No Significant Association between Anesthesia Group Concentration and Private Insurer Payments in the United States

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ABSTRACT

Background: Markets for physician services are becoming increasingly concentrated, with many areas being dominated by a few groups. Antitrust authorities are concerned that increasing concentration will lead to inappropriately high payments for physician services from private insurers. The authors examined the association between market concentration and private insurer payments for anesthesia services.

Methods: The authors obtained data on average payments from private insurers for five commonly used anesthesia Current Procedure Terminology codes for physicians located in 229 counties in the United States between 2002 and 2010. The authors calculated a measure of market concentration (the Herfindahl–Hirschman Index [HHI]) for anesthesiologists in each county using Medicare claims data. The authors then estimated the association between market concentration and private insurer payments using a difference-in-differences approach to minimize confounding.

Results: Private insurer payments to anesthesiologists in more concentrated markets were not significantly different from payments in less concentrated markets. Compared with the 25% of counties with the least concentration (counties with an HHI in the 0th to 25th percentile), payments in counties in the 25th to 50th percentile of HHI were approximately 0.51% less (95% CI, −2.3 to 1.3%, $P = 0.95$), whereas payments in counties in the 50th to 75th percentile of HHI were approximately 2.8% less (95% CI, −6.7 to 1.4%, $P = 0.41$) and payments in counties in the 75th to 100th percentile were approximately 3.1% less (95% CI, −8.1 to 1.2%, $P = 0.32$).

Conclusion: Increasing market concentration of anesthesia groups is not associated with significantly greater payments from private insurers. **(ANESTHESIOLOGY 2015; 123:507-14)**

IN the United States, physicians practice medicine in a variety of settings, ranging from small solo practices consisting of one physician to large, multispecialty group practices consisting of hundreds or even thousands of physicians. A potential benefit of larger practices is that they can provide resources such as professional colleagues, administrative support, enhanced opportunities for professional development, and—in the case of academic practices—opportunities for teaching. At the same time, larger practices can lead to higher payments for physician services, because practices gain leverage in bargaining with insurers or others. Physician practices have become increasingly concentrated in the United States, as demonstrated by the decrease in the number of physicians engaged in solo practices,[1,2] the increasing number of physicians employed by hospitals or integrated delivery systems,[3] and the increasing size of medical group practices, raising questions about impacts on payments to physicians in concentrated areas.[4–7] Previous work suggests that increasing concentration is associated with higher payments in some cases, but no studies have examined the degree of market concentration within anesthesia or its effect on anesthesia group compensation.

What We Already Know about This Topic

- Markets for physician services are becoming increasingly concentrated, and this could result in inappropriately higher payment for physician services

What This Article Tells Us That Is New

- In a review of payments from private insurers for five commonly billed anesthesia codes in 229 counties in the United States from 2002 through 2010, payments to anesthesiologists in more concentrated markets were not significantly different from payments in less concentrated markets

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Several factors may be driving concentration among anesthesia groups. When hospitals and health systems merge, anesthesia groups may face pressure to merge as well, to place all anesthesia services under a single contract.[8] Groups may merge to benefit from economies of scale,[9] such as increased negotiating power with suppliers and ability to spread fixed costs over a larger practice base. Larger groups may also have access to superior employee benefits such as pension plans, group health, and life and disability compared with small groups. Moreover, larger groups may help improve patient care by facilitating clinical information exchange, the use of practice guidelines, and the development of large scale initiatives to improve quality.[10] These benefits likely form the underlying rationale for large, national anesthesia practices (also known as aggregators) such as North American Partners in Anesthesia and MEDNAX, whose influence and size are continuing to increase in the United States.

