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## December Is Coming: A Time Trend Analysis of Monthly Variation in Adult Elective Anesthesia Caseload across Florida and Texas Locations of a Large Multistate Practice

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### Abstract

**Background:** Anesthesia staffing models rely on predictable surgical case volumes. Previous studies have found no relationship between month of the year and surgical volume. However, seasonal events and greater use of high-deductible health insurance plans may cause U.S. patients to schedule elective surgery later in the calendar year. The hypothesis was that elective anesthesia caseloads would be higher in December than in other months.

**Methods:** This review analyzed yearly adult case data in Florida and Texas locations of a multistate anesthesia practice from 2017 to 2019. To focus on elective caseload, the study excluded obstetric, weekend, and holiday cases. Time trend decomposition analysis was used with seasonal variation to assess differences between December and other months in daily caseload and their relationship to age and insurance subgroups.

**Results:** A total of 3,504,394 adult cases were included in the analyses. Overall, daily caseloads increased by  $2.5 \pm 0.1$  cases per day across the 3-yr data set. After adjusting for time trends, the average daily December caseload in 2017 was 5,039 cases (95% CI, 4,900 to 5,177), a 20% increase over the January-to-November baseline (4,196 cases; 95% CI, 4,158 to 4,235;  $P < 0.0001$ ). This increase was replicated in 2018: 5,567 cases in December (95% CI, 5,434 to 5,700)

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#### Competing Interests

Drs. Tung and Dutton receive salaries as executive section editors for *Anesthesia & Analgesia*. Dr. Dutton is employed by U.S. Anesthesia Partners (Dallas, Texas) and holds equity in the company. The other authors declare no competing interests.

*versus* 4,589 cases at baseline (95% CI, 4,538 to 4,641), a 21.3% increase; and in 2019: 6,103 cases in December (95% CI, 5,871 to 6,334) *versus* 5,045 cases at baseline (95% CI, 4,984 to 5,107), a 21% increase (both  $P < 0.001$ ). The proportion of commercially insured patients and those aged 18 to 64 yr was also higher in December than in other months.

**Conclusions:** In this 3-yr retrospective analysis, it was observed that, after accounting for time trends, elective anesthesia caseloads were higher in December than in other months of the year. Proportions of commercially insured and younger patients were also higher in December. When compared to previous studies finding no increase, this pattern suggests a recent shift in elective surgical scheduling behavior.

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Anesthesia staffing models optimize efficiency in part by matching the number of care providers to the amount of clinical work.<sup>1</sup> These models often assume minimal month-to-month variability in elective surgery and diagnostic procedures caseload.<sup>1-3</sup> A 1994 to 1996 analysis found no relationship between month of the year and ambulatory surgical volume, and a 2014 study of scheduling optimization also found no meaningful monthly variation.<sup>3,4</sup> However, accumulated sick days, looming loss of yearly insurance at the end of the year, and/or the recent rise in high-deductible health plans may predispose patients in the United States to schedule elective surgery at the end of the year. Anecdotal observations and economic modeling projections from a large multistate practice suggest that case volumes may be higher at the end of the year.

A recent change in scheduling preferences for elective surgery is plausible. In the United States, premiums for employer-based insurance have outpaced inflation and workers' wages,<sup>5</sup> and from 2007 through 2017, enrollment in high-deductible health plans has more than doubled among adults aged 18 to 64 with employment-based coverage.<sup>6</sup> This shifting of healthcare costs to the patient leads to delayed and foregone care<sup>7,8</sup> and may also affect the timing of procedural interventions. Patients on high-deductible plans may thus be incentivized to schedule high-cost elective healthcare at the end of the year in years when deductibles have already been fully paid. Such a trend toward higher end-of-year case volumes has previously been observed in bariatric surgery<sup>9</sup> and in colonoscopies for patients with inflammatory bowel disease.<sup>10</sup>

Two large studies have previously found no predictable monthly variation in elective anesthesia case volume. However, both were conducted before the increase in high-deductible health care plans described above.<sup>3,4</sup> Whether more recent experience supports an end-of-year increase in caseload is unclear. Increases due to paid deductibles may be offset by preferences to avoid surgery during the holiday season. Loss (or gain) of employer-based commercial insurance at year end may also affect the decision to schedule elective surgery. Anecdotally and during yearly visual inspections of case/month data from a large multistate anesthesia group, we have observed that daily caseloads are higher in December than in other months. To better describe yearly trends in caseload and reconcile discrepancies between published literature and clinical observation, we reviewed administrative data from a large multistate anesthesia group. We hypothesized that the daily elective anesthesia caseload would be higher in December than in other months of the calendar year, would

vary with age and insurance status, and be more pronounced in procedures more likely to be elective.

## Materials and Methods

### Setting and Participants

This study was reviewed by the University of Chicago Institutional Review Board and judged exempt from written consent due to the deidentified data set. We retrospectively reviewed aggregated adult case volume data from Florida and Texas locations of U.S. Anesthesia Partners, a large multipractice private anesthesia group, from 2017 to 2019. Our primary outcome of interest was daily elective caseload in December *versus* other months of the year, overall and stratified by age and insurance status.

