Changes in Reimbursement to Emergency Physicians After Medicaid Expansion Under the Patient Protection and Affordable Care Act

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Study objective: We examine the effect of Medicaid expansion on reimbursement for emergency physicians' professional services.

Methods: We conducted a retrospective study using data from a national emergency medicine group in a sample of 50 emergency departments (EDs) from July 1, 2012, to June 30, 2015. We categorized facilities in 14 states into full-expansion (23), partial-expansion (17), and nonexpansion (10) categories based on pre-expansion Medicaid eligibility criteria for all adults. We used a difference-in-differences design to assess the effect of Medicaid expansion on provider reimbursement per visit. Secondary outcomes included reimbursement per relative value unit and relative value units per visit, both overall and by payer type, controlling for age, sex, billing codes, and health system relationship.

Results: We studied greater than 6.7 million ED visits during July 2012 to December 2015, 3.0 million pre-expansion and 3.7 million postexpansion. After adjusting for covariates, reimbursement per visit increased 6.3% (95% confidence interval 1.4% to 11.1%) in full-expansion relative to nonexpansion states and did not change significantly in partial-expansion versus nonexpansion states. Reimbursement per visit for commercial insurance increased 17.1% (95% confidence interval 9.9% to 24.2%) in full-expansion versus nonexpansion states. Reimbursement for self-pay visits increased 9.7% (95% confidence interval 3.7% to 15.7%) in full-expansion versus nonexpansion states. Changes in payments were driven by higher reimbursement per relative value unit; relative value units per visit declined slightly in full-expansion compared with nonexpansion states.

Conclusion: In this sample, full Medicaid expansion increased payments for emergency physicians' professional services compared with reimbursement in nonexpansion states. Higher reimbursement was driven primarily by lower proportions of uninsured patients and increased reimbursement per visit for both commercially insured and self-pay patients in states with full Medicaid expansion. [Ann Emerg Med. 2019;73:213-224.]

Please see page 214 for the Editor's Capsule Summary of this article.

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INTRODUCTION

Background

In 2014, a major change occurred in US insurance coverage. That year, with the implementation of provisions of the Patient Protection and Affordable Care Act (ACA), 28 states and the District of Columbia expanded Medicaid eligibility to up to 138% of the federal poverty level for adults. The same year, qualified individuals became eligible to purchase subsidized private coverage through insurance exchanges. As a result, more than 17 million people gained insurance coverage in 2014.[1]

Importance

Many studies have assessed how these changes in insurance coverage have affected emergency department (ED) utilization.[2-5] ED use has been of interest to policymakers because ED care—particularly low-acuity ED use—serves as a community barometer for access to care in outpatient settings.[6] The Oregon experiment with Medicaid expansion led to a substantial increase in ED visits among the newly insured.[7] However, 2 multistate ACA studies, one in greater than 500 hospitals in 36 states and another using data from the National Health Insurance Survey, found that ED visit rates did not significantly increase in Medicaid expansion states compared with nonexpansion ones.[8,9]

Yet one consistent finding in ACA studies that examined Medicaid expansion has been its effect on insurance mix. Since expansion, hospitals, including EDs and other

Editor's Capsule Summary

What is already known on this topic

The 2014 Patient Protection and Affordable Care Act implementation sought to increase insurance coverage for many previously uninsured or underinsured Americans.

What question this study addressed

Did implementation of the act, with its variable embrace across states, alter reimbursement for emergency department (ED) care?

What this study adds to our knowledge

For paid claims during 3 years (2012 to 2015), involving 6.7 million ED encounters from one large multistate emergency care provider group, reimbursement per visit increased in full-expansion states compared with nonexpansion states, more so with commercially insured patients.

How this is relevant to clinical practice

This does not alter care, but it will inform future policy efforts and broader ED economics.

settings, have had increasing proportions of Medicaid patients and decreasing proportions of uninsured individuals.[10] The 2 largest ED-focused studies of Medicaid expansion under the ACA also found modest declines in the proportion of privately insured patients in Medicaid expansion states. Despite this major change in insurance mix, the effect of Medicaid expansion on ED payments has not been examined, to our knowledge. A previous study estimated that after Medicaid expansion, the average outpatient ED encounters could reimburse considerably more; however, to our knowledge no studies have directly examined this.[11]

Goals of This Investigation

In this study, we examined whether Medicaid expansion increased reimbursement for emergency physician professional services, using a difference-in-differences design in which we separately compared the full-expansion and partial-expansion states with nonexpansion states in a sample of 50 EDs managed by a national emergency medicine group in 14 states. We also explored how reimbursement changed within insurance categories to help explain the findings. We hypothesized that average reimbursement per visit would increase because of changes in insurance mix and a decreasing number of uninsured patients. We aimed to quantify this relative increase in reimbursement rates overall and by insurance category.

MATERIALS AND METHODS

Study Design and Setting

This was a retrospective study using data from a national emergency medicine group for a sample of 50 EDs in 14 states from July 1, 2012, to December 31, 2015. Patient-visit-level and facility-level demographic, clinical, operational, and reimbursement data were used. The construction of the data set used in this study has been previously described.[12,13] In summary, operational, clinical, and reimbursement data were generated by regularly audited certified billing and coding specialists within the ED group. We studied reimbursements for professional services provided for ED visits (ie, provider reimbursement only; no facility fees). Data included total reimbursement per visit received from both insurance providers and patients. Visit-level data were combined by information technology staff into a single research database and transferred to Carnegie Mellon University under a data use agreement.[12,13] This study was approved by the institutional review board at Carnegie Mellon University.