Increasing concentration can also change the balance of market power in negotiations over prices, allowing practices in more concentrated markets to command higher prices for their services, potentially without providing additional benefits that would justify the higher costs. This has raised concern from a number of quarters, including U.S. antitrust authorities. For example, in 2006, the U.S. Department of Justice announced its intent to block the merger of several anesthesiology groups in Southern California.[11] These concerns seem reasonable in light of a large literature documenting that hospital concentration is associated with higher private insurer payments,[12–15] whereas health insurer concentration is associated with increased premiums. Recently, we found that physician concentration was associated with increased payments from private insurers for outpatient office visits[16] and total knee arthroplasty,[17] but the effects of concentration on payments for anesthesia services are unknown. Several factors unique to anesthesia may mitigate an extent to which more concentration would drive higher prices from private insurers. First, anesthesia groups typically enter into negotiations with other entities besides insurers, including hospitals and their host institutions, and may choose to focus their efforts elsewhere. Although these negotiations may increase the group's income (through increased subsidies from the hospital), these negotiations would not necessarily affect the price insurers themselves pay for anesthesia care. Second, anesthesia seldom serves as a "patient draw" to a hospital, and patients typically do not choose their own anesthesiologist. These factors may make it easier for new, less established groups to compete against larger, more established groups.

In this study, we examine the association between anesthesia group concentration and payments to anesthesiologists from private insurers. We focus on private payers because in the United States, payments from public payers (*e.g.*, Medicare or Medicaid) are typically not negotiable. Using Medicare claims data, we identify highly concentrated markets, most commonly places where a few anesthesia groups provide a large share of cases. We then determine whether increased concentration is associated with greater payments from private insurers.

Materials and Methods

Data

This study received institutional review board approval (Stanford University, Stanford, California). Our data on payments come from MarketScan®, a database of administrative claims provided by Truven Analytics (MarketScan® Database, Truven Analytics, USA). MarketScan® provides person-level data on utilization and expenditures across outpatient, inpatient, and pharmacy services for patients insured by large employers, health plans, and government and public organizations. The data include procedure codes and the amounts paid to the provider (*i.e.*, not billed or charged). The data are frequently used in analyses of health care payments and spending[18–21] and are publicly available for purchase.

Anesthesia Payments

We purchased from MarketScan® the mean amount paid by private payers for five anesthesia Current Procedural Terminology (CPT) codes by the county of United States (based on the reported physician practice location) for each year between 2002 and 2010. Similar to International Classification of Diseases codes, the CPT code is a coding system commonly used in the United States by insurers and providers to identify specific procedures. The five anesthesia CPT codes we considered were as follows: (1) 00790 (in brief, anesthesia for upper abdominal surgery—formal descriptions for this and other CPT codes can be found in table 1), (2) 00840 (anesthesia for lower abdominal surgery), (3) 01400 (anesthesia for knee joint surgery), (4) 01480 (anesthesia for lower leg bone surgery), and (5) 01967 (anesthesia for Cesarean delivery). We limited our choice to these five CPT codes because they are commonly performed and the associated surgical procedure almost always requires the presence of an anesthesia provider.

Table 1. Sample Summary Statistics

	Sample Counties	Excluded Counties	*P* Value
N (counties)	229	1,279	
Population	579,244 (58,159)	102,572 (4,705)	<0.0001
Median income (US $)	42,870 (672)	39,674 (285)	<0.0001
Rural (%)	6.55 (1.64)	55.9% (1.39)	<0.0001
Northeast (%)	10.9 (2.07)	13.4 (0.954)	0.2956
Midwest (%)	23.1 (2.79)	29.4 (1.27)	0.0534
South (%)	45.4 (3.30)	44.9 (1.40)	0.8807
West (%)	21.8 (2.74)	13.9 (0.968)	0.0021

Demographic characteristics of the counties in our sample compared with counties excluded from our analysis, based on the first year the county entered our sample. A *t* test was used to assess the significance of differences between the two groups.

