

The Association of Nurse Practitioner Scope-of-Practice Laws With Emergency Department Use

Evidence From Medicaid Expansion

Benjamin J. McMichael, JD, PhD,* Joanne Spetz, PhD,†
and Peter I. Buerhaus, PhD, RN, FAAN, FAANP(h)‡

Background: Overuse and inappropriate use of emergency departments (EDs) remains an important issue in health policy. After implementation of Medicaid expansion, many states experienced an increase in ED use, but the magnitude varied. Differential access to primary care might explain such variation.

Objective: To determine whether the increase in ED use among Medicaid enrollees following Medicaid expansion was smaller in states that allowed greater access to primary care providers by permitting nurse practitioners (NPs) to practice without physician oversight.

Research Design: Examining data on ED use by Medicaid beneficiaries, we estimated random effects models to examine changes in ED visits. Models for 8 different clinical conditions were estimated, with each model including a linear time trend, indicators for Medicaid expansion and for the absence of physician oversight requirements, and an interaction between these 2 indicators.

Results: States requiring physician oversight of NPs had a 28% increase in ED visits relative to the preexpansion period, while states allowing NP practice without physician oversight had only a 7% increase. The increase in the share of visits covered by Medicaid in no-oversight states was 40% of the size of the increase in oversight states.

Conclusions: Allowing NPs to practice without physician oversight was associated with a reduction in the magnitude of increase in ED use following Medicaid expansion. States that restrict NP practice should weigh the costs of maintaining these restrictions against the potential benefits of lower ED use. States considering Medicaid expansion should also consider relaxing NP scope-of-practice laws.

Key Words: access to care, emergency department, health care reform, nurse practitioners, primary care

(*Med Care* 2019;00: 000–000)

Overuse and inappropriate use of emergency departments (EDs) remains an important issue within the US health care system, as an estimated 37% of ED visits involve non-urgent care that could be provided in other care settings such as physician offices and urgent care centers.¹ Inappropriate ED use has salient consequences with some estimates placing its cost at \$4.4 billion.² One explanation for high ED utilization that gained traction during the debate over the Affordable Care Act (ACA) is overuse by the uninsured, particularly those unable to access primary care physicians and other sources of nonurgent care.^{3,4}

This explanation for ED overuse plays an important role in the continued debate over expanding health insurance coverage, particularly with respect to the expansion of Medicaid, and 2 prevailing theories have come to dominate the conversation.³ According to the first theory, expansion could *decrease* ED use, as the newly insured are better able to access primary care services and become less reliant on EDs, particularly for inappropriate uses.⁵ However, under the second theory, providing greater access to insurance could *increase* ED use.³ According to Zhou et al,³ “insurance lowers the cost to the patient of using the ED and therefore increases demand,” which in turn increases usage.

Before the passage of the ACA, advocates of each theory could point to empirical evidence supporting their claims. For example, following Massachusetts’s 2006 expansion of health insurance coverage, ED use decreased by 5%–8%.⁶ In contrast, results from the Oregon Health Insurance Experiment indicated Medicaid coverage increased ED use by 40%.^{7,8} Evidence on the role of the ACA itself is less mixed, with most studies finding a sizeable increase in the number of ED visits following Medicaid expansion.^{9–12}

Both of these theories could be true; the newly insured might both have better access to primary care, making them less reliant on ED services, and have less financial incentive to avoid ED use, making them more likely to seek care in an ED. Although the evidence suggests that expanding access to health insurance increases ED use, particularly with Medicaid

From the *Hugh F. Culverhouse Jr. School of Law, University of Alabama, Tuscaloosa, AL; †Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco, San Francisco, CA; and ‡Center for Interdisciplinary Health Workforce Studies, College of Nursing, Montana State University, Bozeman, MT.

The authors declare no conflict of interest.

Reprints: Benjamin J. McMichael, JD, PhD, Hugh F. Culverhouse Jr. School of Law, University of Alabama, P.O. Box 870382, 101 Paul W. Bryant Drive, East, Tuscaloosa, AL 35487. E-mail: bmc michael@law.ua.edu

Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal’s website, www.lww-medicalcare.com.

Copyright © 2019 Wolters Kluwer Health, Inc. All rights reserved.
ISSN: 0025-7079/19/000-000

expansion, the relationship between insurance coverage and ED use is not simple, with the nature of coverage, characteristics of the population, and other factors influencing whether ED use increases or decreases following an increase in insurance coverage.¹³ One factor that could play a role is access to primary care providers.^{14,15} Indeed, both theories on the effect of greater health insurance coverage on ED use include an important role for primary care providers.

