Industry-Wide Survey of Academic Anesthesiology Departments Provides Up-to-Date Benchmarking Data on Surgical Anesthesia Productivity

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BACKGROUND: Benchmarking group surgical anesthesia productivity continues to be an important but challenging goal for anesthesiology groups. Benchmarking is important because it provides objective data to evaluate staffing needs and costs, identify potential operating room management decisions that could reduce costs or improve efficiency, and support ongoing negotiations and discussions with health system leadership. Unfortunately, good and meaningful benchmarking data are not readily available. Therefore, a survey of academic anesthesiology departments was done to provide current benchmarking data.

METHODS: A survey of members of the Society of Academic Associations of Anesthesiology and Perioperative Medicine (SAAAPM) was performed. The survey collected data by facility and included type of facility, number and type of staff and anesthetizing sites each weekday, and the billed American Society of Anesthesiologists (ASA) units and number of cases over 12 months. The facility types included academic medical center (AMC), community hospital (Community), children's hospital (Children), and ambulatory surgical center (ASC). All anesthesia care billed using ASA units were included, except for obstetric anesthesia. Any care not billed or billed using relative value units (RVUs) were excluded. Percentage of nonoperating room anesthetizing sites, staffing ratio, and surgical anesthesia productivity measurements "per case" and "per site" were calculated.

RESULTS: Of the 135 society members, 63 submitted complete surveys for 140 facilities (69 AMC, 26 Community, 7 Children, and 38 ASC). In the survey, overall median productivity for AMC and Children was similar (12,592 and 12,364 total ASA units per anesthetizing site), while the ASC had the lowest median overall productivity (8911 total ASA units per anesthetizing site). By size of facility, in the survey, the smaller facilities (<10 sites, ASC or non-ASC) had lower median overall productivity as compared to larger facilities. For AMC and Children, >20% of anesthetizing sites were nonoperating room anesthetizing sites. Anesthesiology residents worked primarily in AMC and Children. In ASC and Community, residents worked only in 18% and 35% of facilities, respectively. More than half the AMCs reported at least 1 break certified nurse anesthetist (CRNA) each day.

CONCLUSIONS: To make data-driven decisions on clinical productivity, anesthesiology leaders need to be able to make meaningful comparisons at the facility level. For a group that provides care in multiple facilities, one can make internal comparisons among facilities and follow measurements over time. It is valuable for leaders to also be compare their facilities with industry-wide measurements, in other words, benchmark their facilities. These results provide benchmarking data for academic anesthesiology departments. (Anesth Analg 2020;131:885–92)

KEY POINTS

- **Question:** Where can one find current nation-wide facility-based benchmarking data for surgical anesthesia productivity?
- **Findings:** A nation-wide survey of academic anesthesiology departments provided benchmarking data provided by facility type and facility size.
- **Meaning:** Results allow for meaningful comparisons done on a facility level and "per anesthetizing site" measurements.

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GLOSSARY

AMC = academic medical center; **ASA** = American Society of Anesthesiologists; **ASC** = ambulatory surgical center; **Base** = ASA basic units; **CAA** = certified anesthesiologist assistant; **Cases** = Patient cases billed (anesthesia charges only); **Children** = children's hospital; **Community** = community hospital; **CRNA** = certified nurse anesthetist; **D** = day (using 250 days/year estimate); **Day** = start of the day; **FTE** = full-time equivalent; **GI** = gastrointestinal endoscopy suite; **H** = billed hours; **H/case** = surgical duration; **IRB** = institutional review board; **MD** = anesthesiologist, faculty; **MGMA** = Medical Group Management Association; **MRI** = magnetic resonance imaging; **n/a** = not applicable; **Non-GI** = non-OR procedural sites (excluding GI endoscopy suite); **NORA** = non-OR anesthetizing; **OR** = operating room; **PACU** = postanesthesia care unit; **Resident** = anesthesiology resident; **RVU** = relative value unit; **SAAAPM** = Society of Academic Associations of Anesthesiology and Perioperative Medicine; **SD** = standard deviation; **Sites** = Total Anesthetizing Locations (excluding obstetric sites); **Sites/MD** = staffing ratio; **SRNA** = student nurse anesthetists; **tASA** = total ASA units; **tASA/h** = hourly productivity; **tASA/site** = overall productivity; **TU** = ASA 15-minute time units

Benchmarking group surgical anesthesia productivity continues to be an important but challenging goal for anesthesiology groups. Benchmarking is important because it provides objective data to evaluate staffing needs and costs, identify potential operating room (OR) management decisions that could reduce costs or improve efficiency, and support ongoing negotiations and discussions with health system leadership. Unfortunately, benchmarking data that allow for meaningful comparisons are not readily available. Even with a good understanding of how to measure and compare group surgical anesthesia productivity,[1–5] there have been no industry-wide surveys that report data using facility based, "per anesthetizing site" or "per case" measurements since 2013.[5,6] Therefore, we undertook an industry-wide survey of academic anesthesiology departments on surgical anesthesia productivity to provide updated benchmarking data and data on staffing that have not been previously reported.