Our initial sample consisted of payments from 1,508 counties in which there was at least 1 bill for at least 1 of the 5 included services. We further restricted this sample for two reasons. First, not every county was present in every year. (This happened largely because the number of patients covered by insurers providing data to MarketScan® substantially increased between 2002 and 2010, with a resulting increase in the number of counties with data over time.) Second, although the five CPT codes we chose comprise commonly performed procedures, many of these procedures were not performed consistently on annual basis in each county, particularly in smaller counties where access to surgical care (and, therefore, the number and types of procedures available) may be limited. As a result, data for each CPT code were not present for each county in every year of our sample. On the basis of these two factors, we restricted our analysis to the 229 counties with data on all five CPT codes during the entire period. These counties accounted for most (71%) of the claims for these five CPT codes. Our final sample consisted of 10,305 observations (229 counties × 9 yr × 5 procedures per county year).

Market Concentration

The idea of concentration is to capture a continuum from markets in which there are many small firms providing a good service, all of which might be competitors, to markets that are increasingly dominated by fewer and fewer firms, and finally to markets in which there is a single (monopoly) firm. For example, in the software industry, the market for desktop operating systems is extremely concentrated, because Microsoft (the maker of the Windows operating system) controls nearly 90% of the market.[22] Competition represents the degree to which the firms in a given market compete for consumers' business. In the United States, antitrust authorities are interested in ensuring that markets remain competitive, under the belief that increased competition generally results in lower prices for consumers. Although concentration is easy to measure (because it is based on firms' market shares, which can be observed), competition is not. As a result, when evaluating the competitiveness of an industry and the potential effects of mergers, antitrust authorities tend to use concentration as a proxy for competition, with the view that more concentrated markets or industries—those dominated a small number of firms—tend to be less competitive, because there are fewer firms to compete for consumers.[23]

Our measure of concentration is the Herfindahl–Hirschman Index (HHI),[23] which is calculated by summing the squares of each anesthesia group's percentage market share. The HHI approaches 0 when there are many groups, each with a small market share, and attains a maximum value of 10,000 when there is a single group that controls the entire market in the county. For example, if there were two anesthesia groups each with 50% market share for the five CPT codes in a county, the HHI would be 5,000, where $5{,}000 = 50^2 + 50^2$. We use the HHI to measure market concentration because it is frequently used by the Department of Justice and other regulatory agencies when examining the effect of potential mergers. Although appropriate HHI levels vary by industry, in general, the Department of Justice considers markets with an HHI between 1,500 and 2,500 to be "moderately concentrated" and those with an HHI of greater than 2,500 to be "highly concentrated."[23]

To calculate the HHI, we needed to (1) identify individual anesthesia groups and (2) calculate their market shares. Because these data were not available in the MarketScan®, we used data from a 20% sample of Medicare claims. Medicare data can be purchased from the Research Data Assistance Center, which is subject to a review process. Although patient demographics and the types of cases are likely to differ between the Medicare and privately insured population, there should be substantial overlap in the set and structure of anesthesia providers serving both populations, particularly because anesthesia providers typically cannot choose their patients. Medicare data provide four pieces of information that allow us to construct an HHI: (1) the specialty of the billing provider, (2) the taxpayer ID (TIN) for the billing provider, (3) the zip code of the patient's residence, and (4) the billing provider's zip code. By using the Medicare data, we first proceeded by extracting all claims submitted by an anesthesia provider (anesthesiologist or nurse anesthetist).

Following previous studies,[16,17,24,25] we then identified anesthesia groups as sets of anesthesia providers using a common TIN. As described in these studies, the TIN reasonably reliably identifies practices of the form normally known as "medical group practices," perhaps the most common and most integrated form of practice organization. Physicians and other providers in medical groups typically share staff and are usually financially integrated (*i.e.*, have a single accounting bottom line).[6] Medical groups frequently have a single TIN that is reported on claims for all providers in the group, although there is no legal requirement that they do so.

We then proceeded to calculate the HHI on an annual basis for each county in our sample. One approach would be to calculate the market share for each anesthesia group in a given county by dividing the number of claims submitted by the group by the total number of claims submitted by all anesthesiologists practicing in the given county. These market shares could then be used to calculate the HHI for the county using the aforementioned formula .