The theory that ED use will increase following an increase in access to health insurance is based on the idea that the lower out-of-pocket cost of accessing the ED for the newly insured will increase demand for ED services.³ The theory that ED use will drop following an increase in access to health insurance relies on the assumption that patients will use more primary care services due to improved coverage, which will lead to less reliance on care received in the ED. This theory assumes that there is an adequate number of primary care providers with sufficient capacity and willingness to supply these services. If too few providers are available or if providers are unable to meet the increased demand for care, newly insured people may be more likely to visit the ED for care, given the lower personal cost of doing so. Conversely, if the cost of accessing primary care providers decreases *and* there is a sufficient number of primary care providers willing and able to treat the newly insured, ED visits may not increase.

As both theories rely on assumptions about the availability and capacity of primary care providers, we examined the role of access to these providers following an increase in access to health insurance. Specifically, we examined whether nurse practitioners (NPs) and the scope-of-practice laws that govern them are associated with different levels of ED use following an increase in insurance access. In 2016, over 175,000 NPs were licensed to practice,¹⁶ NPs are the principal providers of primary care services in many areas of the country—particularly in rural areas that lack adequate access to care^{17,18}—and NPs are more likely than physicians to practice in primary care.¹⁹ NPs also practice in nontraditional settings, such as retail and urgent clinics.²⁰ Consequently, NPs play a significant role in providing primary care, and scope-of-practice laws—particularly laws regulating the degree to which a physician must supervise the practice of an NP—impact the ability of NPs to fulfill this role. A recent study by Federal Trade Commission staff suggested that NP physician supervision requirements “may exacerbate provider shortages and thereby contribute to access problems, particularly for underserved populations,” and “can impact the cost and quality of health care services.”²¹

Recent evidence indicates that relaxing NP scope-of-practice laws could reduce ED use through several different mechanisms. First, studies show NPs are more willing than physicians to care for underserved populations and Medicaid patients.^{17,22–24} Accordingly, patients in need of care may find it easier to access primary care and have less need of EDs in areas with less restrictive scope-of-practice laws. Second, other studies demonstrate that relaxing scope-of-practice laws can increase the number of NPs in underserved areas,¹⁶ geographic access to primary care,²⁵ and the availability of primary care services.²⁶ Further, NPs are often the clinician in retail clinics, which provide episodic and urgent care,²⁷ and it

has been found that restrictive scope-of-practice laws increase the cost of such care.²⁰ With greater availability of NPs, individuals may no longer find it necessary to rely on EDs. Third, relaxing scope-of-practice laws can better enable NPs to meet the demand for care and result in lower ED use for conditions that can be treated in primary care settings.²⁶

On the basis of this evidence, we used state scope-of-practice laws as a measure of access to primary care services to examine whether following an increase in the availability of health insurance (which was provided by Medicaid expansion), greater access to primary care providers could mitigate ED use among newly insured individuals. Our analysis was limited to revealing associations between scope-of-practice laws and changes in ED use, and we did not seek to provide another estimate of the size of the increase in ED use following Medicaid expansion—that question has been asked and answered by previous work.^{9–12}

METHODS

State Scope-of-Practice Law Classification

Data on NP scope-of-practice laws came from McMichael,¹⁶ and each state in each year of our study was assigned to 1 of 2 categories. First, oversight states require that physicians supervise NPs. Also included in this category are states that require NPs to “collaborate” with physicians—this is another form of oversight. Second, no-oversight states allow NPs to practice without any physician supervision or collaboration. Table 1 provides an overview of scope-of-practice laws in the 15 states that appear in our analysis.

Study Sample

The outcomes measures are ED visit data from the Fast Stats database, which is compiled by the Agency for Healthcare Research and Quality. The Fast Stats database is an early-access, aggregated version of the State Emergency Department Databases and State Inpatient Databases, which are all-capture, longitudinal databases. The Fast Stats data include ED visits from all community nonrehabilitation hospitals whether or not a particular visit resulted in a hospital admission. These data are reported as counts of ED visits by expected payer and by 8 different clinical condition categories (all ED visits as well as visits for abdominal pain, back or

TABLE 1. State Scope-of-Practice Laws, 2006–2015

Never Independent (Since 2006)	Change in Law (Between 2006 and 2015)	Always Independent (Since 2006)
Arkansas, California, Illinois, Kentucky, Massachusetts, New Jersey, and New York	Hawaii (2010), Maryland (2012), Minnesota (2015), Nevada (2013), North Dakota (2011), and Vermont (2011)	Arizona and Iowa

All states that appear in our analysis are listed here. Those in the left column never allowed NPs to practice without physician oversight. Those in the right column always allowed NPs to practice without oversight. States listed in the middle column changed their laws during the study period, and the date the law is first coded as taking effect is provided in parentheses.