### Data Collection

The 3-yr longitudinal data set was constructed from extracting all 2017 to 2019 billing data for adult patients from the group's internal data warehouse and included all adult anesthetics performed at Florida and Texas practice locations between 2017 and 2019. This database is used by the group as part of standard billing activity. Group clinicians work in both care team and individually performed practice models and across a range of facility types from offices and ambulatory surgical centers to large tertiary care hospitals. Table 1 describes the characteristics of individual practices contributing to our data set. Billable anesthesia encounters were validated by a professional coder through cross-examination of relevant medical records, including but not limited to the patient demographics, intraoperative records, anesthesia notes, surgical dictation transcripts, procedure notes, and other records as appropriate. The group process includes daily reconciliation of scheduled procedures with those actually performed and includes direct query of providers when a discrepancy is noted. Each billing record is then externally validated by the corresponding payer. The group revenue cycle management system has a "clean claim" rate greater than 95% before validation, and the data set for this study was created using only fully validated claims. The group does not provide chronic pain or intensive care unit services.

The focus of our analysis was on daily elective anesthesia caseload in December *versus* other months of the year overall and its relationship to patient age and insurance status. We thus prospectively defined data fields to be extracted into our final data set for analysis. Because patients over 65 yr old may choose to remain commercially insured, we considered both age and insurance status in our analysis and prospectively used age of 65 yr or more to define two age subgroups. For each case, the data set therefore contained dichotomized patient age (18 to 64 yr old *vs.* 65 yr old or older), date of service, practice location (Florida *vs.* Texas), patient insurance status (commercial, government, or other [including self-pay]), practice setting (as defined by the Center for Medicare and Medicaid Services [Baltimore, Maryland] place of service codes for professional claims), anesthesia Current Procedural Terminology (American Medical Association, Chicago, Illinois) code, and a unique case identifier.<sup>11</sup> We classified practice settings into four categories: inpatient (corresponding to the Center for Medicare and Medicaid Services "Inpatient Hospital" place of service), outpatient (corresponding to the Center for Medicare and Medicaid

Services “On Campus-Outpatient Hospital” and “Off Campus-Outpatient Hospital” places of service), ambulatory surgery centers (corresponding to the Center for Medicare and Medicaid Services “Ambulatory Surgical Center” place of service), and other (“Office,” “Emergency Room-Hospital,” “Independent Clinic,” “Home,” and “Unknown” places of service). The data set did not contain information on the emergency “E” modifier to the American Society of Anesthesiologists class designation.

We applied several exclusion criteria to our 3-yr data set. Cases with missing practice location or date of service were excluded from the study. Cases from anesthesia groups that joined the practice during the 3-yr study period were also excluded. No individual anesthesia practices left the group during the study period. For consistency across years, we included only practices from locations in Florida and Texas. To reduce confounding by unscheduled emergency cases, we excluded cases performed during the weekends and on federal holidays. Because of the high likelihood of unscheduled urgent or emergent activity, we also excluded obstetric cases (defined as any case with anesthesia Current Procedural Terminology codes ranging from 01958 through 01969). To assess daily caseload in December *versus* other months of the year for procedures likely to be elective *versus* urgent, we compared daily caseload trends for colonoscopy (Current Procedural Terminology code descriptions of “screening colonoscopy” or “anesthesia for lower endoscopic procedures”) and coronary artery bypass surgery (Current Procedural Terminology code description of “coronary artery bypass graft [CABG] with pump” and “CABG without pump”).

### Statistical Analysis

Our plan for statistical analysis was developed after the size of the data set was known and after accessing the data to visually inspect of monthly trends in caseload. An initial analysis of a single year (2017) found an increase in December caseloads when compared to all other months in that year. However, expanding our data set to 3 yr (2017 to 2019) revealed clear underlying time trends. Specifically, we observed both an increase in caseload across the entire 3-yr study period and an increase within each calendar year with the highest caseloads at the end the year (fig. 1).

To adequately adjust for both inter- and intrayear trends, we thus decomposed daily caseload data into a daily trend, a seasonal component (December), and random disturbance components. We then fitted a linear trend model with a superimposed seasonal element and performed a multiple regression analysis that included both a daily time trend that spanned the entire 3-yr duration (day = 1, 2, 3...1,095) and a seasonal component (December = 1, all other months = 0). We added lagged residuals to the regression as an explanatory variable to account for autocorrelation identified by Durbin–Watson testing. In this regression model, we adjusted for potential confounders for estimating trend and seasonality including practice location (Texas *vs.* Florida) and setting (inpatient *vs.* other). These confounders were identified during univariate analysis as significantly correlated to the primary outcome and expressed as the proportion of the daily caseload in Texas and in an inpatient setting.

In our data set, patient age (18 to 64 and 65 yr old or older) and insurance status (commercial *vs.* government) were highly correlated. To estimate the relationship between each factor and December caseloads, we performed separate linear regressions with

December (*vs.* all other months) as the independent variable and proportion of patients commercially insured (*vs.* not) or aged 18 to 64 yr (*vs.* 65 yr old or older) as the dependent variable. Both regressions also adjusted for practice location and setting as described above.