We studied ED visits between July 1, 2012, and December 31, 2015, at 50 facilities in 14 states with continuous, complete data for each month between July 2013 and June 2015. The study period was chosen because we observed nonparallel trends in reimbursement before July 2012, and there was a significant change in market position of the national emergency medicine group that took effect after December 2015, which was a potential confounder. We categorized facilities into 3 groups, full expansion, partial expansion, and nonexpansion, based on the status of Medicaid expansion (and pre-expansion income eligibility limits) under the ACA across the 14 states where the facilities are located.[14] Expansion status refers to the change from pre-ACA to post-ACA in income eligibility for Medicaid for adults. Full expansion was defined as an increase in eligibility for Medicaid that changed from 0% of the federal poverty line to 138%. Partial expansion status refers to states whose pre-ACA Medicaid program allowed adults to be eligible despite an income level above 0% of the federal poverty level.[14] For example, Connecticut was a partial-expansion state because it expanded Medicaid eligibility from 56% of the federal poverty level to 138%. In Table E1 (available online at http://www.annemergmed.com), we display the number of facilities and the criteria for categorization of expansion status in detail. Our sample included a total of 50 facilities that met the above criteria (23 full-expansion ones in 7

states, 17 partial-expansion ones in 5 states, and 10 nonexpansion ones in 2 states).

Methods of Measurement

We performed statistical analyses at the visit level. Our primary outcome was reimbursement per visit. Secondary outcomes included reimbursement per relative value unit (RVU) to determine whether there was greater payment per clinical work unit (ie, controlling for visit complexity) and RVUs per visit to assess whether visit complexity had increased. RVUs are a measure of visit complexity generated from Current Procedural Terminology (CPT-4) codes billed according to the type and number of procedures conducted in the ED, as well as the Evaluation and Management level of visit from the coded medical decisionmaking. Because of the sensitive nature of reimbursement data, we present normalized reimbursement data relative to pre-expansion values in full-expansion-state EDs (Table 1). For evaluation of the difference in reimbursement per visit and reimbursement per RVU among EDs in states with full, partial, and nonexpansion, we present the percentage change by dividing the raw difference-in-difference dollar value by the average actual (not normalized) pre-ACA reimbursement per visit and pre-ACA reimbursement per RVU across all included visits, respectively, and multiplying by 100 while controlling for covariates listed below. Two included states, Michigan and Pennsylvania, expanded Medicaid on April 1, 2014, and April 1, 2015, respectively. To adjust for this time effect, we performed analyses in event time and excluded Michigan ED visits from January 1, 2014, to March 31, 2014, and Pennsylvania ED visits from January 1, 2015, to March 31, 2015, given the time differences in how these states transitioned to Medicaid expansion under the ACA. Pennsylvania ED visits before January 1, 2015, were categorized as pre-expansion for analyses.

Primary Data Analysis

Our first analysis is a difference-in-differences model, which assumes a onetime post-Medicaid expansion change in outcomes; specifically, reimbursement per visit, reimbursement per RVU, and RVUs per visit, with patient zip code, facility, and time (month of visit) fixed effects and the following covariates: patient age, patient sex, visit CPT-4 Evaluation and Management code, and health system and site management relationship (Table E2, available online at http://www.annemergmed.com). Health system relationship was thought to be a potential confounder because of its effect on reimbursement rates within a local region according to market position. We clustered robust standard errors at the facility level. In addition, given the 2 years of post-ACA implementation data available, we also estimated a distributed lags model that allows effects to emerge over time. The overall effect is captured as the sum of coefficients in the distributed lag model. Specifications for the modeling are shown in Appendix E1 (available online at http://www.annemergmed.com).

In our second analysis, we estimated the differential effects of expansion across insurance groups. This was a similar difference-in-differences model, except that we examined the results of reimbursement between full-expansion and nonexpansion states in each insurance category. As did the previous model, this allowed a onetime postreform change in outcomes, with patient zip code, facility, and time (month of visit) fixed effects and the following covariates: patient age, patient sex, visit CPT-4 Evaluation and Management code, and health system and site management relationship (Table E2, available online at http://www.annemergmed.com). Health system and site relationship was divided into 5 categories: single ED contract, single hospital with 2 or more locations contract, regional multihospital system with contract to staff some EDs, regional multihospital system with contract to staff all EDs, and national healthcare system with contract to staff EDs in some regions. We clustered robust standard errors at the facility level. For this analysis, we focused only on visits to facilities in full-expansion versus nonexpansion states and excluded visits to facilities in partial-expansion states, given the lack of significance in reimbursement between partial-expansion and nonexpansion states (results below). We similarly estimated a distributed lags model to study the time pattern of the effect of ACA Medicaid expansion. Specifications for the modeling are shown in Appendix E1 (available online at http://www.annemergmed.com).

We also performed additional sensitivity analyses for differing time increments to allow additional control by major diagnostic codes whose use changed during the study period (*International Classification of Diseases, Ninth Revision* in effect until September 30, 2015) and to test the effect of omitting covariates to verify that these specifications did not significantly affect the main results reported (Tables E3 to E11, available online at http://www.annemergmed.com). Specifications for these sensitivity analyses in their modeling were similar to those for the main analyses described above.

We next estimated leads and lags regressions for our primary outcome of reimbursement per visit and secondary outcomes of reimbursement per RVU and RVUs per visit to investigate pre-expansion versus postexpansion trends between visits to facilities in full-expansion and nonexpansion states. We also estimated separate leads and

Table 1. Characteristics of included EDs, July 1, 2012, to December 31, 2015.