NP indicates nurse practitioner.

neck pain, dental, headache, injury, mental health or substance use, and skin infections), which were defined by primary listed ICD-9 codes. Quarterly data are available at the state level from the first quarter of 2006 through the fourth quarter of 2015.

However, not all states participate in the Fast Stats database. Our sample of states that both participated in the Fast Stats database and expanded Medicaid included Arizona, Arkansas, California, Hawaii, Illinois, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Nevada, New Jersey, New York, North Dakota, and Vermont. Information on state Medicaid expansion came from the Kaiser Family Foundation.²⁸ Medicaid expansion formally took place on January 1, 2014 in most of these states, but following previous research,¹¹ we treated expansion as occurring in the fourth quarter of 2013 because Medicaid coverage began to expand in most states at this time. Three states (California, Minnesota, and New Jersey) conducted partial Medicaid expansion before 2014 but, as with previous research,¹¹ we included them in our analysis. Of the states that expanded Medicaid, 7 allowed NPs to practice without physician oversight at the time of Medicaid expansion (Arizona, Hawaii, Iowa, Maryland, Nevada, North Dakota, and Vermont) while the rest required physician oversight of NPs.¹⁶ We excluded Rhode Island from the analysis because it amended its law from requiring physician oversight to allowing NPs to practice without oversight at the same time Medicaid was expanded in 2014.

As the specific goal of this study was to assess whether NPs and the scope-of-practice laws that govern them moderate ED use following an increase in insurance access in states that expanded Medicaid, the study included only states that expanded Medicaid. In addition, as Medicaid expansion was targeted at childless adults, we limited our analysis to ED visits by adults with Medicaid coverage. In 2014, there was a total of 9,982,600 ED visits by Medicaid beneficiaries, and 17.6% of these occurred in the states that allowed NPs to practice without physician oversight.

Key Variables

We examined 2 different dependent variables in our analysis: the number of per capita ED visits covered by Medicaid and the share of ED visits covered by Medicaid. The first variable is the number of visits covered by Medicaid at the state level divided by state population estimates published by the Bureau of Economic Analysis. As this variable exhibits a right skew, we applied a logarithmic transformation. The second variable was constructed by dividing the number of Medicaid visits by the sum of Medicaid, privately insured, and uninsured visits. Consistent with previous research, we excluded Medicare visits from this calculation.¹¹

The key independent variables in our models were indicator variables for whether a state allowed NPs to practice without physician oversight and for whether Medicaid expansion had occurred. The first variable equaled one if a state allowed NPs to practice without physician oversight in a given quarter and was based on the McMichael classification of state scope-of-practice laws.¹⁶ The second indicator variable equaled one in all quarters postexpansion, which was defined as occurring in the fourth quarter of 2013.

Study Design

We exploited a legal change to compare the change in ED use in states that expanded Medicaid and required no physician oversight of NPs with states that expanded Medicaid and required physician oversight of NPs. We estimated a series of random effects models with random intercepts for each state. These models accounted for the correlation of repeated measurements of the same state over time and therefore, allowed us to analyze trends in ED use over time.

We estimated a separate model for each of the ED clinical conditions identified above. All models included an indicator variable for Medicaid expansion and an indicator variable for whether a given state allowed NPs to practice without physician oversight. Each model also included an interaction term between these 2 variables to capture the differential association of Medicaid expansion with ED use in oversight and no-oversight states. In addition, the models included linear time trends. All analysis was performed using Stata 14.2, and all SEs were clustered at the state level.

We report the coefficients for the 2 indicator variables and their interaction term. In addition, to facilitate the interpretation of these results pertaining to the association of NP scope-of-practice laws with ED use, we report transformed and combined coefficients that represent the increase in ED use in oversight and no-oversight states. In particular, the percentage increase in ED use in oversight states was calculated as $[\exp(\beta_1)-1] \cdot 100$, where β_1 is the reported coefficient for the variable indicating Medicaid expansion. The percentage increase in ED use in no-oversight states was calculated as $[\exp(\beta_1+\beta_2)-1] \cdot 100$, where β_1 is the reported coefficient for the variable indicating Medicaid expansion and β_2 is the reported coefficient for the interaction term. The exponential transformation is necessary because the coefficients were derived from a log-linear regression model. We utilized similar calculations—without the exponential transformation—for the Medicaid share results. In addition to the main analysis, the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/B754>) reports a series of robustness checks.