We performed three additional exploratory analyses of our data set. To probe the relative contribution of emergency and unscheduled cases on the difference between December and January-to-November caseloads, we performed a similar time trend decomposition analysis after including weekend, holiday, and obstetric cases. In addition, because inspection of the monthly time trend in figure 1 suggested a decrease in January daily caseload, we performed a time trend analysis to estimate the association between January month and daily caseload. Finally, to examine the relative association between case type and changes in December daily caseloads, we performed time trend analysis and age/insurance regressions on procedure subtypes likely to be elective (colonoscopy) and not elective (CABG).

All statistical analyses were performed in JMP 14.1 (JMP, USA). We used standard descriptive statistics with 95% CI around the mean for average daily caseloads, overall and for age, insurance status, and specific procedure subgroups. We also present mean differences with 95% CI to permit assessment of effect size. We calculated average daily caseloads per month by summing all the cases performed in a month and dividing by the number of working days in that month. Two-tailed hypothesis testing was used for all statistical tests.

### Statistical Power

Our analysis included all cases performed between 2017 and 2019 at Texas and Florida locations of the group that met our inclusion criteria. Although we did not perform a pre-hoc power analysis, our data set had a considerably larger sample size than previous studies of monthly variation.<sup>3,4</sup> We therefore expected to have sufficient power to evaluate our primary hypothesis. To minimize type 1 error and identification of spurious relationships, we set a *P* value of 0.01 as statistically significant.

## Results

### Study Sample Characteristics

During the 3-yr study period, our extracted data set contained a total of 4,156,072 adult anesthetics administered at Florida and Texas locations of the group. After an initial screen, we excluded 10 cases due to missing practice location and 15 due to missing date of service. Of the remaining cases, 35,642 (0.9%) were performed at practices that joined the group during the 3-yr study period and were thus excluded from the data set. We then excluded 223,704 (5.4%) cases performed during weekend days and 69,707 (1.7%) cases performed on federal holidays. We also excluded 322,600 (7.8%) obstetric cases. A flow diagram of case inclusions and exclusions is provided in figure 2.

A total of 3,504,394 adult cases were thus included in our final analyses. Table 1 provides a description of the data set. Of the included cases, 2,007,422 patients (57.3%) were aged 18 to 64 yr old, 1,550,979 (44.3%) were commercially insured, and 20,992,012 (59.9%) cases were performed in an outpatient setting.

### Daily Caseload in December *versus* Other Months of the Year

Table 2 depicts daily caseloads for December *versus* other months in the calendar year after adjustment for time trends, practice location, and setting. Overall, daily caseloads increased by  $2.5 \pm 0.1$  cases per day across the 3-yr data set. After adjustment for that time trend, practice location, and type, daily caseloads in December 2017 increased 20% from 4,196 cases during the January-to-November period (95% CI, 4,158 to 4,235) to 5,039 cases in December (95% CI, 4,900 to 5,177;  $P < 0.0001$ ). The magnitude of this increase was similar in 2018 (January to November: 4,589 [95% CI, 4,538 to 4,641] and December: 5,567 [95% CI, 5,434 to 5,700]; 21.3% increase) and 2019 (January to November: 5,045 [95% CI, 4,984 to 5,107] and December: 6,103 [95% CI, 5,871 to 6,334]; 21% increase; both  $P < 0.001$ ).

### Association between Patient Age and Insurance Status and December Caseload

Table 3 depicts the results of linear regression to evaluate the association between patient age or insurance status and December daily caseloads. Figure 3 (A and B) graphically depicts monthly trends in daily caseload for age and insurance status subgroups. In 2017, the proportion of commercially insured patients increased from 0.45 (95% CI, 0.44 to 0.46) during January to November 2017 to 0.58 (0.55 to 0.58) in December with similar increases in 2018 and 2019 (table 3; all  $P < 0.0001$ ). The proportion of patients aged 18 to 64 also increased from 0.56 (95% CI, 0.54 to 0.57) in January to November to 0.65 (95% CI, 0.63 to 0.66) in December with similar increases in 2018 and 2019 (table 3; all  $P < 0.0001$ ).

### Exploratory Analyses

In exploratory analyses, we observed that when obstetric, weekend, and holiday cases were added back to the data set and after adjustment for time trend, practice location, and type, daily caseloads in December remained higher than those in the preceding January-to-November period (4.5% in 2017,  $P = 0.0009$ , 11.2% in 2018,  $P < 0.0001$ , and 5.5% in 2019,  $P = 0.0097$ ). Supplemental Digital Content 1 (<http://links.lww.com/ALN/C672>) depicts monthly trends in daily caseloads for obstetric, weekend, and holiday cases and for overall daily caseloads after excluding those case categories. We also observed that after adjustment for time trend, practice location, and setting, January caseloads were 6 to 15% lower than during the subsequent February-to-December period ( $P < 0.001$ ; Supplemental Digital Content 2, <http://links.lww.com/ALN/C673>).