However, because anesthesia groups may compete for and draw patients across county lines, this approach would tend to overestimate the degree of market concentration. For example, consider the case of large, integrated systems (*e.g.*, the Mayo Clinic) that tend to draw patients from other counties. In effect, then, these groups compete with groups in neighboring counties, so that the relevant market is larger than an individual county. The simple approach described earlier—which would restrict the calculation of market

shares to a county-by-county basis—would overestimate the degree of concentration because the true "market" for a given group is larger than the county it resides in.

Therefore, following previous studies,[16,17,26] we calculated the HHI in a way that accounts for this possibility. First, for each practice, we identified the set of zip codes from which the practice drew patients.* For each zip code, we calculated the HHI based on the market shares of the anesthesia groups serving the patients in the zip code. The final HHI for an individual practice was then calculated as the mean of the zip code HHIs across the zip codes served by an individual practice. Finally, we calculated a county-level HHI by calculating the mean HHI across the practices serving a given county. In essence, our modified HHI measure is constructed by calculating the market shares for the practices located in a given county, where the market facing an individual practice is determined by the zip codes from where the practice draws patients and not simply the county the group is located in. As we described elsewhere,[16,17,26] this methodology allows us to examine the concentration at the county level, taking into account the fact that the anesthesia groups may compete across county lines.

Statistical Analyses

Because a simple cross-sectional comparison of payments across markets could be subject to confounding, we used a difference-in-differences analysis to identify the effect of increased market concentration on payments from private insurers. Under this approach, county-specific controls were used to adjust for unobservable market-level factors. Thus, rather than comparing payments and concentration across counties, our approach examined how changes in concentration within a given county over time were associated with payments. Moreover, the use of year-specific controls adjusted for general market trends affecting all counties in a given year.

We implemented our difference-in-differences approach using a multivariate linear regression in which the dependent variable was the average payment for a given procedure in a given county for a specific year. In addition, we constructed a summary measure that combined payments for the five services into a payment index. Payment (or price) indices are often used to compare prices of groups of procedures[27,28] or drugs[29,30] and typically consist of utilization-weighted averages of the component drugs/procedures. In our situation, we calculated the payment index as the weighted average of the payments for all five CPT codes in a given county for a specific year, where the weights are the relative share of claims for each procedure (table 2). Our primary analyses used the payment index as the dependent variable, but we also performed separate analyses where the dependent variable was simply the average payment for each CPT code separately.

Our primary independent variables were dummy variables indicating whether a market was in the 25th to 49th percentile for HHI, the 50th to 74th percentile for HHI, or the 75th to 100th percentile for HHI. The use of these dummy variables allowed us to estimate how each category affects payment without imposing a strict functional form on how the HHI affects payment. However, we also performed separate analyses in which we incorporated HHI directly and the natural log of HHI.

To implement our difference-in-differences approach, our regression model included dummy variables for county and year. To reduce confounding further, we included controls at the county level: linear time trends, total population, share of the population older than 65 yr, share of the population that was white, share of the population that was male, and median income. We chose these demographic variables as controls because they may affect patients' willingness to pay for medical care, which may in turn affect how insurers negotiate and the prices they pay for medical services. These variables have been used in similar studies examining the effects of concentration.[13,16,17] Annual population and income data were obtained at the county level from the U.S. Census Bureau. All dollar values were converted to year 2010 U.S. dollars using the Consumer Price Index. So that the results may be easily viewed in percentage terms for comparison across procedures (table 2), we converted all dollar figures to natural logs. Doing so allows us to convert the regression coefficients associated with our dummy variables into percentage effects on payments using methods described elsewhere.[31] SEs were clustered at the county level. Further details of our linear model are outlined in the technical appendix (see Supplemental Digital Content 1, technical appendix, http://links.lww.com/ALN/B178). All analyses were performed with STATA version 13 (StataCorp., USA).