RESULTS

Figure 1 reports the mean number of per capita ED visits covered by Medicaid in oversight and no-oversight states for each quarter of 2013 and 2014—Medicaid expansion occurred in the fourth quarter of 2013. The preexpansion trends in ED visits in all states were similar, and all states saw an increase in ED visits following Medicaid expansion.¹¹ However, states that required physician oversight of NPs experienced larger increases in the number of ED visits by Medicaid beneficiaries relative to the no-oversight states. Immediately before expansion, the 7 no-oversight states and the 8 oversight states had ~151 and 152 Medicaid-covered ED visits per 100,000 residents, respectively. By the third quarter of 2015, these numbers had increased to 214 and 257.

Panel A of Table 2 presents the results of random effects models that examined the association of Medicaid expansion with the number of per capita ED visits by Medicaid beneficiaries. Figure 2 translates these results into comparisons between oversight and no-oversight states. Not surprisingly, expanding Medicaid was associated with a

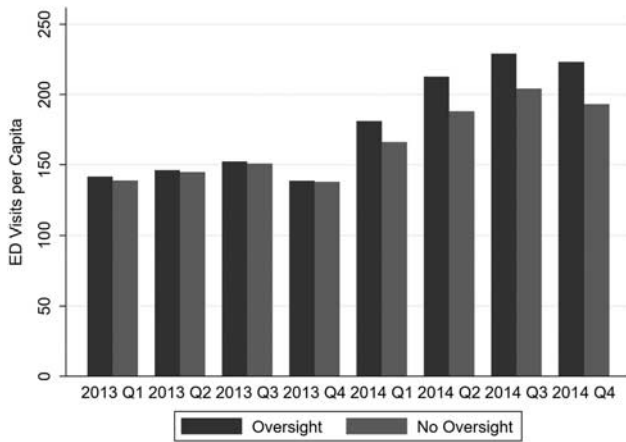


FIGURE 1. Mean per capita ED visits by type of scope-of-practice law, 2013–2014. ED indicates emergency department.

statistically significant increase in ED use.¹¹ In states that required physician oversight, all ED use by adult Medicaid beneficiaries increased by ~28% relative to the preexpansion period. In states that allowed NPs to practice without physician oversight, ED use by Medicaid beneficiaries also increased, but only by 7%. Therefore, states allowing NPs to practice without physician oversight experienced only about 25% of the increase in ED use observed in states requiring oversight. The same general pattern persists across all 7 of the specific clinical condition categories. For all categories except skin infections, the difference in the association of Medicaid expansion with ED use in oversight and no-oversight states is statistically significant.

Panel B of Table 2 reports results of random effects models that examined the change in the share of ED visits covered by Medicaid, and Figure 3 translates these results into straightforward comparisons. Medicaid expansion is associated with an increase in the share of visits covered by Medicaid. However, the increase in the share of ED visits covered by Medicaid was larger in oversight states than in no-oversight states. For all ED visits, the increase in the Medicaid share in states allowing NPs to practice without oversight was only 40% of the increase in states requiring physician oversight of NPs. A similar result was found in all of the specific clinical condition categories, although the difference in the association between Medicaid expansion and ED use in oversight and no-oversight states was not statistically significant for mental health and substance abuse.

DISCUSSION

Insurance Expansion and ED Use

Our results suggest that Medicaid expansion increased ED use among Medicaid beneficiaries—consistent with prior work¹¹—and that the size of this increase was larger in states that required physicians to oversee the practice of NPs. These results suggest that access to NPs was associated with a smaller increase in ED use following the increase in health insurance coverage. Interestingly, ED use for dental

TABLE 2. Association of Medicaid Expansion With ED Use Across Different Types of NP Scope-of-Practice Laws, 2006–2015

