Benchmarking Subspecialty Practice in Academic Anatomic Pathology: The 2017 Association of Pathology Chairs Survey.

Robert E. Mrak, *University of Toledo*
Tristram G Parslow, *Emory University*
BS arbara S. Ducatman, *Oakland University*

Journal Title: Academic Pathology
Volume: Volume 5
Publisher: SAGE Publications (UK and US): Open Access Titles | 2018-01, Pages 2374289518798556-2374289518798556
Type of Work: Article | Final Publisher PDF
Publisher DOI: 10.1177/2374289518798556
Permanent URL: https://pid.emory.edu/ark:/25593/tj2tf

Final published version: http://dx.doi.org/10.1177/2374289518798556

Regular Article

Academic Pathology
Volume 5: 1–9

DOI: 10.1177/2374289518798556
journals.sagepub.com/home/apc

Benchmarking Subspecialty Practice in Academic Anatomic Pathology: The 2017 Association of Pathology Chairs Survey

Robert E. Mrak, MD, PhD[1], Tristram G. Parslow, MD, PhD[2], and Barbara S. Ducatman, MD[3,4]

Abstract

Assessment of physician workloads has become increasingly important in modern academic physician practice, where it is commonly used to allocate resources among departments, to determine staffing, and to set the compensation of individual physicians. The physician work relative value unit system is a frequently used metric in this regard. However, the application of this system to the practice of pathology has proven problematic. One area of uncertainty is the validity of using work relative value unit norms that were derived from general surgical pathology practice to assess the various subspecialties within anatomic pathology. Here, we used data from the 2017 Association of Pathology Chairs practice survey to assess salary and work relative value unit data for single-subspecialty practitioners in US academic pathology departments in the prior year (2016). Five subspecialties were evaluated: dermatopathology, gastrointestinal pathology, hematopathology/hematology, renal pathology, and neuropathology. Data for general surgical pathologists and cytopathologists were included for comparison. For this analysis, survey data were available for 168 practitioners in 43 US academic departments of pathology. Salary ranges varied little among subspecialties, with the exception of dermatopathology, where salaries were higher. In contrast, work relative value unit productivity varied widely among different subspecialties, with median values differing as much as 4- to 7-fold between subspecialties. These results suggest that the use of a single overall work relative value unit standard is not appropriate for specialty- or subspecialty-based anatomic pathology practice, and that either the benchmark norms should be tailored to individual practice patterns, or an alternative system of workload measurement should be developed.

Keywords

anatomic pathology, benchmarking, clinical effort, salary, subspecialty practice, work relative value units

Received July 18, 2018. Received revised July 26, 2018. Accepted for publication August 01, 2018.

Introduction

Assessment of physician workloads has become increasingly important, as many physicians move to salaried, hospital-based, or group-based practices and as bundled payments by third-party payers make it difficult to attribute specific dollar reimbursement amounts to individual practitioners. The physician work relative value unit (wRVU) system was introduced in 1988[1] as a system for quantifying the professional effort required for diverse physician activities both within and across specialties. Time, technical skill and effort, mental effort and

[1] Department of Pathology, University of Toledo College of Medicine and Life Sciences, Toledo, OH, USA
[2] Department of Pathology and Laboratory Medicine, Emory University School of Medicine, Atlanta, GA, USA
[3] Department of Pathology, Oakland University William Beaumont School of Medicine, Rochester, MI, USA
[4] Beaumont Health, Royal Oak, MI, USA

Corresponding Author:
Robert E. Mrak, Department of Pathology, University of Toledo College of Medicine and Life Sciences, 3000 Arlington Ave, Toledo, OH 43614, USA.
Email: robert.mrak@utoledo.edu

judgment, and any attendant stresses are among the factors ostensibly used in ascribing wRVUs to a given physician activity. The original study by Hsaio and coworkers[1] was based on surveys of physicians in only 4 specialties that, notably, did not include pathology. This system has since been applied across virtually all clinical specialties, including pathology, to determine workload—and reimbursement—by third-party payers as well as by individual hospitals, university-based practice plans, and private groups.