When we performed time trend decomposition on CABG and colonoscopy subgroups, we found no association between December date of surgery and the number of CABG procedures performed per month (adjusted differences,  $-4.7\%$  [ $P = 0.3$ ],  $-11\%$  [ $P = 0.02$ ], and  $-1.8\%$  [ $P = 0.7$ ] in 2017, 2018, and 2019, respectively) but did find that more colonoscopies were performed per day in December than in other months of the calendar year (adjusted difference, 24.5% in 2017 [ $P < 0.001$ ], 14.8% in 2018 [ $P = 0.001$ ], and 15.9% in 2019 [ $P < 0.001$ ]; Supplemental Digital Content 3, <http://links.lww.com/ALN/C674>). In addition, we observed that the increase in December colonoscopies was strongly correlated to the proportion of commercially insured patients and those aged 18 to 64 yr old (Supplemental Digital Content 4, <http://links.lww.com/ALN/C675>). Supplemental Digital Content 5 (<http://links.lww.com/ALN/C676>) depicts trends in daily caseload by month for colonoscopy and CABG procedures.



## Discussion

In this 3-yr study of anesthesia caseloads in Florida and Texas locations of a large U.S. anesthesia practice, we found that, after controlling for time trends, daily elective caseloads were 20% higher in December than in the other 11 months of the calendar year. This finding was consistent for all three calendar years in our data set (2017 to 2019). Additionally, younger age and commercial insurance status were both independently associated with higher December daily caseloads. Our findings were true both overall and for colonoscopy, a procedure likely to be elective. For CABG surgery, we found no association between December surgery date (*vs.* other months) and daily case volumes.

Our findings contrast with those of earlier studies finding no predictable monthly variation in anesthesia caseload. A large 1999 analysis of the National Survey of Ambulatory Surgery study found no variation by month in ambulatory surgery caseload from 1994 to 1996.<sup>4</sup> A 2014 single center analysis of surgical schedule predictability likewise found no December-specific increase in daily case volume.<sup>3</sup> Although we cannot be certain why our results differ, both previous studies were largely conducted before the recent increase in high-deductible private health insurance plans in the United States.<sup>5,6,12</sup> In 2020, such deductibles can exceed \$1,350 per year for individuals and \$2,700 for families<sup>13</sup> and impose a financial burden that decreases healthcare utilization.<sup>8,14</sup> It is thus possible that commercially insured patients in high-deductible plans may be incentivized to schedule elective surgical procedures at the end of the calendar year in years when their deductible has already been met due to earlier healthcare expenses. Considerably lower Medicare Part B deductibles (\$144.60 in 2020) and similarly limited Medicaid cost sharing may then explain why older age or government insurance status was associated with a less prominent change in December caseload.<sup>15,16</sup> Other possible explanations for a December increase in caseload are that working patients may have accumulated sick days at the end of the year, or that patients who will be losing or changing insurance plans due to end-of-year changes in employment are incentivized to seek additional healthcare before their current plan expires.

Our findings are consistent with other observations regarding the association between the timing of procedural care and high-deductible health plans. A 2018 review of insurance claims found delays in breast biopsy procedures among women enrolled in high-deductible health plans.<sup>17</sup> A 2019 study of bariatric surgery found decreased utilization by patients on high-deductible health plans and greater utilization of surgical services in the fourth quarter relative to the first quarter of the calendar year.<sup>9</sup> Our data suggest a similar pattern for procedures such as colonoscopy, which can often be scheduled electively. Taken together, these observations support a hypothesis that high deductibles may affect the calendar timing of elective surgical interventions.

That newer studies find recurring monthly variation in caseload whereas older ones do not is also consistent with existing literature. In contrast to a 2006 study finding no seasonal variation in colonoscopy rates from 2000 to 2003,<sup>18</sup> a 2020 review found that the scheduling of colonoscopies for inflammatory bowel disease was shifted toward the end of the calendar year.<sup>10</sup> Our 2017 to 2019 data set likewise found a shift in the scheduling of colonoscopies toward the end of the year.

Our data were insufficiently granular to evaluate the effect of higher December caseloads on the scheduling behavior of individual practices. Responses to such an increase may have included running operating rooms later into the evening, opening additional anesthetizing locations, and/or limiting clinician vacation time. The ~20% higher December caseload we observed would translate into approximately 30 additional hours of elective anesthesia care per day at the University of Chicago. Although earlier studies concluded that staffing decisions should assume no seasonal variation in caseload,<sup>1,3,4</sup> our data suggest that some practices may see consistent seasonal patterns.

Our study has limitations. First, our data were limited to Florida and Texas locations of a multistate anesthesia group and may not be generalizable to all practices and years. Additional studies with different payors and from different geographic locations, practice settings, and calendar years are needed to determine whether the patterns we observed are generalizable. Our deidentified data were also extracted from an administrative database, raising the possibility of incorrect or missing data. However, we believe our data set, created using only fully validated claims, is highly accurate because payment claims will not be reimbursed by the payer unless these fields match what has been claimed by the surgeon and the facility and the group's revenue cycle management system has a "clean claim" rate greater than 95%. In addition, we did not have sufficient case detail to determine elective or emergent status. To address this limitation and minimize the number of emergent (nonscheduled) cases in the sample, we excluded obstetric procedures and those performed over the weekends and holidays. When these cases were added back into the data set, however, the association between December month and higher anesthesia caseload persisted. This finding supports our hypothesis that higher December caseload is primarily due to scheduled not urgent/emergent surgery. Finally, our data span only 3 yr from 2017 to 2019. Although our findings may not be reproducible outside this time period, we note that the rise in high-deductible care plans is a relatively recent phenomenon and that studies of monthly variation in surgical case volume in 2020 may be unique due to the COVID-19 pandemic.<sup>19</sup> Although COVID-19 distorted monthly caseload trends for 2020, the group did observe a December 2020 increase.