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Visits	Abdominal	Back/Neck	Dental	Headache	Injury	Mental Health	Skin Infection
Panel A: per capita ED visits								
No NP oversight	0.107 (0.086)	0.087 (0.118)	0.079 (0.101)	0.160 (0.080)**	0.069 (0.122)	0.123 (0.102)	0.281 (0.140)**	0.104 (0.095)
Expansion	0.243 (0.070)***	0.177 (0.070)**	0.215 (0.079)***	0.321 (0.105)***	0.170 (0.068)**	0.271 (0.086)***	0.520 (0.165)***	0.243 (0.101)**
(No NP oversight)×(expansion)	-0.179 (0.089)**	-0.219 (0.091)**	-0.200 (0.101)**	-0.261 (0.117)**	-0.202 (0.094)**	-0.229 (0.111)**	-0.289 (0.147)**	-0.152 (0.124)
Observations	512	512	512	512	512	512	512	512
Panel B: share of visits								
No NP oversight	0.030 (0.016)*	0.025 (0.021)	0.021 (0.022)	0.044 (0.022)*	0.019 (0.022)	0.030 (0.015)**	0.020 (0.025)	0.043 (0.015)***
Expansion	0.081 (0.023)***	0.075 (0.024)***	0.081 (0.027)***	0.123 (0.034)***	0.064 (0.022)***	0.077 (0.023)***	0.114 (0.033)***	0.111 (0.029)***
(No NP oversight)×(expansion)	-0.049 (0.023)**	-0.052 (0.025)**	-0.052 (0.027)*	-0.066 (0.036)*	-0.045 (0.023)*	-0.042 (0.023)*	-0.028 (0.043)	-0.054 (0.028)*
Observations	512	512	512	512	512	512	512	512

The dependent variable in panel A is the natural logarithm of the number of visits for the type reported at the top of each column. The dependent variable in panel B is the share of Medicaid visits for the type of ED visit reported at the top of each column. All models include only those states that expanded Medicaid. SEs clustered at the state level are reported in parentheses. ED indicates emergency department; NP, nurse practitioner. *Significant at the $P < 0.1$ level. **Significant at the $P < 0.05$ level. ***Significant at the $P < 0.01$ level.

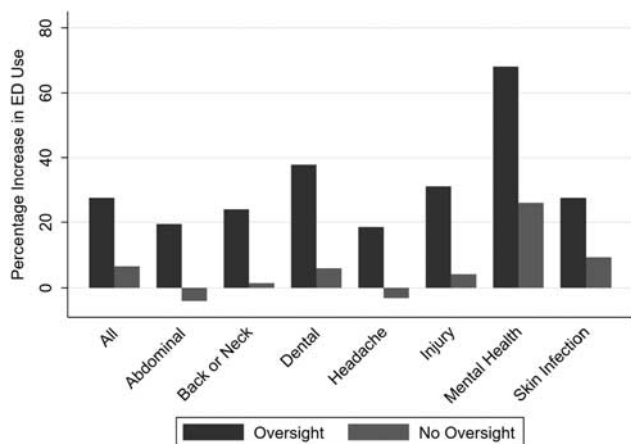


FIGURE 2. Increase in the number of visits per capita by Medicaid patients following Medicaid expansion, 2006–2015 (N = 512). Each set of bars represents the primary results from a single model. Full regression results are available in the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/B754>). All differences in ED visits are statistically significant at the 0.05 level, with the exception of skin infections. ED indicates emergency department.

conditions increased in all states, but it increased less in states not requiring physician oversight of NPs. The mechanism of association is the same as for the other conditions. If an individual presents at an ED for a dental condition (that does not involve a traumatic injury), he or she will likely be provided antibiotics or painkillers, as appropriate, and referred to a dentist.²⁹ An NP could provide the same care.

In general, the evidence that access to NPs is associated with a smaller increase in ED use following an increase in access to health insurance has important implications for the 2

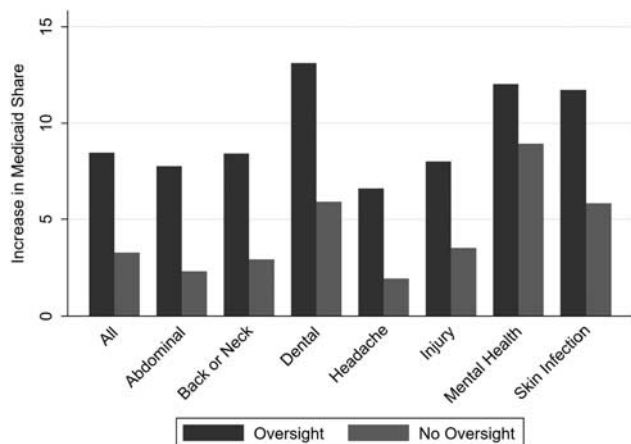


FIGURE 3. Increase in the share of ED visits covered by Medicaid following Medicaid expansion, 2006–2015 (N = 512). Each set of bars represents the primary results from a single model. Full regression results are available in the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/B754>). All differences in ED visits are statistically significant at the 0.05 level, with the exception of mental health and substance abuse.