METHODS

After receiving institutional review board (IRB) exemption, a survey on surgical anesthesia and staffing was sent to the chairs of academic anesthesiology departments as identified through the membership list of the Society of Academic Associations of Anesthesiology and Perioperative Medicine (SAAAPM). The survey was reviewed and approved by SAAAPM leadership and was sent to chairs through the SAAAPM chair email listserv and was promoted via SAAAPM email newsletters. Survey notice was sent out initially in March 2019 with several reminders. The survey was available to be downloaded and respondents completed data entry via a web portal. The web portal was open from March 2019 through June 2019. After survey completion, one of the investigators (A.E.A.) reviewed all entries, calculated measurements, and then sent a confirmation email with any questions about possible incorrectly entered data to the respondent. The respondent was asked to review the information and confirm the data was correct as well as to recheck any data flagged as possibly incorrect.

The survey requested data for a 1-year period—either calendar year 2018 or fiscal year 2018, whichever was easier for the respondent to complete. The full survey and questions can be viewed in Supplemental Digital Content 1, Appendix, http://links.lww.com/AA/D132. Similar to previous surveys of academic anesthesiology departments, the survey instructions were for data to be reported by facility rather than by department.[5,6] Respondents were asked to classify the facility type—academic medical center (AMC), children's hospital (Children), cardiovascular or heart hospital (Heart), community facility (Community; all other facilities with inpatient beds), ambulatory surgical center (ASC) (no inpatient beds), and other (to be specified by respondent). To be included in the survey results, a facility must have data (billed units, number of cases, sites) submitted to be able to calculate productivity measurements and staffing data. Facilities with insufficient data were excluded.

For surgical anesthesia sites, the number of anesthetizing sites staffed on regular workday was estimated by counting the number of sites staffed on the tenth day of each month (20th if the tenth day is holiday or weekend), then averaging the numbers over the 12 months. The total number of anesthetizing sites (Sites) excluded obstetric anesthesia sites but included both ORs and all other sites including non-OR anesthetizing (NORA) sites. In addition, the number of NORA that was gastrointestinal endoscopy suite (GI) and non-GI (eg, interventional radiology, magnetic resonance imaging [MRI], cardiac catheterization, radiation oncology, electroconvulsive therapy, pulmonary bronchoscopy) sites staffed on a weekday was also collected.

For staffing data, descriptive data and quantitative data were collected. For descriptive, the staffing model that may be used on any day and the majority of time in both the OR and NORA was collected.

The types of staffing model were physician-only, medical direction 1:1 or 1:2, medical direction 1:3, medical direction 1:4, supervision by anesthesiologist (>4 ORs), certified nurse anesthetist (CRNA) supervised by nonanesthesiologist physician, and CRNA alone (in opt-out states). For quantitative staffing data, similar to anesthetizing sites, for each question (work shift), respondents were to count those staff available on the tenth of each month (20th if the tenth day is holiday or weekend) and averaging over 12 months. Staffing estimates included all OR and NORA sites but excluded staff scheduled in acute pain service, critical care team, obstetric anesthesia, or preanesthesia clinic. For each shift, the number of faculty anesthesiologists (MD), fellows, residents (Resident), certified anesthesiologist assistants (CAA), CRNA, and student nurse anesthetists (SRNA) was collected. The shifts included (1) at the beginning of the day, even if not assigned to a specific OR, but involved with OR duties including postanesthesia care unit (PACU), (2) break or "mid-day" staff who come in later in the day to provide lunch breaks, (3) late staff who start work in the afternoon to provide care in the evening but are not scheduled to be in-house overnight, (4) weekday in-house call staff who are in-house all night during regular weekdays, (5) weekend and holiday in-house call staff who are in-house all night during holidays or weekends, and (6) at-home call staff who are not required to remain in-house but may be called in for specific duties. In addition, specialty of home call teams (regular OR, backup OR, cardiac, pediatric, liver transplant, other) and if a postcall day was provided for at-home call staff were collected.