	Full-Expansion EDs (N=23, 7 states)		Partial-Expansion EDs (N=17, 5 states)		Nonexpansion EDs (N=10, 2 states)	
Independent Variable	**Pre-Medicaid Expansion**	**Post-Medicaid Expansion**	**Pre-Medicaid Expansion**	**Post-Medicaid Expansion**	**Pre-Medicaid Expansion**	**Post-Medicaid Expansion**
Total visits	1,262,078	1,451,872	1,011,637	1,352,462	730,523	978,223
Mean monthly visits, No. (SD)	3,086 (1,768)	3,377 (1,796)	3,306 (1,785)	3,541 (1,916)	4,058 (1856)	4,076 (1,651)
Mean patient age (SD), y	41.2 (23.3)	41.1 (22.9)	38.7 (25.6)	38.7 (26.1)	39.3 (22.4)	41.2 (22.2)
Men, %	44.1	44.4	45.7	46.1	42.2	42
Medicare, %	22.7	21.7	23	22.7	21.5	21.7
Medicaid, %	29	38.5	29.3	35.7	21.1	20.9
Commercial, %	23.1	21.8	28.7	26.5	24.7	27.9
Uninsured, %	21.8	15	12.6	9.4	30.6	28.5
Other insured, %	3.4	3	6.5	5.9	2.1	1
Visit codes 99281–99283 ED, %	24.9	25.3	29	28.9	25.4	24.3
Visit codes 99284–99285, %	69.9	70.4	64.9	66.1	68.4	70.5
Visit codes 99291–99292, %	5.2	4.4	6.1	5	6.2	5.2
ED patient zip codes, No.	12,128	13,045	11,820	13,489	9,164	9,795
Single hospital, % visits	20	13	37.2	41.3	30.8	30.2
Single hospital with ≥2 locations, % visits	12.6	14	31	28.4	—*	—
Regional multihospital system, some sites contracted, % visits	42.2	45.2	31.8	30.3	51.8	55.2
Regional multihospital system, all sites contracted, % visits	10.8	10.6	—	—	17.4	14.7
National healthcare system or hospital chain, % visits	14.4	17.2	—	—	—	—
Mean RVUs/visit, No. (SD)	3.92 (1.77)	3.81 (1.69)	3.86 (1.96)	3.71 (1.72)	3.90 (1.75)	3.85 (1.70)
Mean normalized reimbursement, $/visit, No. (SD)	100 (114.54)	112.97 (147.30)	120.45 (111.42)	125.02 (132.25)	98.02 (100.18)	105.49 (121.61)
Mean normalized reimbursement, $/RVU, No. (SD)	25 (24.79)	29.16 (34.13)	32.15 (25.60)	34.14 (30.91)	24.36 (21.74)	26.75 (29.16)

The pre-Medicaid expansion period is quarter 3 of 2012 to quarter 4 of 2013; the postexpansion period is quarter 1 of 2014 to quarter 4 of 2015, except that the Michigan postexpansion period began in quarter 2 of 2014, and the Pennsylvania pre-expansion period included 2014 and the postexpansion period began in quarter 2 of 2015. Reimbursement per visit is normalized to $100 for visits in the pre-expansion period in full-expansion states. Reimbursement per RVU is normalized to $25 for visits in the pre-expansion period in full-expansion states. We omitted data for Michigan for quarter 1 of 2014 and Pennsylvania for quarter 1 of 2015. Single hospital with greater than or equal to 2 ED locations is the main hospital and satellite ED location. Three Pennsylvania EDs in a regional multihospital system changed category on April 1, 2014, from some sites contracted to all sites contracted; we report visits according to contract status at the time of the ED visit.

*Dashes indicate no visits or EDs met this criteria.

lags regressions for our 3 outcome variables for each of the insurance groups. This allowed us to assess how the change in reimbursement was temporally related to Medicaid expansion through visual inspection of leads and lags graphs and to show whether the parallel trends assumption was met before expansion (ie, that trends were parallel during the pretreatment period). All analyses were conducted with Stata/MP (version 14.1; StataCorp, College Station, TX) and R (version 3.3.2; The R Foundation, Vienna, Austria).[15]

RESULTS

We included greater than 6.7 million ED visits to 50 EDs during a 3.5-year study period in 14 states. Of those, 3.0 million visits were pre-expansion and 3.7 million were postexpansion. Across study EDs, mean monthly visits increased by approximately 10%, and visit demographics were largely unchanged. In full-expansion states, the proportion of visits covered by Medicaid increased from 29% to 38%, increased from 29% to 36% in partial-expansion states, and remained constant at 21% in nonexpansion states. The proportion of uninsured visits decreased from 22% to 15% in full-expansion states, from 13% to 9% in partial-expansion states, and from 31% to 28% in nonexpansion states. Commercially insured visits decreased slightly (by 2%) in full- and partial-expansion states and increased 3% in nonexpansion states. In unadjusted analyses, normalized ED reimbursements per visit increased from $100 to $113 in full-expansion states, from $120 to $125 in partial-expansion states, and from $98 to $105 in nonexpansion states (Table 1). Figure E1 (available online at http://www.annemergmed.com) shows

Table 2. Difference-in-differences analyses for outcome measures for EDs in states with full, partial, and no Medicaid expansion.

Covariates	Reimbursement/Visit	Reimbursement/RVU	RVUs/Visit
Full×post	6.257*	6.852†	−0.021†
(SE)	(2.431)	(2.469)	(0.006)
[95% CI]	[1.371 to 11.142]	[1.890 to 11.814]	[−0.034 to −0.008]
Partial×post	−1.569	−1.520	−0.041
(SE)	(1.474)	(1.482)	(0.038)
[95% CI]	[−4.532 to 1.393]	[−4.498 to 1.457]	[−0.116 to 0.035]
Full expansion	−28.510†	−28.561†	0.060*
(SE)	(7.495)	(7.435)	(0.029)
[95% CI]	[−43.571 to −13.448]	[−43.502 to −13.620]	[0.002 to 0.117]
Partial expansion	39.641†	36.833†	0.284†
(SE)	(8.232)	(8.012)	(0.036)
[95% CI]	[23.097 to 56.185]	[20.732 to 52.935]	[0.211 to 0.356]
Constant	12.729*	119.355†	0.692†
(SE)	(4.860)	(9.159)	(0.023)
[95% CI]	[2.963 to 22.495]	[100.949 to 137.762]	[0.647 to 0.737]
R^2	0.173	0.081	0.612
Distributed lag results for full-expansion states			
Full×year 1	4.811*	5.341†	−0.018†
(SE)	(1.933)	(1.968)	(0.005)
Full×year 2	3.721‡	3.515	−0.009
(SE)	(2.052)	(2.177)	(0.007)
Sum of coefficients	8.532*	8.856*	−0.027*
(SE)	(3.665)	(3.771)	(0.011)
[95% CI]	[1.168 to 15.897]	[1.277 to 16.435]	[−0.049 to −0.006]