theories that predominate the debate over the ACA, Medicaid expansion, and ED use. Our results suggest that, to some extent, both theories concerning the effect of expanding health insurance access on ED use may be correct. On one hand, our results are consistent with the studies that found ED use increased generally.¹¹ On the other hand, our results provide evidence that the size of this increase was not as great in states that facilitated access to primary care via more relaxed NP scope-of-practice laws, implying that ED use could potentially decrease if new enrollees have adequate access to primary care. This evidence has important implications for states that are considering whether to expand Medicaid and suggests that these states may be well-advised to simultaneously relax NP scope-of-practice laws.

Implications for Health Care Workforce Policy and Reducing ED Use

If, as is suggested by both our study and others,¹⁴ ED use increases following the expansion of insurance coverage more in areas that lack access to primary care, then expanding access to primary care via relaxed NP scope-of-practice laws may be a viable option to reduce ED use. Eighty-four million Americans currently have inadequate access to primary care, the ongoing shortage of primary care providers is well documented, and the number of physicians practicing in rural areas is projected to decrease.^{30–33} NPs can provide most of the primary care services required by newly insured individuals,^{34,35} and their capacity to do so is substantially augmented when they can practice without physician oversight.^{36–38} Our results suggest that when NPs can practice without physician oversight, they can better expand the capacity of the primary care system and serve as a “relief valve” for EDs that are often overcrowded and considerably more expensive. In the states that we studied, trends in ED use coinciding with ACA expansion of Medicaid suggest that expanded coverage generally increased ED use in those states. Differences in the trends for states with different scope-of-practice laws suggest that better access to primary care NPs may have moderated increases in ED use associated with Medicaid expansion.

Implications for Payers and Delivery Systems

Recognizing EDs are a costlier alternative to primary care settings, the Centers for Medicare and Medicaid Services (CMS) indicated its strong interest in reducing unnecessary ED usage at the time Medicaid coverage was initially expanded.³⁹ One of its primary strategies for achieving the goal of reduced ED use was broadening access to primary care services. Although allowing NPs to practice without physician oversight was not listed as one of the specific ways to implement this strategy—states, not CMS, determine whether NPs require physician oversight—the results here suggest that granting NPs more autonomy may be effective in curtailing ED use. Furthermore, recent studies of Medicare beneficiaries report that primary care provided by NPs was associated with significantly fewer ED visits compared with beneficiaries who received their primary care from physicians.^{40,41} In light of the results here and other evidence, states that currently restrict NP practices may consider lifting these restrictions.

Implications for Patients

To the extent that EDs generate higher out-of-pocket costs than other settings, patients benefit financially from the ability of NPs to practice without physician oversight. Indeed, recent research has found that care received in urgent care clinics can replace some care provided in EDs and that this care is significantly less expensive in states that allow independent NP practice.²⁰ Patients also obtain other benefits by avoiding ED visits. Medical errors and adverse events are not uncommon in EDs,⁴² so patients that can substitute other care for ED use may see a decrease in risk. For those patients that must seek care in an ED, reduced overcrowding can result in fewer medical errors,⁴³ suggesting these patients also benefit.

Limitations

This study focused on the association between allowing NPs to practice independently and ED use following Medicaid expansion in states that expanded Medicaid. Accordingly, the results may not indicate a causal relationship.

Our analysis was limited by the number of clinical condition categories reported by Fast Stats data. In addition, if allowing NPs to practice without physician oversight is highly correlated with other factors that influence ED use, our results may partly represent these other factors. Two important factors that may confound the results are the percentage of a state's population living in rural areas and the size of the increase in Medicaid enrollment following Medicaid expansion. As discussed in the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/B754>) we performed a series of robustness checks to rule out the possibility that these 2 factors may have confounded our results.

CONCLUSIONS

This study examined ED use following Medicaid expansion in states that allowed and prohibited NPs to practice without physician oversight. We find that allowing NPs to practice without physician oversight was associated with a smaller increase in ED use following Medicaid expansion. States that restrict NP practice should weigh the potential costs of maintaining these restrictions relative to the likely benefits of lower ED use which may be achieved by their removal.