Billing data were collected for the 12-month period and included total ASA units billed (tASA), total 15-minute time units billed (TU), and total cases billed (cases). Base units were calculated from the difference of tASA and TU. For billing data, all anesthesia cases billed using ASA units were included except for obstetrical anesthesia. Resource-based relative value unit (RVU)–based procedures (eg, arterial or central line placement, postoperative pain blocks, transesophageal echocardiography) done in conjunction with surgical anesthesia were excluded. Pain medicine and critical care services were also excluded because these services are billed using RVUs and not ASA units. Any clinical activity that was not billed (eg, preanesthesia clinic) was also excluded.

For information reported for NORA, total NORA was the summation of NORA GI and NORA non-GI. The percentage of Sites that were NORA was calculated for % NORA total (= NORA total/Sites), % NORA GI, and % NORA non-GI.

For productivity measurements, calculations were similar to previous described.[1–6] For staffing ratio, Sites/MD was determined by dividing Sites by MD and not by the qualitative category chosen in the survey. Per case data are reported including tASA/case, base/case, h/case (=(TU/4)/case). Overall productivity was determined per Site using tASA/Site measurement. Hourly productivity was determined using tASA/h (=tASA/(TU/4)). Billed hours per site per day (h/site/d) used 250 d/y approximation and was calculated with the following formula: (TU/4)/Site/250 days. Case/site/d also used this 250 d/y approximation. In both these measurements, if the number is higher than median, it reflects either work done in evening/nights or on weekends/holidays.

Surgical anesthesia measurements are reported for all facilities and then by categories based on type of facility and the size of the facility (defined by the number of anesthetizing sites). Median values, mean, and SDs are reported for total anesthetizing sites, % NORA total, % NORA GI, % NORA non-GI, sites/MD, tASA/case, base/case, h/case, h/site/d, tASA/site, and tASA/h. For staffing, prevalence of staffing model or type of clinician present was determined by facility type.

RESULTS

Of the 135 members of SAAAPM, 63 departments participated in the survey for a 47% response rate. These 63 departments submitted information on 156 facilities. However, 16 facilities from 13 departments were excluded from the analysis due to insufficient data (14 did not submit sufficient data for billing [eg, total ASA units, time units, cases, sites] and 2 did not submit any staffing data). Therefore, 140 facilities reporting 69 AMC, 26 Community, 7 Children, and 38 ASC were included in the survey results. These facilities provided data for 3402 anesthetizing sites staffed daily by over 1917 anesthesiologists, 940 residents, and 2281 CRNA/CAA providing care to 2,767,852 cases annually (Table 1). Although AMC only accounts for about half the facilities, they are responsible for 82% of the anesthesia cases reported.

In this survey, median values of overall productivity for AMC and Children were similar (12,592 and 12,364 tASA/Site), while the ASC had the lowest overall productivity (8911 tASA/Site). By size of facility, in this survey, the smaller facilities (<10 sites, ASC or non-ASC) had lower overall productivity as compared to larger facilities. Median values and mean and standard deviation by facility type are shown in Table 2, respectively, and by size of facility (defined as number of Sites) are shown in Table 3.

Although hourly productivity (tASA/h) is dependent on both surgical duration (h/case) and base/case, surgical duration has a bigger impact.[1,5,7] This relationship is seen in the ASC median values. In this study, ASC has the smallest median h/case and

Table 1. Summation of Sites, Cases, Staff, and Units

	All Facilities n = 140	AMC n = 69	Community n = 26	Children n = 7	ASC n = 38
Sites	3402	2886	211	132	173
NORA non-GI	458	405	12	37	5
NORA GI	309	261	27	7	14
All NORA	767	665	39	44	19
MDs Day	1917	1635	113	91	78
Resident Day	940	887	16	25	12
CRNA/CAA Day	2281	1884	181	69	147
tASA	42,455,646	36,836,223	2,566,517	1,464,243	1,588,664
Cases	2,767,852	2,294,244	199,833	106,817	166,958

Although AMC accounts for 49% of the facilities, but 82% of the cases, 87% of the ASA units, and 85% of the anesthesiologists in the survey. Staffing numbers are only for those staff available from the Day and do not include break, late, or call staff.