SE, Standard error; *CI*, confidence interval.
Covariates: Patient age, sex, visit CPT-4 Evaluation and Management codes, and health system and site management relationship, with patient zip code, facility, and month (which absorb postdummy) fixed effects. Reimbursement per visit and reimbursement per RVU are reported as percentage changes relative to average actual (not normalized) pre-expansion levels. The sample was 6,785,859 visits to 50 EDs between July 1, 2012, and December 31, 2015. Standard errors are clustered at the facility level. Significant results are at the 5% level or better.
*$P<.05$.
†$P<.01$.
‡$P<.10$.

the visit trends in the ED sample overall and by insurance status. Average numbers of monthly visits to sample EDs did not change significantly overall. However, as observed in previous studies, EDs in states with full Medicaid expansion had a significantly increased proportion of visits under Medicaid and concomitant decreased proportion of visits by the uninsured.[7-9] EDs in states with partial Medicaid expansion had a smaller increase in the proportion of Medicaid visits, without the same degree of decrease in uninsured visits. EDs in states with no Medicaid expansion had no significant change in the overall proportion of Medicaid and uninsured visits.

After adjusting for covariates (ie, age, sex, CPT-4 level, health system and site relationship with patient zip code, and facility and month fixed effects), reimbursement per visit increased 6.3% (95% confidence interval [CI] 1.4% to 11.1%) in full-expansion states compared with nonexpansion states but was not significantly changed in partial-expansion states compared with nonexpansion states (Table 2). Figure 1 demonstrates an increase in reimbursement per visit in full-expansion states (compared with nonexpansion states) that increased further in 2015. These results are confirmed in the distributed lag results in Table 2, which shows an increasing disparity in relative payments over time. Increases in reimbursement were driven by an increased reimbursement per RVU of 6.9% (95% CI 1.9% to 11.8%), whereas RVUs per visit decreased slightly (–0.02 RVUs [95% CI –0.03 to –0.01]) in full-expansion states.

Reimbursement per RVU increased immediately in quarter 1 after expansion and continued to increase in subsequent quarters (Figure 1*B*). Similarly, RVUs per visit decreased after expansion and continued a slight decline (Figure 1*C*). These findings are also confirmed by the distributed lag results. There was no change in reimbursement per RVU or RVUs per visit in partial-expansion states relative to nonexpansion states.

Reimbursement per visit for commercial insurance increased 17.1% (95% CI 9.9% to 24.2%) in full-expansion relative to nonexpansion states after adjusting for covariates. Similarly, reimbursement for self-pay visits increased 9.7% (95% CI 3.7% to 15.7%) in full-expansion

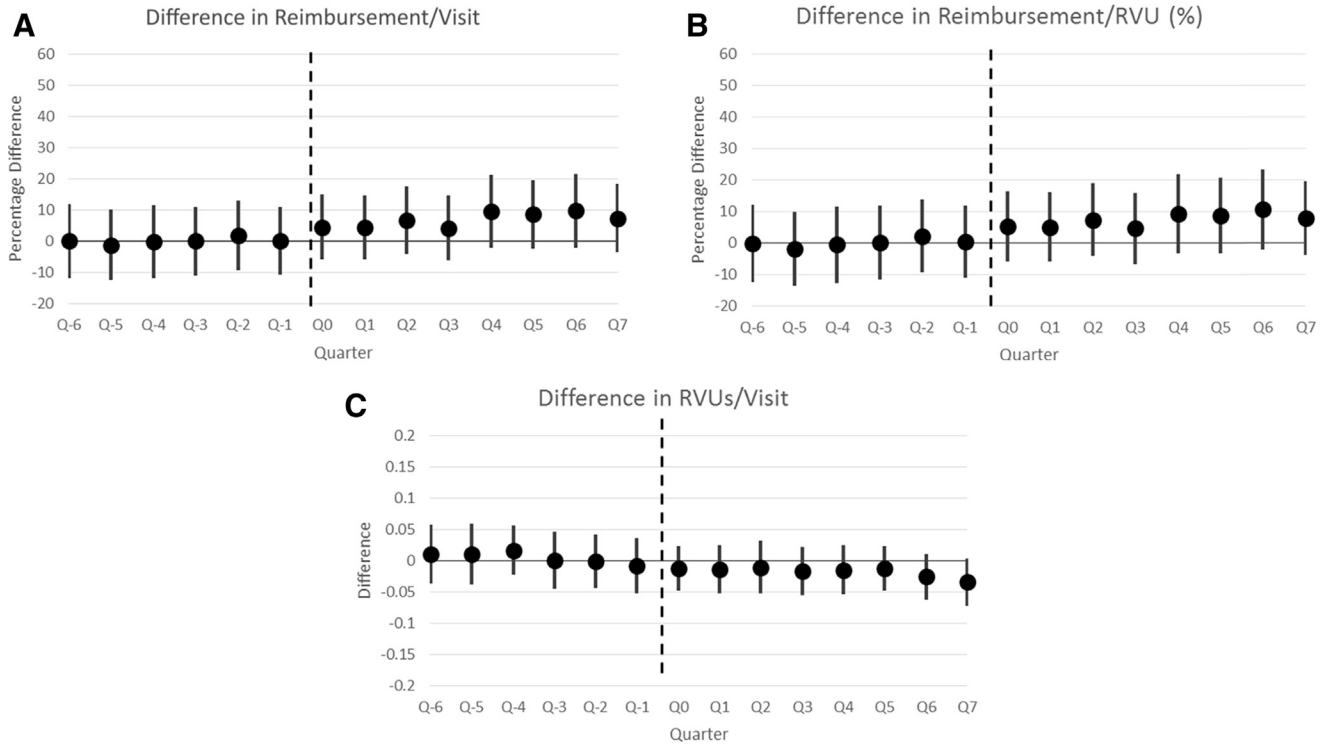

Figure 1. Leads and lags figures for reimbursement per visit, reimbursement per RVU, and RVUs per visit, July 1, 2012, to December 31, 2015. The leads and lags graphs use quarterly data of percentage differences in reimbursement per visit, reimbursement per RVU, and RVUs per visit between EDs in full-expansion versus nonexpansion states, in event time relative to Medicaid expansion date. Vertical bars show 95% CI. Point estimate for quarter 3 is set to zero. Sample and covariates are the same as in Table 2 for EDs in full-expansion and nonexpansion states. Standard errors are clustered at the facility level. Reimbursement per visit and reimbursement per RVU are reported as percentage changes relative to average pre-expansion levels. The dotted line between quarter 1 and quarter 0 separates pre- and post-Medicaid expansion periods. Quarter 0 is January to March 2014, with the exception of Michigan and Pennsylvania.