REFERENCES

1. Uscher-Pines L, Pines J, Kellermann A, et al. Emergency department visits for nonurgent conditions: systematic literature review. *Am J Manag Care.* 2013;19:47–59.
2. Weinick RM, Burns RM, Mehrotra A. Many emergency department visits could be managed at urgent care centers and retail clinics. *Health Aff (Millwood).* 2010;29:1630–1636.
3. Zhou RA, Baicker K, Taubman S, et al. The uninsured do not use the emergency department more—they use other care less. *Health Aff.* 2017;36:2115–2122.
4. AHRQ New data say uninsured account for nearly one-fifth of emergency room visits. 2009. Available at: <https://archive.ahrq.gov/news/newsroom/press-releases/2009/hhsuninser.html>. Accessed June 1, 2018.
5. Cheung PT, Wiler JL, Lowe RA, et al. National study of barriers to timely primary care and emergency department utilization among Medicaid beneficiaries. *Ann Emerg Med.* 2012;60:4–10; e2.
6. Miller S. The effect of insurance on emergency room visits: An analysis of the 2006 Massachusetts health reform. *J Public Econ.* 2012;96:893–908.
7. Taubman SL, Allen HL, Wright BJ, et al. Medicaid increases emergency-department use: evidence from Oregon's Health Insurance Experiment. *Science.* 2014;343:263–268.
8. Finkelstein AN, Taubman SL, Allen HL, et al. Effect of Medicaid coverage on ED use—further evidence from Oregon's experiment. *N Engl J Med.* 2016;375:1505–1507.
9. Nikpay S, Buchmueller T, Levy HG. Affordable Care Act Medicaid expansion reduced uninsured hospital stays in 2014. *Health Aff (Millwood).* 2016;35:106–110.
10. Freedman S, Nikpay S, Carroll A, et al. Changes in inpatient payer-mix and hospitalizations following Medicaid expansion: evidence from all-capture hospital discharge data. *PLoS ONE.* 2017;12:e0183616.
11. Nikpay S, Freedman S, Levy H, et al. Effect of the Affordable Care Act Medicaid expansion on emergency department visits: evidence from state-level emergency department databases. *Ann Emerg Med.* 2017;70:215–225; e6.
12. Garthwaite C, Gross T, Notowidigdo M, et al. Insurance expansion and hospital emergency department access: evidence from the Affordable Care Act. *Ann Intern Med.* 2017;166:172–179.
13. Sommers BD, Simon K. Health insurance and emergency department use—a complex relationship. *N Engl J Med.* 2017;376:1708–1711.
14. Cunningham P, Sheng Y. Trends in preventable inpatient and emergency department utilization in California between 2012 and 2015: the role of health insurance coverage and primary care supply. *Med Care.* 2018;56:544–550.
15. Kellermann AL, Weinick RM. Emergency departments, Medicaid costs, and access to primary care—understanding the link. *N Engl J Med.* 2012;366:2141–2143.
16. McMichael BJ. Beyond physicians: the effect of licensing and liability laws on the supply of nurse practitioners and physician assistants: beyond physicians: the effect of licensing and liability laws. *J Empirical Legal Stud.* 2018;15:732–771.
17. Everett CM, Schumacher JR, Wright A, et al. Physician assistants and nurse practitioners as a usual source of care. *J Rural Health.* 2009;25:407–414.
18. Auerbach DI, Staiger DO, Buerhaus PI. Growing ranks of advanced practice clinicians—implications for the physician workforce. *N Engl J Med.* 2018;378:2358–2360.
19. Stange K. How does provider supply and regulation influence health care markets? Evidence from nurse practitioners and physician assistants. *J Health Econ.* 2014;33:1–27.
20. Spetz J, Parente ST, Town RJ, et al. Scope-of-practice laws for nurse practitioners limit cost savings that can be achieved in retail clinics. *Health Aff (Millwood).* 2013;32:1977–1984.
21. Gilman DJ, Koslov TI. *Competition and the Regulation of Advanced Practice Nurses (Policy Perspectives)*. Washington, DC: Federal Trade Commission; 2014. Available at: <https://www.ftc.gov/system/files/documents/reports/policy-perspectives-competition-regulation-advanced-practice-nurses/140307aprnpolicypaper.pdf>. Accessed April 10, 2018.
22. Buerhaus PI, DesRoches CM, Dittus R, et al. Practice characteristics of primary care nurse practitioners and physicians. *Nurs Outlook.* 2015;63:144–153.
23. Grumbach K, Hart LG, Mertz E, et al. Who is caring for the underserved? A comparison of primary care physicians and nonphysician clinicians in California and Washington. *Ann Fam Med.* 2003;1:97–104.
24. Barnes H, Maier CB, Altares Sarik D, et al. Effects of regulation and payment policies on nurse practitioners' clinical practices. *Med Care Res Rev.* 2017;74:431–451.
25. Graves JA, Mishra P, Dittus RS, et al. Role of geography and nurse practitioner scope-of-practice in efforts to expand primary care system capacity: health reform and the primary care workforce. *Med Care.* 2016;54:81–89.
26. Traczynski J, Udalova V. Nurse practitioner independence, health care utilization, and health outcomes. *J Health Econ.* 2018;58:90–109.
27. Deloitte Center for Health Solutions. Retail medical clinics: update and implications—2009 report. 2009. Available at: www.deloitte.com/view/en_US/us/Industries/health-plans/Center-for-Health-Solutions-Health-Plans/research/c15bff6512de4210VgnVCM100000ba42f00aRCRD.htm. Accessed June 1, 2018.
28. The Henry J. Kaiser Family Foundation. Status of state action on the Medicaid expansion decision; 2018. Available at: www.kff.org/health-reform/state-indicator/state-activity-around-expanding-medicare-under-the-affordable-care-act/. Accessed June 1, 2018.