Abbreviations: AMC, academic medical center; ASC, ambulatory surgical center; CAA, certified anesthesiologist assistant; Cases, patient cases billed (anesthesia charges only); Children, children's hospital; Community, community hospital; CRNA, certified nurse anesthetist; Day, start of the day; GI, gastrointestinal endoscopy suite; MD, anesthesiologist, faculty; non-GI, nonoperating room procedural sites (excluding GI endoscopy suite); NORA, nonoperating room anesthetizing sites; Resident, anesthesiology resident; Sites, total anesthetizing sites (excluding obstetric sites); tASA, total American Society of Anesthesiologists units.

Table 2. Median and Mean ± SD Values by Facility Type

		All Facilities n = 140	AMC n = 69	Community n = 26	Children n = 7	ASC n = 38
Sites	Median	15.1	39.0	7.5	17.0	3.0
	Mean ± SD	24.3 ± 22.9	41.8 ± 20.3	8.1 ± 5.0	18.9 ± 11.9	4.5 ± 4.1
% NORA non-GI	Median	8%	12%	0%	27%	0%
	Mean ± SD	9% ± 10%	14% ± 7%	4% ± 7%	28% ± 6%	1% ± 4%
% NORA GI	Median	7%	9%	10%	0%	0%
	Mean ± SD	7% ± 8%	9% ± 4%	11% ± 10%	3% ± 4%	3% ± 9%
% NORA total	Median	18%	21%	16%	29%	0%
	Mean ± SD	16% ± 13%	22% ± 9%	14% ± 13%	31% ± 7%	3% ± 11%
Day anesthesiologist	Median	8.0	21.0	4.0	10.0	1.8
	Mean ± SD	13.4 ± 13.1	23.7 ± 12.6	4.3 ± 3.2	13.0 ± 10.1	2.1 ± 1.6
sites/MD	Median	1.9	1.8	2.0	1.6	2.0
	Mean ± SD	2.0 ± 0.7	1.9 ± 0.4	2.1 ± 0.8	1.6 ± 0.3	2.1 ± 1.0
base/case	Median	5.8	6.3	5.3	6.3	4.4
	Mean ± SD	5.9 ± 2.0	6.7 ± 2.0	5.7 ± 1.5	7.2 ± 2.2	4.5 ± 1.4
h/case	Median	2.0	2.3	1.9	2.0	1.1
	Mean ± SD	2.0 ± 0.9	2.5 ± 0.8	1.9 ± 0.8	2.1 ± 0.6	1.2 ± 0.5
h/site/d	Median	6.5	7.3	5.8	6.3	4.4
	Mean ± SD	6.8 ± 3.1	7.6 ± 2.1	7.4 ± 4.6	6.1 ± 1.0	4.9 ± 2.9
cases/site/d	Median	3.2	3.1	3.4	3.0	3.7
	Mean ± SD	3.7 ± 2.5	3.2 ± 0.8	4.0 ± 2.2	3.0 ± 0.7	4.6 ± 4.1
tASA/site	Median	11,546	12,592	11,164	12,364	8911
	Mean ± SD	12,022 ± 5401	12,798 ± 2962	13,109 ± 7961	11,332 ± 1997	9996 ± 6615
tASA/h	Median	7.0	6.8	7.2	7.3	7.8
	Mean ± SD	7.3 ± 1.3	6.8 ± 0.8	7.1 ± 0.7	7.4 ± 0.5	8.2 ± 1.7

Operational and productivity measurements differ based on type of facility consistent with different types of surgical procedures, patients, and physical parameters. For example, in this survey, ASC had the smallest median h/case and base/case. Median values are regularly used in benchmarking surveys.

Abbreviations: AMC, academic medical center; ASA, American Society of Anesthesiologists; ASC, ambulatory surgical center; Base, ASA basic units; Cases, patient cases billed (anesthesia charges only); Children, children's hospital; Community, community hospital; D, day (using 250 d/y estimate); GI, gastrointestinal endoscopy suite; h, billed hours (=time units/4); h/case, surgical duration; MD, anesthesiologist, faculty; non-GI, non-OR procedural sites (excluding GI endoscopy suite); NORA, non-OR anesthetizing sites; OR, operating room; SD, standard deviation; Sites, total anesthetizing sites (excluding obstetric sites); Sites/MD, staffing ratio; tASA, total ASA units; tASA/h, hourly productivity; tASA/site, overall productivity.

smallest median base/case, but the largest median tASA/h (Table 2). Over 20% of sites covered in AMC and Children are NORA sites with median values of 21% and 29% (Table 2).