In summary, our analysis of Florida and Texas locations of a large multistate anesthesia group found that, after adjusting for time trends, daily anesthesia caseloads were higher in December than in other months for calendar years 2017 through 2019. This pattern was associated with commercially insured patients and those aged 18 to 64 yr old and was also observed with procedures likely to be electively scheduled, such as colonoscopy. Although the mechanisms underlying a higher caseload in December are unclear, one possible explanation is that patients with high-deductible health insurance may schedule elective surgical care at the end of the year when deductibles are more likely to have been met. Other explanations include looming end-of-year loss of insurance and accumulated vacation or sick time at the end of the year. Our findings may have implications for policymakers and behavioral economists seeking to better understand how patients make decisions to undergo elective surgery and how to optimize health insurance delivery.



## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## References

1. Strum DP, Vargas LG, May JH: Surgical subspecialty block utilization and capacity planning: A minimal cost analysis model. *Anesthesiology* 1999; 90:1176–85 [PubMed: 10201692]
2. Dexter F, Macario A, Qian F, Traub RD: Forecasting surgical groups' total hours of elective cases for allocation of block time: Application of time series analysis to operating room management. *Anesthesiology* 1999; 91:1501–8 [PubMed: 10551603]
3. Tiwari V, Furman WR, Sandberg WS: Predicting case volume from the accumulating elective operating room schedule facilitates staffing improvements. *Anesthesiology* 2014; 121:171–83 [PubMed: 24940734]
4. Dexter F, Traub RD: The lack of systematic month-to-month variation over one-year periods in ambulatory surgery caseload: Application to anesthesia staffing. *Anesth Analg* 2000; 91:1426–30 [PubMed: 11093993]
5. Kaiser Family Foundation. 2019 Employer Benefits Survey. Available at: <http://files.kff.org/attachment/Report-Employer-Health-Benefits-Annual-Survey-2019>. Accessed May 6, 2021.
6. Cohen RA, Zammiti EP: High-deductible health plan enrollment among adults aged 18–64 with employment-based insurance coverage. NCHS Data Brief No. 317. Hyattsville, MD, National Center for Health Statistics, 2018
7. Abdus S, Selden TM, Keenan P: The financial burdens of high-deductible plans. *Health Aff (Millwood)* 2016; 35:2297–301 [PubMed: 27920319]
8. Agarwal R, Mazurenko O, Menachemi N: High-deductible health plans reduce health care cost and utilization, including use of needed preventive services. *Health Aff (Millwood)* 2017; 36:1762–8 [PubMed: 28971921]
9. Chhabra KR, Fan Z, Chao GF, Dimick JB, Telem DA: The role of commercial health insurance characteristics in bariatric surgery utilization. *Ann Surg* 2021; 273:1150–6 [PubMed: 31714318]
10. Berinstein JA, Cohen-Mekelburg SA, Steiner CA, McLeod M, Noureldin M, Allen JI, Kullgren JT, Waljee AK, Higgins PDR: Variations in health care utilization patterns among inflammatory bowel disease patients at risk for high medical service utilization enrolled in high deductible health plans. *Inflamm Bowel Dis* 2021; 27:771–8 [PubMed: 32676638]
11. Centers for Medicare & Medicaid Services. Place of Service Code Set. Available at: [https://www.cms.gov/Medicare/Coding/place-of-service-codes/Place\\_of\\_Service\\_Code\\_Set#:~:text=Off%20Campus%20Outpatient%20Hospital,not%20require%20hospitalization%20or%20institutionalization.%20](https://www.cms.gov/Medicare/Coding/place-of-service-codes/Place_of_Service_Code_Set#:~:text=Off%20Campus%20Outpatient%20Hospital,not%20require%20hospitalization%20or%20institutionalization.%20). Accessed May 6, 2021.
12. Wharam JF, Ross-Degnan D, Rosenthal MB: The ACA and high-deductible insurance: Strategies for sharpening a blunt instrument. *N Engl J Med* 2013; 369:1481–4 [PubMed: 24088042]
13. Centers for Medicare & Medicaid Services. High Deductible Health Plan (HDHP). Available at: <https://www.healthcare.gov/glossary/high-deductible-health-plan/>. Accessed May 6, 2021.
14. Sinaiko AD, Mehrotra A, Sood N: Cost-sharing obligations, high-deductible health plan growth, and shopping for health care: Enrollees with skin in the game. *JAMA Intern Med* 2016; 176:395–7 [PubMed: 26784644]