Results

Table 1 compares the demographics of the 229 counties included in our analysis with those of the 1,279 excluded counties. Rural status was obtained from the National Center for Health Statistics.[32] Geographic region (*e.g.*, Northeast, Western United States) was based on definitions provided by the U.S. Census Bureau.† In constructing the table, we used the demographic variables associated with each county in the first year it was present in our sample. Compared with the excluded counties, the counties included in our analysis had a significantly higher population (mean, 579,244 *vs.* 102,572, $P < 0.0001$) and median income (42,870 USD *vs.* 39,674, $P < 0.0001$). The included counties were also more likely to be located in the Western United States (21.8 *vs.* 13.9%, $P = 0.0021$) and were less likely to be classified as rural (6.55 *vs.* 55.9%, $P < 0.0001$).

* Similar to postal codes used internationally, zip codes typically comprise a smaller geographical area than a county. As a result, the entirety of a zip code is usually contained within a county. However, the borders do not always align exactly, so that it is possible for a zip code to be spread across two counties and *vice versa*.

† See http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf. Accessed May 26, 2015.

Table 2. Payment for Anesthesia CPT Codes, 2002–2010

CPT	Description	Frequency (Claims)	Payment ($) Mean (SD)	25th Percentile	50th Percentile	75th Percentile
00840	Anesthesia for intraperitoneal procedures in lower abdomen including laparoscopy; not otherwise specified	533,229	738 (181)	623	706	827
01400	Anesthesia for open or surgical arthroscopic procedures on knee joint; not otherwise specified	382,021	528 (166)	432	500	592
00790	Anesthesia for intraperitoneal procedures in upper abdomen including laparoscopy; not otherwise specified	373,205	794 (212)	661	755	896
01480	Anesthesia for open procedures on the bones of lower leg, ankle, and foot; not otherwise specified	254,821	526 (151)	429	500	595
01961	Anesthesia for cesarean delivery only	254,629	712 (212)	581	679	807

The distribution of payments from private insurers for the five anesthesia CPT codes is shown. "Description" refers to an anesthesia CPT for the given procedure. "Frequency" shows the number of claims for each procedure. All dollar values are in year 2010 U.S. dollars. Source: MarketScan® (Truven Health Analytics, USA).
CPT = Current Procedural Terminology.

Among all five anesthesia CPT codes, table 2 shows substantial heterogeneity in private insurer payments across markets. Payments among counties in the 25th percentile of payments were generally 15 to 20% less than the median market; conversely, payments in the 75th percentile were 15 to 20% greater.

Table 3 shows summary characteristics of the markets in our analysis. By using a Wilcoxon signed-rank test, we found that more concentrated areas tended to have smaller populations, a larger share of whites, and lower incomes ($P < 0.0001$ for each characteristic). Figure 1 shows that the market for anesthesia groups was, by standards of the U.S. Department of Justice, fairly concentrated. In 2002, only 11% of counties were considered nonconcentrated (HHI < 1,500), whereas 55% would be considered moderately concentrated (HHI, 1,500 to 2,499) and 34% would be considered highly concentrated (HHI > 2,500). In 2010, 17% of markets were "nonconcentrated," 24% were highly concentrated, and 60% were moderately concentrated.

Table 4 shows the results of our difference-in-differences analysis. As a first analysis, we examined the association between our payment index (a weighted average of payments for all five anesthesia CPT codes) and market concentration. There was no statistically significant association between concentration and payments. None of the coefficients on the HHI categories were statistically significant. If anything, the results tended toward associating more concentration with lower prices. For example, the coefficient on the most concentrated areas showed prices roughly 3.1% lower than in the least concentrated areas, but the results were not significant (95% CI, −8.1 to 1.2%, $P = 0.32$). Compared with the 25% least concentrated, most competitive, markets (markets in the bottom quartile of HHI), payments for anesthesia CPT codes were approximately 0.51% less in markets in the 25th to 49th percentile of HHI (95% CI, −2.3 to 1.3% higher, $P = 0.95$), approximately 2.8% less in markets in the 50th to 74th percentile of HHI (95% CI, −6.7 to 1.4% higher, $P = 0.41$) and approximately 3.1% less in markets in the 75th to 100th percentile (95% CI, −8.1 to 1.2%, $P = 0.32$). When considered by procedure, there was also no significant association and the overall patterns in the results were similar.