29. American Dental Association. From the Emergency Room to the Dental Chair. 2016. Available at: www.ada.org/en/public-programs/action-for-dental-health/er-referral. Accessed August 1, 2018.
30. Huang ES, Finegold K. Seven million Americans live in areas where demand for primary care may exceed supply by more than 10 percent. *Health Aff (Millwood)*. 2013;32:614–621.
31. Petterson SM, Liaw WR, Phillips RL, et al. Projecting US primary care physician workforce needs: 2010–2025. *Ann Fam Med*. 2012;10:503–509.
32. Ku L, Jones K, Shin P, et al. The states' next challenge—securing primary care for expanded Medicaid populations. *N Engl J Med*. 2011;364:493–495.
33. Skinner I, Staiger D, Auerbach D, et al. Implications of an aging rural physician workforce. (2019, under journal review).
34. Doescher MP, Andrilla CHA, Skillman SM, et al. The contribution of physicians, physician assistants, and nurse practitioners toward rural primary care: findings from a 13-state survey. *Med Care*. 2014;52:549–556.
35. Sullivan-Marx EM. Lessons learned from advanced practice nursing payment. *Policy Polit Nurs Pract*. 2008;9:121–126.
36. Westat Impact of state scope of practice laws and other factors on the practice and supply of primary care nurse practitioners, Washington, DC. Report No.: HHSP23320095655WC; 2015. Available at: https://aspe.hhs.gov/system/files/pdf/167396/NP_SOP.pdf. Accessed April 10, 2018.
37. Poghosyan L, Nannini A, Smaldone A, et al. Revisiting scope of practice facilitators and barriers for primary care nurse practitioners: a qualitative investigation. *Policy Polit Nurs Pract*. 2013;14:6–15.
38. Fairman JA, Rowe JW, Hassmiller S, et al. Broadening the scope of nursing practice. *N Engl J Med*. 2011;364:193–196.
39. Mann C. *Reducing Nonurgent Use of Emergency Departments and Improving Appropriate Care in Appropriate Settings (CMCS Informational Bulletin)*. Washington, DC: Center for Medicare and Medicaid Services; 2014. Available at: www.medicare.gov/federal-policy-guidance/downloads/cib-01-16-14.pdf. Accessed April 20, 2018.
40. Buerhaus P, Perloff J, Clarke S, et al. Quality of primary care provided to medicare beneficiaries by nurse practitioners and physicians. *Med Care*. 2018;56:484–490.
41. DesRoches CM, Clarke S, Perloff J, et al. The quality of primary care provided by nurse practitioners to vulnerable Medicare beneficiaries. *Nurs Outlook*. 2017;65:679–688.
42. Freund Y, Goulet H, Bokobza J, et al. Factors associated with adverse events resulting from medical errors in the emergency department: two work better than one. *J Emerg Med*. 2013;45:157–162.
43. Epstein SK, Huckins DS, Liu SW, et al. Emergency department crowding and risk of preventable medical errors. *Intern Emerg Med*. 2012;7:173–180.