The median staffing ratios are <2.0 for AMC and Children reflecting a staffing model with 1:2 and some 1:1 coverage consistent with residency program limitations[8] and the complexity of cases as defined by base/case. AMC and Children have a median base/case of 6.3 ASA units/case, while Community has median of 5.3 ASA units/case and ASC 4.4 ASA units/case. The prevalence of the type of staff at the beginning of the day reflects the staffing ratios with anesthesiology residents at 97% of the AMCs and 100% of the Children (Table 4). Despite residents in only a minority of ASC (18%) and Community (35%), the median staffing ratio was 2.0 reflecting that these facilities also include physician-only practices (18% of ASC, 12% Community). In more than half (62%) of AMC, at least 1 break CRNA or CAA is regularly scheduled on a weekday (Table 4).

Table 3. Median and Mean ± SD Values by Facility Size

		ASC < 10 n = 34	Non-ASC < 10 n = 23	Non-ASC 10–19 n = 16	Non-ASC 20–39 n = 28	Non-ASC ≥ 40 n = 35
Sites	Median	3.0	7.0	13.5	30.0	57.8
	Mean ± SD	3.5 ± 2.4	6.1 ± 2.5	13.8 ± 3.1	29.1 ± 5.1	58.6 ± 12.5
% NORA non-GI	Median	0%	0%	17%	13%	13%
	Mean ± SD	0% ± 0%	2% ± 5%	15% ± 13%	15% ± 8%	15% ± 6%
% NORA GI	Median	0%	3%	6%	9%	9%
	Mean ± SD	0% ± 2%	8% ± 10%	8% ± 8%	8% ± 4%	9% ± 4%
% NORA total	Median	0%	11%	23%	21%	22%
	Mean ± SD	0% ± 2%	11% ± 12%	24% ± 10%	23% ± 8%	24% ± 8%
Day anesthesiologist	Median	1.0	3.0	7.5	16.4	31.0
	Mean ± SD	1.7 ± 1.0	3.3 ± 1.9	8.0 ± 2.7	16.8 ± 4.9	33.3 ± 9.7
sites/MD	Median	2.0	2.0	1.8	1.8	1.9
	Mean ± SD	2.1 ± 1.0	2.1 ± 0.8	1.8 ± 0.5	1.8 ± 0.4	1.8 ± 0.5
Base/case	Median	4.3	5.1	6.2	5.9	6.7
	Mean ± SD	4.4 ± 1.4	6.0 ± 1.9	7.6 ± 3.3	6.0 ± 1.0	6.6 ± 1.4
h/case	Median	1.1	2.0	2.1	2.2	2.4
	Mean ± SD	1.2 ± 0.5	2.1 ± 1.0	2.5 ± 1.2	2.3 ± 0.6	2.4 ± 0.6
h/site/d	Median	4.5	5.7	7.0	7.5	7.1
	Mean ± SD	5.0 ± 3.0	7.7 ± 4.9	7.1 ± 2.3	7.6 ± 1.7	7.4 ± 2.0
cases/site/d	Median	4.1	3.0	3.2	3.3	3.1
	Mean ± SD	4.8 ± 4.3	3.8 ± 2.3	3.2 ± 1.3	3.4 ± 0.8	3.1 ± 0.6
tASA/site	Median	9019	11,452	12,746	12,719	12,290
	Mean ± SD	10,296 ± 6922	13,231 ± 8252	12,608 ± 4108	12,785 ± 2524	12,548 ± 2931
tASA/h	Median	7.6	7.2	7.2	6.7	6.9
	Mean ± SD	8.2 ± 1.7	7.1 ± 0.9	7.1 ± 0.5	6.8 ± 0.7	6.9 ± 0.9

Operational and productivity measurements differ based on size of facility (as defined by anesthetizing sites) consistent with different types of surgical procedures, patients, and physical parameters. For example, in this survey, smallest non-ASC had the smallest median base/case and h/OR/d. Median values are regularly used in benchmarking surveys. There were 4 ASC that had ≥10 sites and not included.

Abbreviations: ASA, American Society of Anesthesiologists; ASC, ambulatory surgical center; Base, ASA basic units; Cases, patient cases billed (anesthesia charges only); D, day (using 250 d/y estimate); GI, gastrointestinal endoscopy suite; H, billed hours (=time units/4); H/case, surgical duration; MD, anesthesiologist, faculty; non-ASC, facility that is not ASC; non-GI, non-OR procedural sites (excluding GI endoscopy suite); NORA, non-OR anesthetizing sites; OR, operating room; SD, standard deviation; Sites, total anesthetizing sites (excluding obstetric sites); Sites/MD, staffing ratio; tASA, total ASA units; tASA/h, hourly productivity; tASA/site, overall productivity.