In our sensitivity analyses, we considered several alternate specifications (see Supplemental Digital Content 2, appendix table 1, http://links.lww.com/ALN/B179). First, we examined using lagged values of HHI, which produced results in line with those shown here. Second, we performed analyses where we directly incorporated HHI into the regression model and where we incorporated the natural log of HHI into the regression model. In both scenarios, the results showed no significant association between payments and HHI (both $P > 0.15$). For

Table 3. Summary Characteristics for Markets Studied, by Market Concentration

	Market Concentration 0–25th Percentile	25th–50th Percentile	50th–75th Percentile	75th–100th Percentile	*P* Value
HHI range	890–1,672	1,673–2,062	2,063–2,644	2,645–6,373	
Total population	1,074,135 (1,406,205)	602,700 (743,430)	437,708 (513,293)	284,457 (315,043)	<0.0001
White population (%)	73.1 (15.1)	75.5 (15.7)	80.8 (13.8)	83.9 (11.0)	<0.0001
Elderly population (%)	12.4 (3.12)	11.9 (2.64)	12.4 (3.33)	12.4 (3.02)	0.198
Male population (%)	48.7 (0885)	48.8 (0.928)	49.0 (1.00)	49.0 (0.982)	<0.0001
Median income ($)	50,998 (14,125)	47,937 (11,872)	46,229 (9,589)	45,093 (9,316)	<0.0001

Summary statistics for the markets in our analysis, segregated by market concentration is shown. SDs are shown in parentheses. Dollar values shown are 2010 U.S. $. "*P*" refers to the significance of a trend across the four consolidation quartiles, using a Wilcoxon rank sum test.
HHI = Herfindahl–Hirschman Index.