The application of this system to the practice of pathology has proven problematic. In particular, there is as yet no recognized system for assigning wRVUs to many areas of pathology practice, such as autopsy pathology, forensic practice, or almost all of laboratory medicine. For the specialties of general surgical pathology and cytopathology, wRVUs are commonly used to measure workload and productivity, although reported benchmark numbers vary widely based on the methodologies used to define and calculate these benchmarks.[2] A question that remains is the applicability of surgical pathology wRVU norms, which are derived from general surgical pathology practice, to practitioners of individual subspecialties. To our knowledge, there has not previously been a systematic study of wRVU measures as they apply to specific subspecialty practices within anatomic pathology.

Methods

The Association of Pathology Chairs Practice Survey

The Association of Pathology Chairs (APC) practice survey design has been described in detail by Ducatman and Parslow.[2] The present report is based exclusively on the APC's 2017 annual survey, which gathered data from the preceding year (ie, 2016). The survey was conducted by the APC's Practice and Management Committee, and all member departments of the APC were invited to participate. The APC represents pathology departments in 170 US medical teaching institutions, including virtually all 88 US academic medical centers who are members of the Association of Academic Health Centers.[3] Ducatman and Parslow[2] previously reported a detailed analysis of data from the 2015 APC survey, providing normative information on clinical effort (both Part A and Part B), educational effort, research effort, median total salary, annual days on clinical service, and wRVUs for surgical pathologists practicing (1) general surgical pathology, (2) one or more subspecialties, or (3) a hybrid of general surgical pathology plus some subspecialty practice, using data from 2014. However, assessment of those data for specific subspecialty practices was limited by low numbers of practitioners within each subspecialty in the 2015 survey database.

Definitions of Survey Salary Terms

The survey asked respondents for the following 3 data points (in addition to other data points) for individual pathologists: (1) base salary for individual (last full year available) not including fringes, (2) incentive salary for individual (last full year available) not including fringes, and (iii) fringe rate as a decimal. These terms were not further defined in the survey.

For the 2017 survey, conducted from January to April 2017, respondents were asked to preferentially provide data on single subspecialty practitioners for 2016, with the aim of obtaining a robust representation of such practitioners that would allow further subspecialty analysis. Chairs or administrators at participating APC institutions were asked to provide specific data on individual faculty pathologists practicing at their own institution during the most recently completed fiscal year. Because all data were completely anonymized and deidentified as to program and individual prior to submission to the APC, this study was exempt from institutional review board review. The present study used data from the 2017 survey only, which was merged into a single Excel® spreadsheet.

Compensation Analyses

We included data from all responding institutions to develop mean, median, and quartile data for pathologists' total annual compensation (base + incentive), stratified by doctoral-level degree, by academic rank, and by geographic region. Geographic regions were used as defined by the APC.[4] We also assessed fringe benefit rates and incentive salary as a percentage of total salary. We further analyzed salary data by years-in-rank for assistant professors.

Subspecialty Analyses

Reporting departments were asked to specify the scope of each individual's practice, choosing from a list of specialties and subspecialties. Our present analysis focused on those anatomic pathology categories for which data were reported on 10 or more practitioners, except that all autopsy and forensic pathologists were excluded. The subspecialties analyzed were dermatopathology, gastrointestinal (GI) pathology, hematopathology/hematology, renal pathology, and neuropathology. Data for practitioners of general surgical pathology and of cytopathology were included for comparison. Mean, median, and quartile data for total compensation and for wRVUs were assessed. Departments were also asked to specify the proportion of each individual's professional effort that was devoted to such practice (ie, the clinical full-time equivalent, cFTE).

Work Relative Value Unit Analyses

Except where otherwise noted, all analyses presented here focused on absolute (raw) wRVU production as reported for each pathologist in a given practice category. Two alternative formats were prepared for purposes of comparison. The first alternative format likewise depicts raw wRVU data but only for the subset of practitioners within each category who had a reported cFTE of 0.67 or greater; this is intended to approximate the method used by the Medical Group Management Association (MGMA) to report physician wRVU data. The