Table 4. Anesthesia Staffing Prevalence By Facility Type

	Anesthesia Staffing at the Beginning of the Weekday (Day Staff)			
	AMC n = 69	Community n = 26	Children n = 7	ASC n = 38
MD only: No Resident or CRNA/CAA	0 (0%)	3 (12%)	0 (0%)	7 (18%)
Resident but no CRNA/CAA	0 (0%)	2 (8%)	0 (0%)	0 (0%)
CRNA/CAA but no Resident	2 (3%)	14 (54%)	0 (0%)	24 (63%)
Both Resident and CRNA/CAA	67 (97%)	7 (27%)	7 (100%)	7 (18%)
Mid-day staff for giving breaks and covering late rooms				
CRNA/CAA	43 (62%)	7 (27%)	1 (14%)	2 (5%)
Weekday late staff but not in-house call				
MD faculty	37 (54%)	2 (8%)	1 (14%)	1 (3%)
Resident	32 (46%)	0 (0%)	0 (0%)	0 (0%)
CRNA/CAA	22 (32%)	5 (19%)	2 (29%)	1 (3%)
In-house weekday call				
MD faculty	64 (93%)	8 (31%)	4 (57%)	n/a
Resident	56 (81%)	0 (0%)	4 (57%)	n/a
CRNA/CAA	40 (58%)	2 (8%)	1 (14%)	n/a
In-house weekend call				
MD faculty	63 (91%)	8 (31%)	4 (57%)	n/a
Resident	55 (80%)	0 (0%)	4 (57%)	n/a
CRNA/CAA	38 (55%)	3 (12%)	1 (14%)	n/a
At-home call: MD only				
Backup OR	48 (70%)	6 (23%)	4 (57%)	n/a
Cardiac	57 (83%)	3 (12%)	5 (71%)	n/a
Pediatric	40 (58%)	1 (4%)	n/a	n/a
Liver transplant	42 (61%)	1 (4%)	2 (29%)	n/a

Percentage of facilities with at least 1 staff type. Although residents work in 97% of AMC and 100% of Children but only 18% of ASC and 35% of Community facilities. Almost all AMC function as 24/7 facilities with staff in-house all night.

Abbreviations: AMC, academic medical center; ASC, ambulatory surgical center; CAA, certified anesthesiologist assistant; Children, children's hospital; Community, community hospital; CRNA, certified nurse anesthetist; MD, anesthesiologist, faculty; n/a, not applicable; OR, operating room; Resident, anesthesiology resident.

Table 5. Median Values by Facility Type—2003, 2013, and 2019 SAAPM Surveys on Surgical Anesthesia Productivity

	All Facilities			AMC			Community			ASC		
	2003	2013	2019	2003	2013	2019	2003	2013	2019	2003	2013	2019
n	58	143	140	34	80	69	12	20	26	7	32	38
Sites	18.1	21.0	15.1	23.0	31.4	39.0	10.3	14.5	7.5	3.0	4.0	3.0
MD Day	11.0	12.0	8.0	14.6	17.0	22.0	6.5	6.0	4.0	2.0	2.0	1.8
Sites/MD	1.8	1.8	1.9	1.7	1.8	1.8	1.7	1.8	2.0	2.0	2.8	2.0
Base/case	6.4	5.8	5.8	6.6	6.2	6.3	6.5	5.4	5.3	5.4	4.5	4.4
h/case	2.4	2.2	2.0	2.6	2.5	2.3	2.1	1.6	2.0	1.6	1.2	1.1
h/site/d	7.1	6.5	6.5	7.6	7.3	7.3	6.5	6.0	5.8	3.8	4.3	4.4
cases/site/d	2.9	3.1	3.2	3.0	3.0	3.1	3.0	3.2	3.4	2.4	3.6	3.7
tASA/site	11,700	11,223	11,546	12,600	11,982	12,592	11,500	10,630	11,164	8210	8912	8911
tASA/h	6.7	6.7	7.0	6.6	6.5	6.8	7.3	7.1	7.2	8.2	7.4	7.8

Remarkably, other than the "n" for each survey, no clear trend in any of the measurements are clear. Children was not included because this type of facility was not reported in 2003, and the n <10 for 2013 and 2019 reports.[5,6]