relative to nonexpansion states. Reimbursement per visit for Medicaid (1.5% [95% CI –1.2% to 4.2%]), Medicare (–0.05% [95% CI –1.6% to 1.5%]), and other insured visits (–2.6% [95% CI –17.7% to 12.5%]) on average was not different between full and nonexpansion states during the overall study period (Table 3). This was driven primarily by increases in reimbursement per RVU rather than by changes in RVUs per visit. Relative payments for commercial insurance increased in expansion states in 2014, whereas RVUs per visit

Table 3. Difference-in-differences analyses for outcome measures between Medicaid full-expansion and nonexpansion states by payer, July 1, 2012, to December 31, 2015.

Covariates	Reimbursement/Visit	Reimbursement/RVU	RVUs/Visit
Full×post×commercial	17.052*	18.924*	−0.030*
(SE)	(3.487)	(3.805)	(0.009)
[95% CI]	[9.949 to 24.154]	[11.174 to 26.675]	[−0.049 to −0.011]
Full×post×self-pay	9.696*	8.033†	0.004
(SE)	(2.930)	(3.351)	(0.012)
[95% CI]	[3.721 to 15.671]	[1.198 to 14.869]	[−0.019 to 0.028]
Full×post×Medicaid	1.531	1.779	−0.006
(SE)	(1.332)	(1.418)	(0.006)
[95% CI]	[−1.183 to 4.245]	[−1.109 to 4.668]	[−0.018 to 0.006]
Full×post×Medicare	−0.050	0.396	−0.017†
(SE)	(0.774)	(0.682)	(0.008)
[95% CI]	[−1.627 to 1.527]	[−0.993 to 1.785]	[−0.034 to −0.000]
Full×post×other	−2.570	−6.242	−0.037
(SE)	(7.394)	(8.019)	(0.025)
[95% CI]	[−17.672 to 12.531]	[−22.619 to 10.134]	[−0.088 to 0.013]
Distributed lag results for full-expansion states			
Full×comm×year 1	12.972*	14.543*	−0.023*
(SE)	(3.143)	(3.412)	(0.007)
Full×comm×year 2	14.577*	15.657*	−0.025†
(SE)	(5.196)	(5.405)	(0.010)
Sum of coefficients: full×comm (SE)	27.549* (5.525)	30.199* (5.752)	−0.048* (0.0141)
[95% CI]	[16.295 to 38.803]	[18.483 to 41.916]	[−0.076 to −0.019]
Full×self×year 1	9.256*	8.501*	0.004
(SE)	(2.562)	(2.825)	(0.010)
Full×self×year 2	1.196	−1.269	0.001
(SE)	(2.337)	(2.903)	(0.011)
Sum of coefficients: full×self (SE)	10.452† (3.918)	7.232 (4.721)	0.005 (0.017)
[95% CI]	[2.460 to 18.444]	[−2.398 to 16.861]	[−0.029 to 0.038]
Full×Medicaid×year 1	0.727	0.999	−0.008
(SE)	(0.926)	(0.957)	(0.005)
Full×Medicaid×year 2	3.851†	3.738‡	0.008
(SE)	(1.668)	(2.007)	(0.007)
Sum of coefficients: full×Medicaid (SE)	4.578† (2.164)	4.738‡ (2.561)	0.005 (0.009)
[95% CI]	[0.168 to 8.988]	[−0.480 to 9.955]	[−0.019 to 0.019]
Full×Medicare×year 1	−0.450	0.011	−0.016†
(SE)	(0.573)	(0.491)	(0.007)
Full×Medicare×year 2	1.592	1.535	−0.006
(SE)	(1.046)	(0.968)	(0.010)
Sum of coefficients: full×Medicare (SE)	1.143 (1.4821)	1.545 (1.314)	−0.022 (0.015)

Table 3. Continued.

Covariates	Reimbursement/Visit	Reimbursement/RVU	RVUs/Visit
[95% CI]	[−1.876 to 4.162]	[−1.133 to 4.224]	[−0.052 to 0.007]
Full×other×year 1	−5.619	−9.577	−0.035
(SE)	(5.585)	(6.221)	(0.023)
Full×other×year 2	24.252*	26.526*	−0.020
(SE)	(4.978)	(6.409)	(0.024)
Sum of coefficients: full×other (SE)	18.633† (8.935)	16.949 (10.993)	−0.055 (0.040)
[95% CI]	[0.384 to 36.881]	[−5.503 to 39.400]	[−0.137 to 0.026]

Covariates: Patient age, sex, visit CPT-4 Evaluation and Management codes, and health system and site management relationship, with patient zip code, facility, and month (which absorb postdummy) fixed effects. Reimbursement per visit and reimbursement per RVU are reported as percentage changes relative to average actual (not normalized) pre-expansion levels. We ran models separately for each of the 5 potential insurance categories the visit was covered under: Medicare, Medicaid, commercial, self-pay, and other. The sample was visits to 33 EDs with Medicaid full expansion and nonexpansion, staffed between July 1, 2012, and December 31, 2015. Standard errors are clustered at the facility level. Significant results are at the 5% level or better.
*$P<.01$.
†$P<.05$.
‡$P<.1$.

demonstrated a downward trend, particularly in the latter part of 2015 (Figure 2*A*). Self-pay reimbursement per visit also increased immediately after expansion, as did reimbursement per RVU, with no change in RVUs per visit (Figure 2*B*). Neither Medicaid nor Medicare reimbursements per visit increased in 2014, and both reimbursement per visit and RVUs per visit remained flat until the end of 2015, during which reimbursement per visit and reimbursement per RVU increased (Figure 2*C* and *D*). These findings were confirmed in the distributed lag results (Table 3). Among other insurance category visits, the difference in payments remained flat for 2014 but increased in 2015 (Figure 2*E*).