15. Centers for Medicare & Medicaid Services. 2020 Medicare Part A & B Premiums and Deductibles. Available at: <https://www.cms.gov/newsroom/factsheets/2020-medicare-parts-b-premiums-and-deductibles>. Accessed May 6, 2021.
16. Medicaid.gov. Cost Sharing Out of Pocket Costs. Available at: <https://www.medicaid.gov/medicaid/cost-sharing/cost-sharing-out-pocket-costs/index.html>. Accessed May 6, 2021.
17. Wharam JF, Zhang F, Lu CY, Wagner AK, Nekhlyudov L, Earle CC, Soumerai SB, Ross-Degnan D: Breast cancer diagnosis and treatment after high-deductible insurance enrollment. *J Clin Oncol* 2018; 36:1121–7 [PubMed: 29489428]
18. Auslander JN, Lieberman DA, Sonnenberg A: Endoscopic procedures and diagnoses are not influenced by seasonal variations. *Gastrointest Endosc* 2006; 63:267–72 [PubMed: 16427933]
19. O'Reilly-Shah VN, Van Cleve W, Long DR, Moll V, Evans FM, Sunshine JE, Kassebaum NJ, Harrison EM, Jabaley CS: Impact of COVID-19 response on global surgical volumes: An ongoing observational study. *Bull World Health Organ* 2020; 98:671–82 [PubMed: 33177757]