Abbreviations: AMC, academic medical center; ASA, American Society of Anesthesiologists; ASC, ambulatory surgical center; Base, ASA basic units; Cases, patient cases billed (anesthesia charges only); Children, children's hospital; Community, community hospital; D, day (using 250 d/y estimate); H, billed hours (= time units/4); H/case, surgical duration; MD, anesthesiologist, faculty; non-GI, non-OR procedural sites (excluding GI endoscopy suite); NORA, non-OR anesthetizing sites; OR, operating room; SAAAPM, Society of Academic Associations of Anesthesiology and Perioperative Medicine; Sites, total anesthetizing sites (excluding obstetric sites); Sites/MD, staffing ratio; tASA, total ASA units; tASA/h, hourly productivity; tASA/site, overall productivity.

Table 6. Comparison of "Per Anesthetizing Site" Versus "Per MD," Median Values, ASC Facilities

	Staffing Ratio (Sites/MD)	
	≤1.0 (n = 10)	≥2.0 (n = 19)
cases/MD	984.2	2886.5
cases/site	984.2	1124.8
tASA/MD	8765	26,033
tASA/site	9241	8931
h/MD/d	4.7	12.1
h/site/d	4.7	4.6

Measurements based "per MD" result in misleading comparisons when staffing ratios differ. In an industry-wide survey, staffing ratio will not be consistent among all facilities, and therefore, "per MD" measurements are not reported. In this survey, the number of MDs needed to staff a facility at the beginning of a weekday was collected. The number of MDs is always less than the number of FTEs because 1 FTE anesthesiologist does not work every week of the year.

Abbreviations: ASA, American Society of Anesthesiologists; ASC, ambulatory surgical center; Cases, patient cases billed (anesthesia charges only); D, day (using 250 d/y estimate); FTE, full-time equivalent; H, billed hours (=time units/4); MD, anesthesiologist, faculty; Sites, total anesthetizing sites (excluding obstetric sites); tASA, total ASA units; tASA/site, overall productivity.

In comparison to the 2 previous surveys of surgical anesthesia productivity in facilities by academic anesthesiology departments,[5,6] the number of departments and number of facilities included in the survey is similar between the 2013 report and this survey (2019) and about double from 2003 (Table 5). In 2003, 37 departments reported 58 facilities, while 2013 report had 64 departments reported 143 facilities and this report 63 departments reporting 140 facilities. The number of facilities per department is increased from 1.9 in 2003 to 2.2 in both the 2013 and 2019 surveys. The biggest change has been the percentage of facilities that are ASC. In 2003, only 12% of the facilities were ASC, while in 2003 and 2019 had 22% ASC. This trend is consistent with clinical experience that in last 15–20 years, many that academic anesthesiology departments are now staffing new self-standing facilities that hospital systems have opened. Unfortunately, the earlier surveys (2003 and 2013) did not capture NORA sites, so we are unable to confirm the clinical experience that the trend for NORA is growing in percentage of clinical commitment for anesthesiology departments.

In other comparisons between 2003 survey, 2013 survey, and this survey, the staffing ratio (sites/MD) has remained similar for almost all facilities except ASC. In the 2013 survey, ASC 25th–50th–75th percentile values were 1.5–2.8–3.0, while this reports' values were 1.0–2.0–3.0. Although we cannot definitively explain the differences, we do note that 18% of the ASC in this report was staffed as physician-only staffing model. On the other hand, there was virtually no difference in overall productivity (tASA/site) between 2013 and 2019. The fact that facilities are staffed at different ratio but have similar productivity reinforces the fact that "per full-time equivalent (FTE)" measurements for benchmarking do not provide consistent or meaningful conclusions. Remarkably, there were very similar productivity measurements between 2013 and 2019 survey for AMC, Community, and ASC. Children had a small sample in both survey (n = 11 and 7), so we cannot make any conclusions about differences for these facilities (Table 5).[5,6]

DISCUSSION

Despite the understanding that benchmarking of anesthesia productivity at the facility level cannot be done in a meaningful way by using "ASA units/FTE,"[1,3,4] this measurement is collected and published annually. The Medical Group Management Association (MGMA) surveys are considered as the "gold standard" for compensation and productivity surveys by administrators, but the MGMA "Academic Compensations 2019 report based on 2018 data" has

only 31 groups included for overall total compensation and 20 groups for ASA units/FTE.[9]

In Table 6, we use the median values for ASC facilities with MD/site ≤1 and ≥2 to illustrate the problem with using "per physician" to compare productivity. If all the comparisons of median values in this survey were based on "per MD," then ≥2 MD/site facilities are much more productive than the ≤1 MD/site facilities. But when the comparisons are done "per Site," one finds that the 2 categories are very similar. (Please note that we used "per MD" rather than "per FTE" because in our survey, respondents reported the number of faculty anesthesiologists [MD] needed each day. This MD value is for 50 weeks a year [weekdays], and the typical 1.0 FTE does not work 50 weeks. Therefore, you need >1.0 FTE for every 1.0 MD.)