Table 1. Total Compensation Data (US$) by Degree and Academic Rank.*

	Instructor	Assistant Professor	Associate Professor	Associate Professor and Chief	Professor	Professor and Chief	Professor and Chair
Pathologists—PhD							
Count	0	24	24	0	51	2	0
25th	-	123 750	127 000	-	165 125	-	-
Median	-	131 307	140 598	-	187 900	-	-
75th	-	154 494	173 734	-	215 274	-	-
Mean	-	134 982	147 444	-	190 115	286 277	-
Pathologists—DO							
Count	0	9	0	0	0	0	0
25th	-	185 428	-	-	-	-	-
Median	-	215 791	-	-	-	-	-
75th	-	261 267	-	-	-	-	-
Mean	-	228 584	-	-	-	-	-
Pathologists—MD							
Count	3	203	174	7	169	17	5
25th	-	188 270	215 190	270 659	249 161	324 926	394 615
Median	75 000	203 974	246 630	290 000	289 836	343 233	454 980
75th	-	232 998	278 756	296 682	329 861	395 383	496 516
Mean	96 121	210 156	248 173	301 259	291 121	360 545	453 194
Pathologists—MD, PhD							
Count	0	57	50	0	51	8	6
25th	-	186 712	213 412	-	246 204	317 133	405 857
Median	-	198 401	243 388	-	277 636	337 116	425 214
75th	-	213 055	259 810	-	332 662	397 237	512 500
Mean	-	202 312	237 447	-	282 668	354 692	458 488

*Tabulated data indicate the median, mean, and 25th- and 75th-quartile annual salaries (in US$) for pathology faculty. Salary was defined to include base plus incentive pay, excluding benefits.

second alternative format includes data only for those practitioners with a reported cFTE of 0.60 or greater (or, in the case of hematopathologists, 0.5 FTE or greater) but normalized each practitioner's actual wRVU production to that individual's reported cFTE; the resulting wRVU/cFTE ratio is intended to approximate the method used by Vizient (and previously by the Faculty Practice Solutions Center, FPSC) to report physician wRVU productivity. See Ducatman and Parslow[2] for a discussion of the implications of these alternative benchmarking methodologies.

Statistical Analysis

Statistical tests for significance were performed in JMP version 13.0 (Cary, North Carolina) by one of the authors (B.S.D.). Since the data are nonparametric, particularly when using MGMA and Vizient methodologies, the Wilcoxon Kruskal-Wallis test was applied for most analyses reported here.

Study Population

Anonymized survey data from 2016 were available for a total of 918 faculty members from 43 US departments of pathology. We first analyzed individual pathologists' total compensation (defined as base pay plus any incentives but excluding fringe benefits) as a function of academic rank, professional degree, and geographic region, determining the mean, median, first quartile, and third quartile of compensation for each group. Analyses of the distributions of fringe benefits and incentive salary (each as a percent of total salary) were performed for 836 faculty members for whom these data were available, and the results were then further substratified by geographic region.

For analyses of wRVU data, we focused on the subset of 168 faculty members who were identified by their departments as exclusively practicing general surgical pathology (n = 54), cytopathology (n = 15), or 1 of 5 subspecialties for which requisite data on at least 10 practitioners had been reported. The latter subspecialties were hematopathology (n = 39), renal pathology (n = 19), neuropathology (n = 15), dermatopathology (n = 14), and GI pathology (n = 12). Practitioners of 2 anatomic pathology subspecialties for which wRVU data are not available (autopsy and forensic pathology) were not included in our analysis.

Results

Median Salary Compensation Data for All US Pathology Faculty

Salary data for US academic pathologists, stratified by degree, by academic rank, and by senior administrative titles (Chief or Chair), are presented in Table 1. For PhD faculty, median salaries range from US$131 000 for assistant professors to US$188 000 for full professors. The respective figures for those

Table 2. Total Compensation Data (US$) by Region—Pathologists MD, DO, and MD/PhD.*

	Instructor	Assistant Professor <2 years	All Assistant Professor	Associate Professor	Professor	Professor and Chief	Professor and Chair
Midwest							
Count	0	7	63	42	34	4	3
25th	-	177 500	188 404	217 210	243 277	-	-
Median	-	180 000	192 474	252 478	319 249	395 469	423 427
75th	-	197 098	239 246	279 961	365 550	-	-
Mean	-	183 045	213 881	251 748	297 140	386 768	424 341
Northeast							
Count	0	10	61	62	47	4	2
25th	-	194 988	191 380	226 703	260 681	-	-
Median	-	198 705	203 511	252 493	294 128	321 777	-
75th	-	220 006	213 660	287 149	328 713	-	-
Mean	-	211 874	206 021	258 029	301 575	298 517	371 809
Southeast							
Count	3	14	99	97	118	14	5
25th	-	203 232	187 272	207 518	238 274	305 097	-
Median	-	212 904	204 000	236 440	266 400	332 512	541 000
75th	-	227 894	234 600	258 182	312 079	346 433	-
Mean	91 667	219 057	207 635	233 928	271 254	335 780	552 403
West							
Count	0	3	16	23	22	4	2
25th	-	-	204 850	227 926	199 127	-	-
Median	-	209 000	227 500	292 423	239 038	236 000	-
75th	-	-	249 213	346 500	317 024	-	-
Mean	-	225 623	229 835	298 935	286 572	230 436	227 416