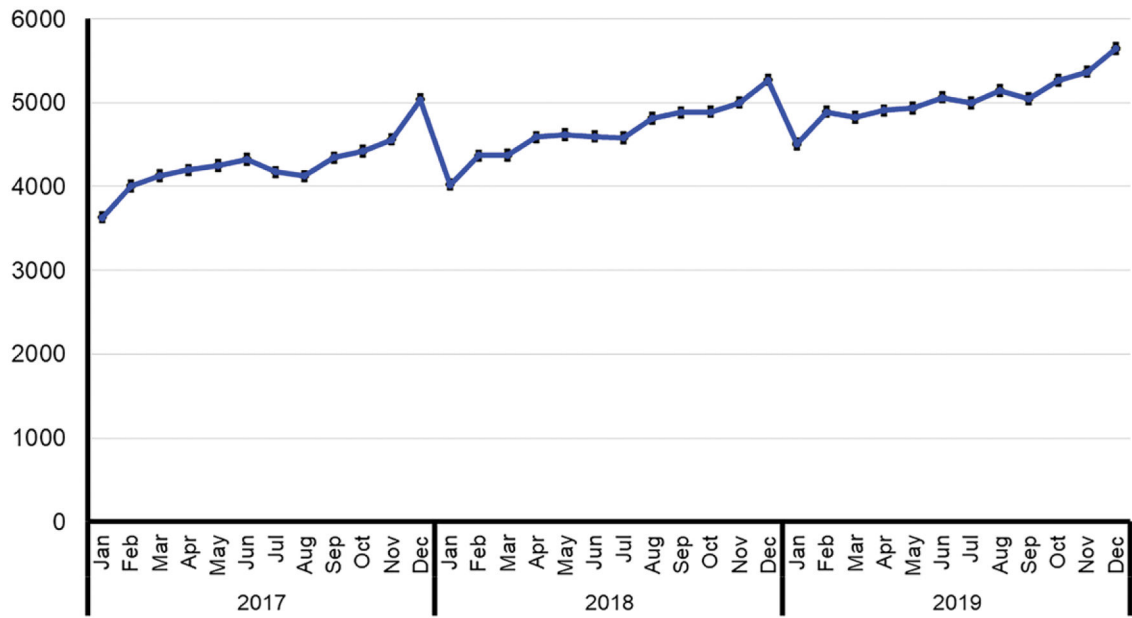
## EDITOR'S PERSPECTIVE

### What We Already Know about This Topic

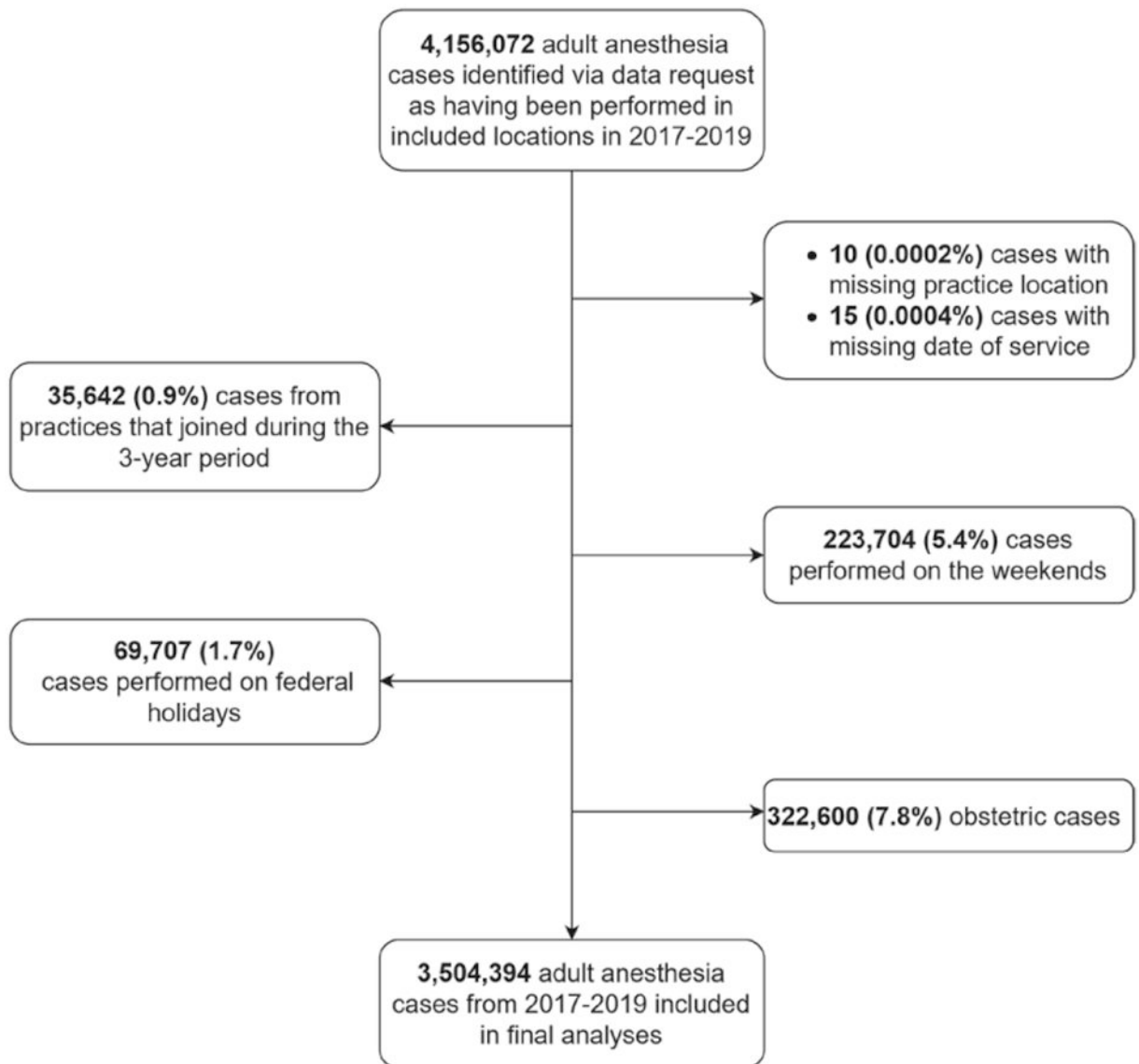
- Existing literature has not observed an association between month of year and anesthesia case volume
- High-deductible health insurance plans are increasingly common in the United States

### What This Article Tells Us That Is New

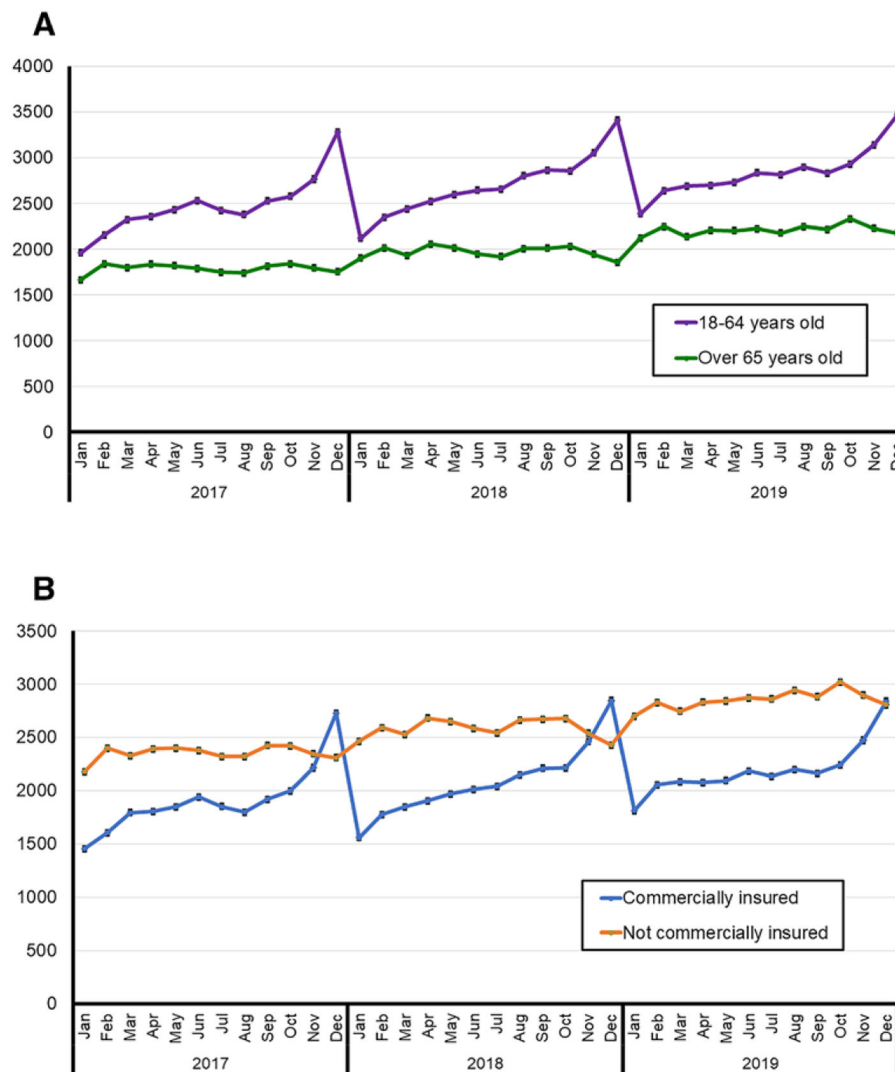
- Administrative data across a large U.S. anesthesia group in 2017 to 2019 demonstrated a 20% increase in average daily elective caseload in December compared with January to November
- Exploratory analyses demonstrated that this relationship was observed for colonoscopies (which are likely to be elective) but not for coronary artery bypass grafting (which is unlikely to be elective)
- The proportion of patients with commercial (rather than government) insurance and aged 18 to 64 yr was also higher in December than in other months of the year