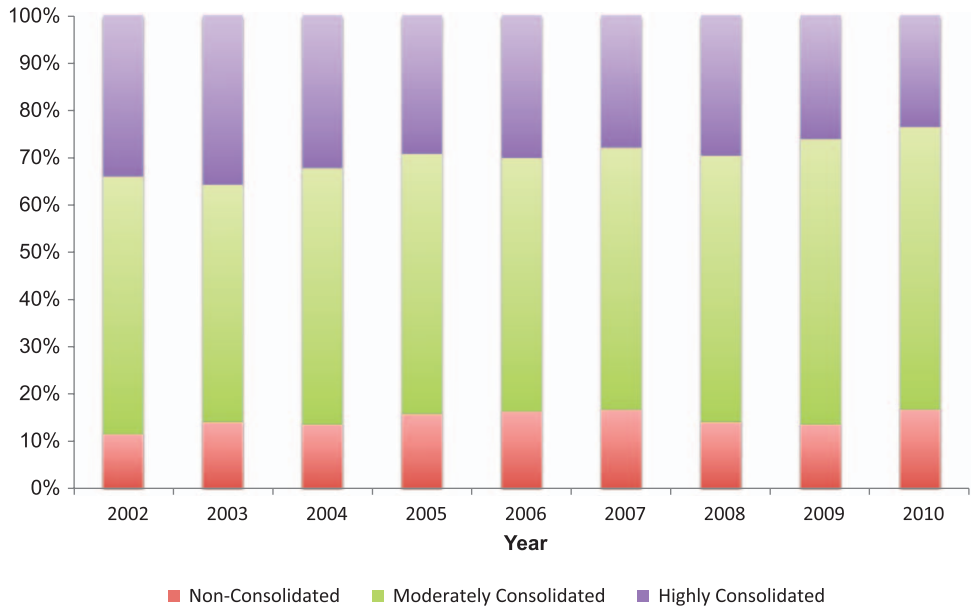

Fig. 1. The market concentration for anesthesiology, as measured by the Herfindahl–Hirschman Index (HHI) during the study period. For each region, the HHI was calculated by summing the market shares across all providers in the region. The figure shows the percentage of markets classified as nonconsolidated (HHI, 0 to 1,500), moderately consolidated (HHI, 1,500 to 2,500), and highly consolidated (HHI, 2,500 to 10,000) using Department of Justice criteria (see footnote † in Results).

Table 4. Market Concentration and Anesthesia Payments, 2002–2010

	Procedure (CPT)					
	Index	00790	00840	01400	01480	01961
Herfindal–Hirschman Index (percentile)						
25th to 50th percentile	−0.508	−0.653	0.00452	−1.10	−0.856	−0.377
	(−2.27 to 1.29) *P* = 0.953	(−2.34 to 1.06) *P* = 0.800	(−2.03 to 1.98) *P* = 0.649	(−3.09 to 0.932) *P* = 0.569	(−3.36 to 1.72) *P* = 0.873	(−2.46 to 1.75) *P* = 0.882
50th to 75th percentile	−2.76	−3.35	−3.02	−3.40	−2.76	−0.985
	(−6.70 to 1.36) *P* = 0.406	(−7.35 to 0.820) *P* = 0.277	(−6.82 to 0.939) *P* = 0.314	(−8.41 to 1.89) *P* = 0.437	(−7.98 to 2.74) *P* = 0.616	(−4.75 to 2.93) *P* = 0.997
75th to 100th percentile	−3.10	−4.65	−3.91	−3.93	−3.83	−1.00
	(−8.14 to 1.16) *P* = 0.319	(−9.39 to 0.327) *P* = 0.180	(−8.09 to 0.443) *P* = 0.204	(−9.66 to 2.16) *P* = 0.433	(−10.3 to 3.11) *P* = 0.546	(−4.96 to 3.11) *P* = 0.990
N	2,061 = 229 counties × 9 yr					
R^2	0.959	0.943	0.948	0.952	0.936	0.928

The results of a multivariate regression examining the effect of market concentration on anesthesia payments for the given anesthesia CPT code, as well as the "Index," which is an overall summary measure of payments calculated as a weighted average of payments for the five individual CPT codes. The values shown are the estimated percentage change in private insurer payments associated with the given Herfindahl–Hirschman Index quartile; the omitted quartile is the 0th to 25th percentile. Not shown are controls for procedure, county, and year, as well as controls for population, median income, white share of the population, linear county trends, and share of the population older than 65 yr. 95% confidence intervals shown in parentheses are adjusted for clustering at the county level.

CPT = Current Procedural Terminology.

example, for our payment index, the regression coefficient associated with HHI itself was −0.143 but was insignificant (95% CI, −0.359 to 0.073). In the case of the natural log of HHI, our regression coefficient associated with the natural log of HHI is −0.0379 and was insignificant (95% CI, −0.101 to 0.0245).

Discussion

Our results suggest that the market for anesthesia groups was fairly concentrated in 2010 with 60% of anesthesia markets being moderately concentrated (HHI, 1,500 to 2,499) and 24% being highly concentrated (HHI ≥ 2,500). These values decrease within the broad ranges reported for other health care specialties and hospital markets. For example, among physician groups in 10 other specialties the proportion of markets with an HHI greater than 2,500 varied between 17 and 98%, with a median of 64%.[16] Similarly, another study found that 6% of hospital markets were nonconcentrated and an additional 13% were moderately concentrated.[33] Interestingly, our results suggest that anesthesiology may

have become less concentrated during this time period, with the number of highly concentrated markets in our sample (HHI ≥ 2,500) decreasing from 34 to 24%.