*Tabulated data indicate the median, mean, and 25th- and 75th-quartile annual salaries (in US$) for MD, DO, and MD/PhD pathology faculty. Salary was defined to include base plus incentive pay, excluding benefits.

with medical degrees (MD, DO, or MD/PhD) range from US$198 000 for MD/PhD assistant professors to US$290 000 for MD professors. Interestingly, median salaries for MD/PhD faculty are consistently lower than those for MD-only faculty, although the absolute differences are small and not statistically significant (Wilcoxon Kruskal-Wallis). For all subsequent analyses, data for faculty with different medical degrees (MD, DO, or MD/PhD) were pooled to maximize the numbers of individuals in each subcategory. When total annual compensation was further substratified according to years-in-rank for either MD (including MD/PhD) or PhD faculty, the lines of regression were essentially flat for all ranks, suggesting that rank remains the primary determinant of salary, whereas time-in-rank has a comparatively minor and statistically insignificant effect at least when compared across departments nationally.

Median Salary Compensation Data for Geographic Regions

Analyses of total compensation data by geographic region are presented in Tables 2 and 3. Some variation is apparent: For example, median salaries are lowest in the Midwest and highest in the West for faculty at the rank of assistant professor, whereas the opposite relationship prevails for those at the level of professor (Table 2). For PhD faculty (Table 3), by contrast, median salaries are highest in the Northeast for assistant professors and highest in the Midwest for professors. However, none of these differences reached statistical significance.

Distributions of Fringe Rates and Incentive Salary

Reported fringe rates showed dramatic variation across our data set, ranging from 0% to 59% across the 836 practitioners for whom data were obtained. This distribution is shown graphically in Figure 1. Approximately two-thirds of practitioners had fringe rates between 15% and 30% (Figure 2). Incentive salary, as a percentage of total compensation, varied from 0% to 54%. Interestingly, a significant number of practitioners (ranging from fewer than 10% in the Northeast to approximately 50% in the West) received no incentive compensation at all in 2016, as reported by their departments, although it is not clear what proportion of this group might have been eligible for incentive pay but did not receive it (see Figure 2). In contrast to fringe rate data, there is no identifiable subrange that accounts for a majority of individuals, although incentive compensation rates above 20% are only seen for a small minority of practitioners. Surprisingly, there were marked statistically significant differences in the ratio of incentive pay to total compensation across regions ($P < .0001$), with the Southeast having the highest median fraction of incentive compared to total pay (9.35%), followed by the Northeast (5.32%), with the West and Midwest tied (4.76%).

Table 3. Total Annual Salary by Region—Pathologists PhD.*

	Assistant Professor	Associate Professor	Professor	Professor and Chief
Midwest				
Count	6	7	6	0
25th	110 590	156 143	268 911	-
Median	120 893	204 566	310 893	-
75th	129 042	221 655	344 336	-
Mean	114 089	197 441	312 888	-
Northeast				
Count	7	2	5	0
25th	167 772	-	180 536	-
Median	196 761	-	191 791	-
75th	198 000	-	204 000	-
Mean	179 258	233 460	192 520	-
Southeast				
Count	11	17	34	2
25th	127 498	132 798	164 086	-
Median	136 116	140 598	187 469	-
75th	165 040	165 239	211 354	-
Mean	141 777	150 027	187 577	286 277
West				
Count	0	0	1	0
25th	-	-	-	-
Median	-	-	-	-
75th	-	-	-	-
Mean	-	-	216 900	-

*Tabulated data indicate the median, mean, and 25th- and 75th-quartile annual salaries (in US$) for PhD pathology faculty. Salary was defined to include base plus incentive pay, excluding benefits.