**Fig. 1.** Daily caseload by month. The y-axis represents cases per day, averaged over the number of working days in each month. *Error bars* indicate the population 95% CI.



**Fig. 2.**  
Flowchart describing study exclusion criteria.



**Fig. 3.** Daily caseload by month (A) for patients aged 18 to 64 yr *versus* 65 yr and older and (B) for patients with commercial *versus* government insurance. The y-axis represents cases per day, averaged over the number of working days in each month. *Error bars* indicate the population 95% CI.



**Table 1.****Study Sample Characteristics after Applying Exclusion Criteria**

Characteristics	N (%)			
	2017	2018	2019	Overall
Patient age				
18 to 64 yr	619,126 (58.1)	675,824 (57.7)	712,472 (56.2)	2,007,422 (57.3)
65 yr and older	447,212 (41.9)	494,958 (42.3)	554,802 (43.8)	1,496,972 (42.7)
Patient insurance status				
Commercially insured	478,194 (44.8)	521,749 (44.6)	551,036 (43.5)	1,550,979 (44.3)
Government-insured	527,820 (49.5)	583,106 (49.8)	645,072 (50.9)	1,755,998 (50.1)
Other	60,324 (5.7)	65,927 (5.6)	71,166 (5.6)	197,417 (5.6)
Practice location				
Florida	253,782 (23.8)	347,566 (29.7)	399,494 (31.5)	1,000,842 (28.6)
Texas	812,556 (76.2)	823,216 (76.3)	867,780 (68.5)	2,503,552 (71.4)
Practice setting				
Inpatient	281,590 (26.4)	338,966 (29.0)	365,849 (28.9)	986,405 (28.2)
Outpatient	694,299 (65.1)	700,791 (59.9)	703,922 (55.6)	2,099,012 (59.9)
Ambulatory surgical center	83,323 (7.8)	123,926 (10.6)	189,706 (15.0)	396,955 (11.3)
Other	7,126 (0.7)	7,099 (0.6)	7,797 (0.6)	22,022 (0.6)

**Table 2.** Daily Elective Anesthesia Caseloads for December *versus* Other Months in the Calendar Year after Adjustment for Time Trends, Practice Location, and Setting

Year	Adjusted N (95% CI)		Adjusted Mean Difference (95% CI)	P Value
	January to November	December		
2017	4,196 (4,158–4,235)	5,039 (4,900–5,177)	842 (700–985)	< 0.0001
2018	4,589 (4,538–4,641)	5,567 (5,434–5,700)	977 (836–1,118)	< 0.001
2019	5,045 (4,984–5,107)	6,103 (5,871–6,334)	1,057 (819–1,295)	< 0.001

**Table 3.**

Proportion of Commercially Insured Patients (vs. Government Insured) or Those Aged 18 to 64 yr (vs. 65 yr and Older) Under-going Elective Surgery during the January-to-November Period and in December

Year	January to November	December	Difference (95% CI)	P Value
Proportion of commercially insured patients (95% CI)				
2017	0.45 (0.44–0.46)	0.57 (0.56–0.58)	0.11 (0.08–0.12)	< 0.0001
2018	0.46 (0.45–0.46)	0.56 (0.54–0.57)	0.10 (0.07–0.11)	< 0.0001
2019	0.46 (0.46–0.47)	0.52 (0.50–0.54)	0.06 (0.03–0.07)	< 0.0001
Proportion of patients aged 18 to 64 yr (95% CI)				
2017	0.56 (0.54–0.57)	0.65 (0.63–0.66)	0.09 (0.06–0.10)	< 0.0001
2018	0.56 (0.56–0.57)	0.64 (0.62–0.66)	0.08 (0.05–0.09)	< 0.0001
2019	0.57 (0.56–0.58)	0.61 (0.59–0.63)	0.04 (0.01–0.05)	< 0.0001

The data are adjusted for practice location and setting.