LIMITATIONS

There are several limitations to this study. First and most important was the relatively small sample size of only 50 EDs. Reimbursement changes in these EDs may not be generalizable because this sample represents only approximately 1% of US hospitals. In addition, the EDs studied were staffed by a single national emergency medicine group and may have been systematically different from EDs managed by other national groups or under different structures with respect to reimbursement and payer mix.

Second, we had access only to emergency physician reimbursement data, rather than overall reimbursement, which also includes facility fees. Facility fees are considerably higher than physician fees (often by 5-fold or more) and are a greater driver of costs.[16,17] Therefore, we cannot definitively conclude that all hospital payments related to ED visits increased, only the reimbursement apportioned to providers.

Third, we were unable to control for other secular changes in emergency physician reimbursement. Because this was a single emergency medicine group, and negotiation over contracted rates occurs centrally, it is possible that negotiations between the group and insurers at the state and local levels were different in expansion versus nonexpansion states. However, the temporal findings of our results (demonstrated in the figures), in which reimbursement in full-expansion states increased immediately after Medicaid expansion occurred, make this less of a concern. Theoretically, expansion itself (or expected expansion) may have affected whether an ED contract was sought; however, to our knowledge this was not a strategic goal of the group during the study period.

Fourth, we used RVUs as a measure of visit complexity, which may not fully reflect the intensity of care delivered to the patients. However, it is unlikely there was any differential change in the measurement of RVUs in expansion versus nonexpansion states.

Fifth, nonexpansion states started with considerably higher rates of uninsured patients and may be different from full- and partial-expansion states in other unmeasured ways.

Sixth, we were able to examine only total reimbursement for professional services and could not disaggregate payments from payers versus direct patient responsibility. Understanding this issue better would allow more detailed analysis of how the ACA and future changes to the health care system affect emergency physician reimbursement and out-of-pocket costs for patients.

Seventh, our Medicare category did not differentiate Medicare fee for service versus Medicare Advantage