Payments in more highly concentrated markets were not significantly different from those in less concentrated markets. If there were any trend, it would be for concentration to be associated with a decrease in payments. Two points are worth noting. First, because our difference-in-differences approach reduced confounding by comparing payments and concentration within a market over time, these results demonstrate that increased concentration within a given market was not associated with greater payments. Second, the lack of association was not because of statistical imprecision—even the upper bounds of the CIs around our estimates are small in magnitude.

This study should be viewed in light of its limitations. First, although we used a difference-in-differences approach to reduce confounding, we cannot exclude the existence of other confounding factors driving an observed association between market concentration and payments from private insurers. For example, we did not include insurer concentration in our analysis. If concentration among anesthesia groups occurred in response to lowered payments from insurer concentration, then the actual effect of anesthesia group concentration would be greater than the results reported here. Second, because anesthesia providers are paid in part by case length, we cannot exclude the possibility that any differences in payments (or lack thereof) are driven by differences in case length, as opposed to differences in the amount paid per time unit. However, it is important to note that our use of a difference-in-differences approach limited the degree to which differences in case length could drive our results. Because we included county controls, year controls, and controls for linear trends at the county level in our analysis, differences in case length would confound our results only (1) to the extent they are associated with changes in market structure and (2) to the degree they are unassociated with general trends in case length at the national level and independent of linear trends at the county level. Importantly, our approach implicitly controls for simple differences in case length across counties. Third, our study period ends in 2010, so we cannot exclude the possibility that our results do not reflect the current relationship between concentration and private insurer payments. Fourth, our study was limited to 229 U.S. counties and generally excluded smaller, rural counties. Although our study is still important because the majority of procedures (and anesthetics) are not performed in the smaller, rural areas (29% of anesthetics in our sample), the results of our study may not apply to all areas. We did find that more concentrated markets tend to be located in smaller, rural areas. Therefore, we speculate that the level of concentration in rural areas is higher than the level of concentration reported in this study. The trend in concentration, and its effects on private insurer payments, are a subject for future study. Finally, our study examined the experience of anesthesia groups in the United States, where negotiation between health care providers and private insurers frequently occurs. Our results may have limited application to other health systems, where a single payer—typically a government entity—dominates. However, because private insurers do operate to an extent in many single payer systems, our results may carry over to these systems to the degree that private insurers play an important role in financing health care.

Several factors may explain the lack of association between private insurer payments and anesthesia group concentration. First, patients seldom choose their anesthesiologist, making it easier for new groups to enter a market and to undercut larger groups on payments. Second, negotiating higher payments requires the ability to reject an insurer's offer. However, anesthesia groups typically enter into contracts with hospitals that specifically limit their ability to reject an insurer. Finally, anesthesia groups typically enter into negotiations with other entities besides insurers (such as hospitals and/or their host institutions) and may reserve their efforts for these negotiating activities. Our study would not generally observe the results of these activities, because they typically result in side payments to the group separate from payments made from the insurer.

In summary, by using approaches and standards commonly used in the economic analysis of market interactions, including by U.S. antitrust authorities, we found that the market for anesthesia services in the United States is fairly concentrated. With the growing influence of large, national anesthesia firms such as EmCare and Sheridan Healthcare, concentration is likely to increase. Although concentration has the potential to improve patient care and lower costs, local and federal antitrust authorities are concerned that concentration may also result in increased payments from private insurers. Although a large literature suggests that concentration is associated with higher payments from private insurers in the case of hospitals and other specialties, our study—which applied a similar methodology—found no association in the case of anesthesia services. The causes for this dissimilarity, as well the nature and effects of concentration in anesthesia in rural United States areas, remains an area for further research.

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Competing Interests

Dr. Miller is employed by the American Society of Anesthesiologists (Washington, D.C.). The other authors declare no competing interests.

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