Unlike the annual surveys by MGMA (n = 20 groups), this survey had (n = 63 departments, and 140 facilities included) reported data at the facility level and by site. As previously shown, facility type matters. When comparing surgical anesthesia productivity, to be able to make meaningful conclusions and therefore operational decisions, one should not compare an ASC with an AMC. Further, aggregating data for all facilities by reporting at the departmental level or group level confound the measurements and do not allow for meaningful data-driven decision making.

Because we were concerned about the unfamiliarity of respondents in completing this survey and in the data requested, we did not simply accept the data submitted but rather reviewed each department's submissions for each facility initially with respondents. After submission was received, the data and calculated measurements were reviewed by at least one of the authors and email was sent to the respondent if there were any possible problems or incomplete data. Respondents then could send back corrected data. As an example, if a department submitted initial data for AMC that resulted in h/case <1.0 or > 4, we were concerned that the data were not correct, specifically in billed units or number of cases.

Although in Tables 2 and 3, we provide the mean and standard deviation, the median (and percentiles) appear to be better benchmarks due to the skewed distribution seen in many of the measurements.[10] (Percentile values for each category can be found in Supplemental Digital Content 2, Tables 1–10, http://links.lww.com/AA/D92.) Although it is tempting to do statistical tests to determine "significant differences," we chose not to perform them for several reasons. First, the number of possible comparisons is over 200 for each of Tables 2 and 3. This high number of comparisons lends any statistical test to a sampling error or multiple comparison problem. Second, for benchmarking, the results are used as descriptive data for identifying opportunities or areas for closer inspection within one's own facility rather than to make inferential conclusions or comparisons.[11] Finally, in addition to providing descriptive tables for benchmarking, the results provide possible future studies to make inferential conclusions.

Further complicating any comparisons is that median (or other percentile) values of individual measurements do not belong to the same group. A good example is with the 75th percentile for h/case and tASA/h. Because there is an inverse relationship between these 2 measures, the facility with 75th percentile of h/case will definitely not be the facility with the 75th percentile for tASA/h. In this study, for AMC, the facility with 75th percentile of h/case had 2.85 h/case and tASA/h of 5.7 ASA units/h (<25th percentile), while the facility with 75th percentile of tASA/h had tASA/h of 7.0 ASA units/h and h/case of 2.3 h/case (50th percentile).

To illustrate this very important issue when using surveys to benchmark, one can look at 2 AMC facilities with median or close to median value for overall productivity (tASA/site). As seen in Supplemental Digital Content 2, Table 11, http://links.lww.com/AA/D92, the first column is median values for all AMC facilities, while the second and third columns are actual values for 2 specific facilities with median or close to median tASA/site. In this example, facilities A and B reached the same overall productivity in different ways. Facility B has a very high tASA/h because of high base/case and low h/case. On the other hand, facility A has median tASA/h. The implication is that facility B staffs their ORs only 75% of the hours that facility A does. In other words, facility A may have higher staffing costs than facility B to have the same overall productivity.[14] In the other columns (facilities C–E) in Supplemental Digital Content 2, Table 11, http://links.lww.com/AA/D92, AMC facilities were chosen because they had median values for h/site/d. But again, when one looks at each facility, one can see that overall productivity varies due to difference in h/case, base/case, and tASA/h. In other words, the 3 facilities may potentially have similar staffing costs, but this does not mean they will have the same overall productivity. Therefore, it is very important to understand how the different measurements reported relate to each other.[1,2,13,14] Further, one should use the benchmarking data to identify areas that are potential areas of improvement and that may need more detailed examination before making any conclusions.

To make data-driven decisions on clinical productivity, anesthesiology leaders need to be able to make meaningful comparisons at the facility level. For a group that provides care in multiple facilities, one can make internal comparisons among facilities as well

as follow measurements over time. It is valuable for leaders to also be compare their facilities with industry-wide measurements, in other words, benchmark their facilities. These results provide benchmarking data for academic anesthesiology departments. ■

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DISCLOSURES

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