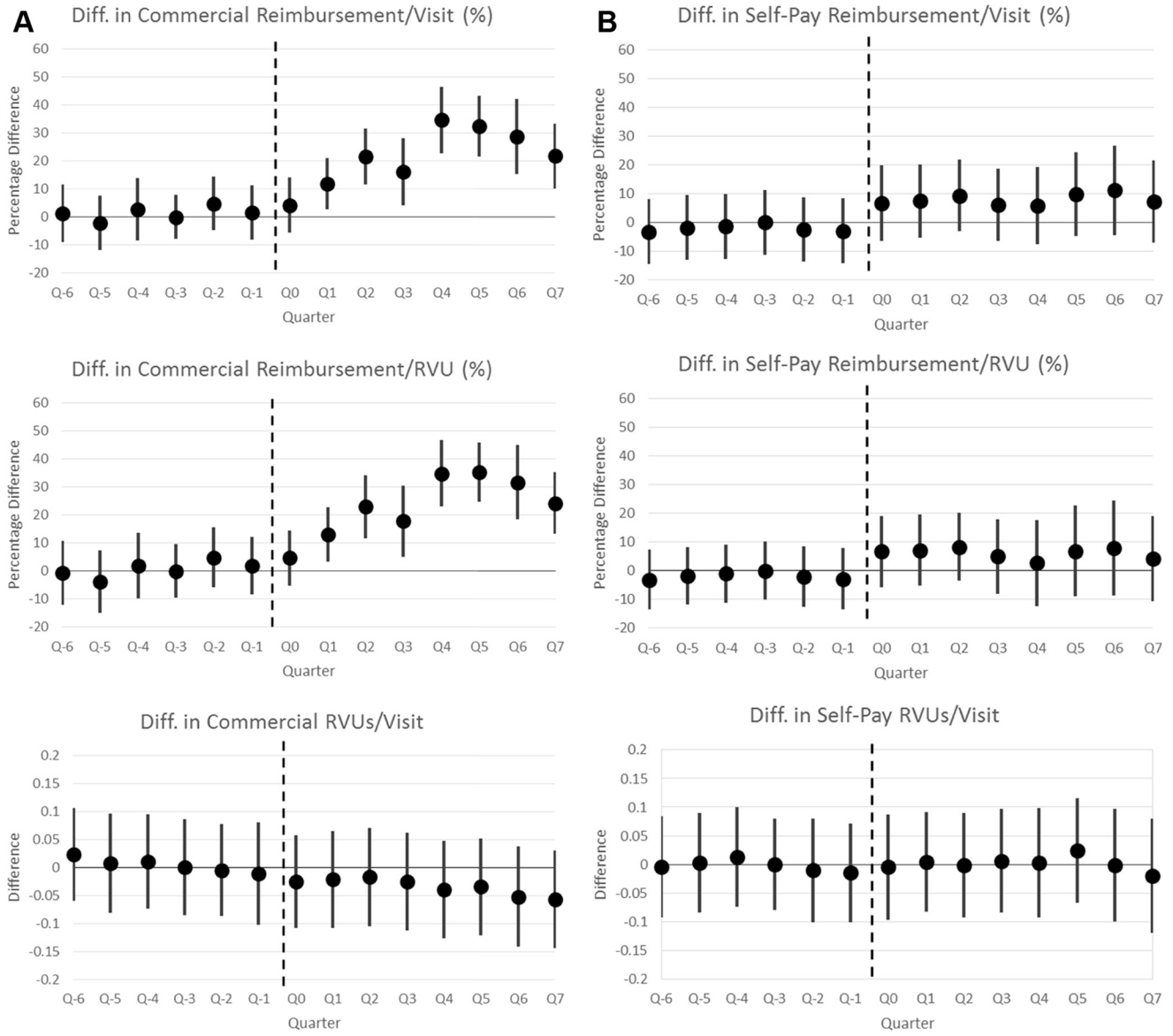

Figure 2. Leads and lags figures for reimbursement per visit, reimbursement per RVU, and RVUs per visit by payer, July 1, 2012, to December 31, 2015. Leads and lags graphs are shown separately for ED visits with commercial payment, self-payment, Medicaid payment, Medicare payment, and other payment source. The sample and covariates are the same as in Table 3 for full-expansion and nonexpansion states. Vertical bars show 95% CI. Quarter 0 is January to March 2014, with the exception of Michigan and Pennsylvania.

(including both), although the latter is similar to commercial insurance. This may have biased toward demonstrating differences among Medicare patients. However, none were observed, and this categorization likely reduced the actual effect on the commercially insured analysis, which might alternatively have included Medicare Advantage beneficiaries.

Eighth, we could not disaggregate how much of the effect of increased reimbursement resulted solely from an increase in Medicaid beneficiaries versus other effects on insurance coverage. However, because emergency physicians treat all patients regardless of payer type, an aggregated-effect analysis as we have reported is more relevant to understanding the effect of the ACA Medicaid expansion on emergency physician reimbursement.

DISCUSSION

In this sample of EDs, we found that full Medicaid expansion resulted in a more than 6% increase in emergency physician reimbursement per visit in full-expansion states compared with nonexpansion ones. This means that the changing payer mix caused by the

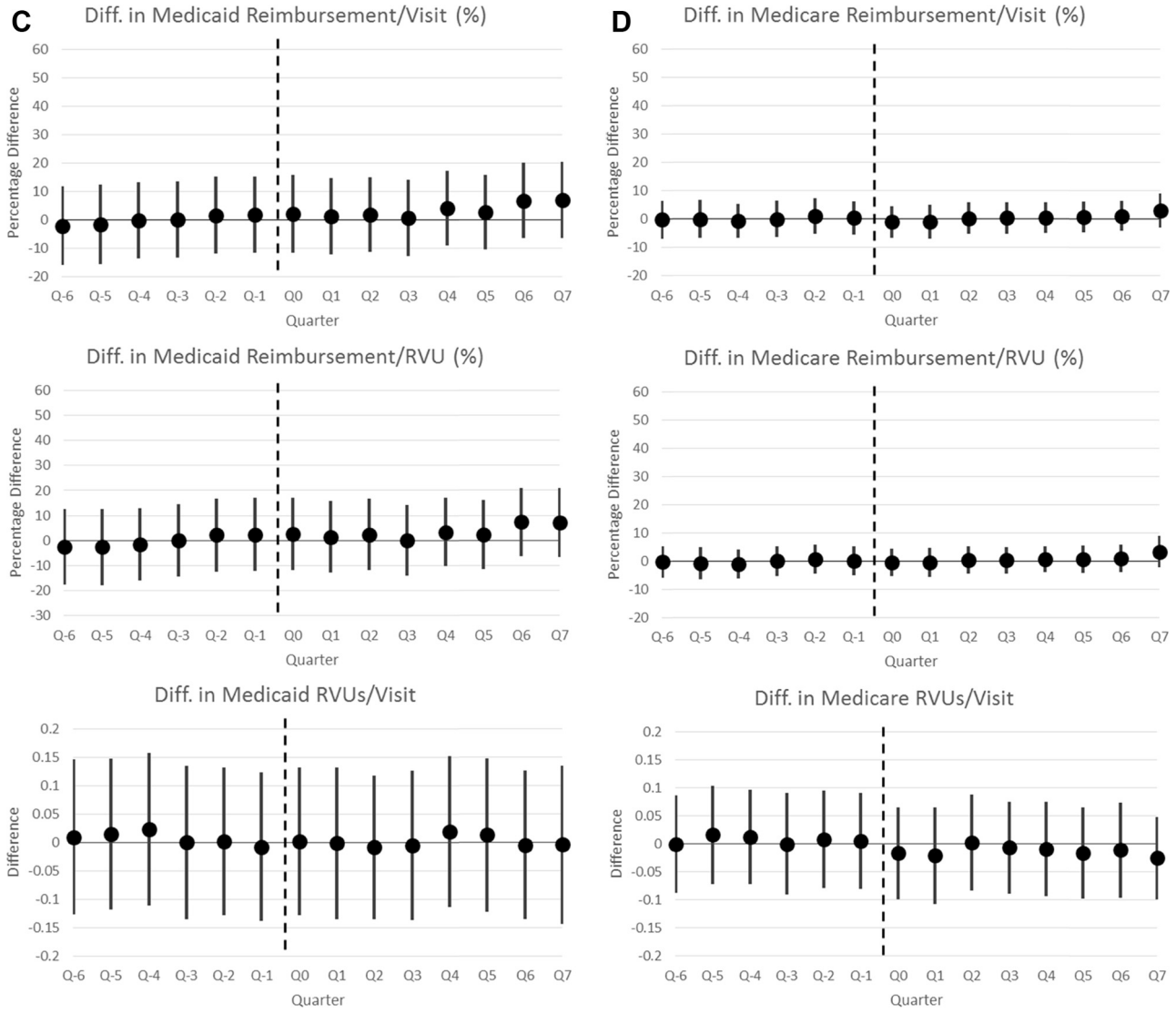

Figure 2. Continued.

