jpain.2012.07.007>. [PubMed: 23031398]
- Moody NB, Smith PL, Glenn LL. Client characteristics and practice patterns of nurse practitioners and physicians. *The Nurse Practitioner*. 1999; 24(3):94–103. <http://dx.doi.org/10.1097/00006205-199903000-00007>. [PubMed: 10100243]
- Morden NE, Munson JC, Colla CH, Skinner JS, Bynum JP, Zhou W, Meara E. Prescription opioid use among disabled Medicare beneficiaries: Intensity, trends, and regional variation. *Medical Care*. 2014; 52(9):852–859. <http://dx.doi.org/10.1097/mlr.000000000000183>. [PubMed: 25119955]
- National Council of State Boards of Nursing [NCSBN]. The 2015 regulatory environment: Executive summary. 2015 from www.ncsbn.org.
- National Council of States Boards of Nursing [NCSBN]. APRN maps. 2014 from NCSBN.org.
- National Council of State Boards of Nursing [NCSBN]. APRN Maps. 2012 from NCSBN.org.
- National Governors' Association [NGA]. Washington DC: Government Printing Office; 2012. The role of nurse practitioners in meeting increasing demand for primary care. from <http://www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-health-publications/col2-content/main-content-list/the-role-of-nurse-practitioners.html> [Retrieved May 29, 2015]
- National Institute on Drug Abuse [NIDA]. [Retrieved May 3, 2015] Prescription drug abuse. 2014. from <http://www.drugabuse.gov/publications/research-reports/prescription-drugs/director>
- Newhouse RP, Stanik-Hutt J, White KM, Johantgen M, Bass EB, Zangaro G, Wilson RF, Fountain L, Steinwachs DM, Heindel L, Weiner JP. Advanced practice nurse outcomes 1990–2008: A systematic review. *Nursing Economics*. 2011; 29(5):230–250. from <http://search.proquest.com/docview/898419565?accountid=14585>. [PubMed: 22372080]
- Nuzzo JL. *Food and Drug Law Journal*. 1998; 53(1):35. from <http://heinonline.org/HOL/LandingPage?handle=hein.journals/foodlj53&div=23&id=&p age=>. [PubMed: 11795335]
- Olsen Y, Daumit GL, Ford DE. Opioid prescriptions by U.S. primary care physicians from 1992 to 2001. *The Journal of Pain*. 2006; 4(4):225–235. <http://dx.doi.org/10.1016/j.jpain.2005.11.006>. [PubMed: 16618466]
- Oregon State Board of Nursing. Pain management CE requirement. [Retrieved May 29, 2015] 2015. from http://www.oregon.gov/OSBN/pages/pain_management.aspx
- Paulozzi LJ, Mack KA, Hockenberry JM. Variation among states in prescribing of opioid pain relievers and benzodiazepines—United States, 2012. *Journal of Safety Research*. 2014; 51:125–129. <http://dx.doi.org/10.1016/j.jsr.2014.09.001>. [PubMed: 25453186]
- Phillips RL, Harper DC, Wakefield M, Green LA, Fryer GE. Can nurse practitioners and physicians beat parochialism into plowshares? *Health Affairs*. 2002; 21(5):133–142. <http://dx.doi.org/10.1377/hlthaff.21.5.133>. [PubMed: 12224875]
- Safriet B. Federal options for maximizing the value of advanced practice nurses in providing quality, cost-effective health care [Appendix H of *The Future of Nursing: Leading Change, Advancing Health* (Institute of Medicine, 2011)]. 2011 from <http://www.nap.edu/catalog/12956.html>.
- State of Rhode Island and Providence Plantations Department of Health. Rules and Regulations for the Licensing of Nurses. [Retrieved May 29, 2015] 2012. from <http://sos.ri.gov/documents/archives/regdocs/released/pdf/DOH/6674.pdf>
- Upshur CC, Luchmann RS, Savageau JA. Primary care provider concerns about management of chronic pain in community clinic populations. *Journal of Geriatric Internal Medicine*. 2006; 21:652–655. <http://dx.doi.org/10.1111/j.1525-1497.2006.00412.x>.
- United States Department of Commerce Bureau of Economic Analysis. 2012 from <https://bber.unm.edu/econ/us-pci.htm>.
- Volkow ND, McLellan TA, Cotto JH, Karithanom M, Weiss SR. Characteristics of opioid prescriptions in 2009. (research letter). *JAMA*. 2011; 305(13):1299–1301. <http://dx.doi.org/10.1001/jama.2011.1043>. [PubMed: 21467282]
- Webster BS, Cifuentes M, Verma S, Pransky G. Geographic variation in opioid prescribing for acute, work-related, low back pain and associated factors: A multilevel analysis. *American Journal of*

Industrial Medicine. 2009; 52:162–171. <http://dx.doi.org/10.1002/ajim.20655>. [PubMed: 19016267]

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Highlights

- Advanced Practice Registered Nurses (APRN) have been recommended as a solution to increasing healthcare access, but barriers such as restrictive state prescribing laws exist that limit their use
- Opponents of independent APRN prescribing argue patient safety will be jeopardized because independent APRN prescribing will increase use of medications with abuse potential, i.e., opioids and benzodiazepines.
- This study offers empirical evidence that independent APRN state prescribing laws are not related to greater opioid or benzodiazepine prescriptions
- Providing empirical evidence demonstrating the safety of independent APRN prescribing can help alleviate access to healthcare problems faced by many U.S. residents

Figure 1. Mean Prescriptions per 100 Persons in States with Independent and Non-independent Practice for Advanced Practice Registered Nurses, when at least one APRN type had independent prescribing status. Note. Opioids = Any type of opioid ($p = .011$). LAO = Long-Action Opioids ($p = .097$). HDO = High Dose Opioids ($p = .566$). Benzo = Benzodiazepines ($p = .006$).

Figure 2.
Opioid Prescriptions per 100 Persons in States with Independent and Non-Independent Practice for Advanced Practice Registered Nurses

Table. 1

State Classification of APRN Prescribing Status in 2012

Independent Prescribing States for at least one APRN type	Non-Independent Prescribing States
Alaska, Arizona, Colorado *, Washington D.C. *, Hawaii *, Idaho *, Maine, Massachusetts, Montana *, Nebraska, New Hampshire, New Mexico *, North Dakota *, Oregon, Rhode Island, Utah *, Vermont *, Washington, Wyoming *	Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin

Note.

* indicates all APRN types are recognized as independent prescribers. (NCSBN, 2012)

Table. 2
Results of ANCOVA Controlling for Characteristics of State when at Least One APRN Type is Independent Prescriber

<i>State Characteristic</i>	Opioids		Long-Acting Opioids		High-Dose Opioids		Benzodiazepines	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Socioeconomic								
Status	16.33	<.001	3.7	.061	2.29	.138	1	.324
Ethnicity	0.69	.410	0.21	.652	0.91	.346	0.03	.870
Medicare								
Beneficiaries	3.00	.091	8.18	.007	4.48	.040	14.73	<.001
Medicaid Enrollees	2.57	.116	2.19	.146	1.74	.194	2.19	.146
Physicians	0.14	.715	0.03	.859	0.34	.561	0.23	.633
Nurse Practitioners	0.33	.568	0.9	.349	0.04	.834	1.59	.214
Scope of Practice	14.78	<.001	3.3	.076	0.05	.832	10.82	.002

Note. All tests were 1 *df* using ANCOVA