ACA's Medicaid expansion policies, with more Medicaid (a 9% increase), fewer uninsured individuals (a 7% decrease), and fewer privately insured individuals (a 2% decrease), resulted in greater payments to emergency physicians for rendering care to approximately the same number of ED patients overall. This is an important finding for EDs, which are required by the federal Emergency Medical Treatment and Labor Act to provide medical care regardless of patients' ability to pay. In addition, because the 2014 Medicaid expansion had little to no effect on ED visit volumes, the overall economic effect needs to be examined closely per patient encounter. In comparison, facilities in partial-expansion states did not have observed changes in reimbursement, possibly because partial-expansion states experienced less of an increase in Medicaid-covered patients (a 6% increase) compared with full-expansion states, and also had a smaller decrease in uninsured self-pay patients (a 4% decrease).

Along with decreasing proportions of self-pay patients, increases in reimbursements in full-expansion states were also driven by relative increases in payments from both commercial insurance (a 17% increase) and payment for self-pay visits (a 10% increase). In expansion states, the small (2%) decrease in commercial insurance was likely a result of movement of patients from commercial insurance to Medicaid. Because beneficiaries who moved to Medicaid are likely the poorest of the commercially insured (ie, those in bronze-equivalent plans [the lowest category of classification of commercial insurance plans]), the remaining commercially insured patients may have had better-paying insurance. As a result, emergency physicians

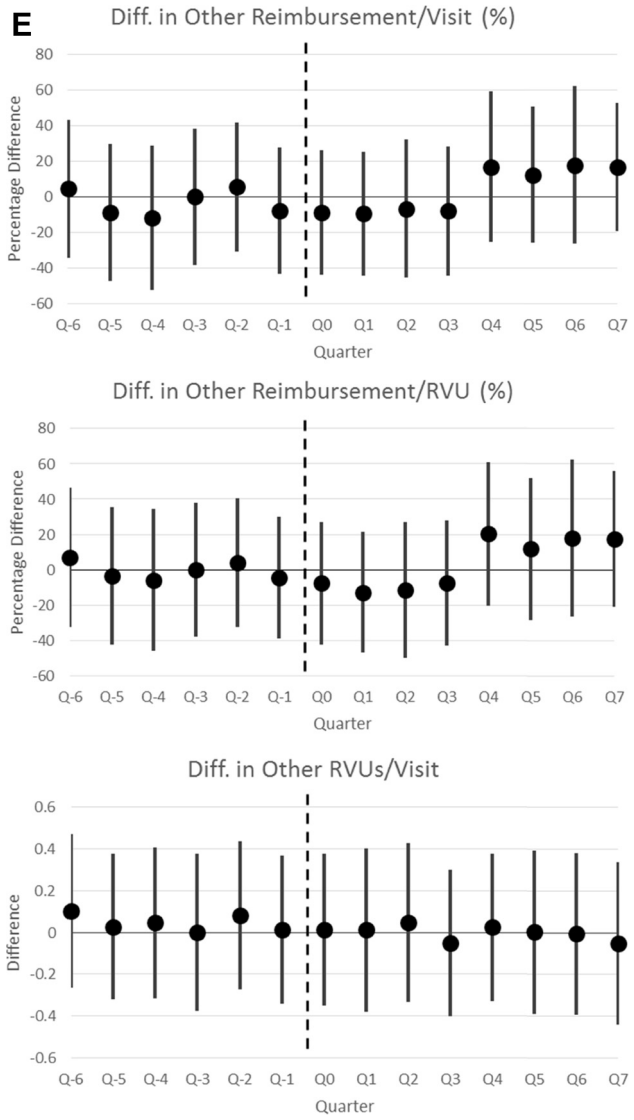

Figure 2. Continued.

may have been reimbursed more for care. In addition, self-pay patients who were financially close to being eligible for Medicaid pre-expansion and who were able to gain Medicaid insurance through the expanded eligibility requirements (up to 138% of the federal poverty level) were likely the poorest self-pay patients. As a result, remaining self-pay patients likely had more means to pay out of pocket for ED care, similarly increasing reimbursements to emergency physicians.

Understanding the effect of the ACA on payments to physicians and hospitals is a key component to evaluating its performance. Our study adds to a burgeoning literature on this topic. However, our study is the first to our knowledge to directly study emergency physician reimbursement after Medicaid expansion. A 2016 study in the *Journal of the American Medical Association* in greater than 1,200 hospitals in Medicaid expansion versus nonexpansion states found increases in Medicaid revenue, lower costs of uncompensated care, and a relative improvement in profit margins of 1.1% in Medicaid expansion states.[18] Another recent study from the Commonwealth Fund found that Medicaid expansion improved operating margins in safety-net hospitals in expansion states through Medicaid revenue and lower rates of uncompensated care.[19] Operating margins in safety-net hospitals in expansion states increased from –3.2% in 2012 to –2.1% in 2015 compared with those in nonexpansion states, which declined from 2.3% in 2012 to 2.0% in 2015. However, equally important to the effect of Medicaid expansion on payments to physicians and hospitals is the effect on out-of-pocket payments for patients. A recent study using data from the Consumer Expenditure Survey (2010 to 2015) demonstrated that patients in Medicaid expansion states did not experience higher out-of-pocket payments.[20] This suggests in the context of our study findings and others that changes in payments to EDs and hospitals may be largely borne by payers rather than patients. Future work in this area should continue to closely monitor changing payment patterns to emergency physicians in the context of evolving health care insurance policies, with a focus on out-of-pocket payments by patients, which are increasingly a concern.[21] However, we were not able to disaggregate payments from payers versus those directly from patients, except presumably in the self-pay category, in which the payment comes only from the patient and increased by 9.7%.

In conclusion, we found that full Medicaid expansion was associated with increased reimbursements to emergency physicians compared with that in nonexpansion states in this sample of EDs. This was driven by lower proportions of uninsured patients and better reimbursement per visit for both commercially insured and self-pay patients.

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Author contributions: JMP, BSB, CKC, JNC, and AV conceived the study. CKC supervised data collection. RL and BSB conducted the statistical analysis. All authors prepared the article. AV takes responsibility for the paper as a whole.

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