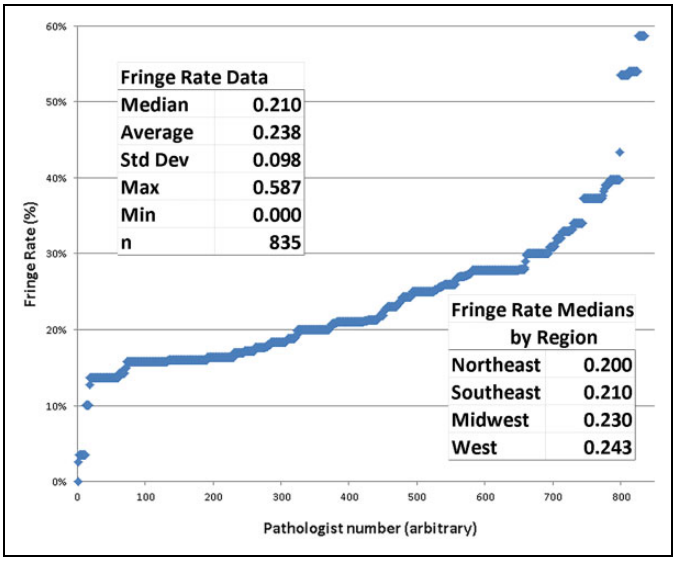

Figure 1. Distribution of salary fringe rates, as a percentage of total compensation, across the entire data set of 836 pathology practitioners.

Salary and Work Relative Value Unit Data for Single-Subspecialty Practitioners

A major focus of the 2017 APC Practice and Management survey was on the collection of salary and wRVU data for single subspecialty practitioners. These data are presented in Tables 4 and 5. Sufficient data (ie, for 10 or more practitioners) were available for analysis of 2 anatomic pathology specialties (general surgical pathology and cytopathology) and for 5 subspecialties (dermatopathology, GI pathology, hematopathology, renal pathology, and neuropathology). Except for dermatopathology (median total salary US$347 309), the salaries for these groups do not vary widely, with median salaries ranging from about US$230 000 to US$270 000 (see Table 4). Pairwise comparisons among these groups failed to reach statistical significance, even when stratified by rank, except that salaries of dermatopathologists were significantly higher than those of practitioners in any of the other individual categories ($P < .014$), both overall and when stratified by academic rank.

In contrast to salary, wRVU productivity varied widely among different anatomic pathology specialties and subspecialties (Table 5). Differences were highly statistically significant and were apparent regardless of the type of analysis applied: (1) raw actual wRVU data per practitioner; (2) raw actual wRVU data per practitioner only for practitioners with at least 0.67 cFTE (MGMA method), or (3) wRVUs normalized for cFTE, and only for practitioners with >0.60 cFTE (Vizient method). As has been observed previously,[2] values derived using methods (1) and (2) were generally concordant, whereas method (3) yielded substantially higher values in all subcategories, largely as a result of normalizing raw wRVU production to reported cFTE. Regardless of the method used, dermatopathologists consistently showed the highest wRVU numbers, with annual medians of 8023 actual wRVUs, 8119 actual wRVUs for cFTE ≥0.67 (MGMA method), and 10 053 normalized wRVUs for cFTE >0.60 (Vizient method). Neuropathologists, by contrast, consistently showed the lowest wRVU numbers, with annual median productivity of 1361 for actual wRVUs, 1153 by MGMA methodology, and 1593 wRVUs by the Vizient method. For general surgical pathologists, the corresponding medians are 5790 actual and 6073 or 8343 wRVUs by the MGMA or Vizient methods, respectively.

We compared the results of the present survey, which were based on data from 2016, to those in our earlier report[2] that utilized data from 2014, in search of historical trends. In accord with MGMA-type methodology, the earlier paper had focused primarily on "full-time" practitioners, defined as those with cFTE of 0.67 or greater, so the present comparison was restricted to that subgroup as well. Both reports presented relevant data from sufficient numbers of (ie, 10 or more) practitioners of surgical pathology, cytopathology, dermatopathology, neuropathology, and renal pathology to allow direct comparisons within those categories.

In comparing the present data with the previous survey (analyzed in 2015 based on 2014 data, and herein referred to as 2015 survey to keep the reference dates similar), we found that median salary data for all MD/DO faculty showed small increases from 2015 to 2017 (assistant professor US$202 710 in 2017, n = 265 vs US$200 391 in 2015; n = 252), associate professor (US$245 689 in 2017; n = 223 vs US$243 176 in 2015; n = 166), and full professor (US$294 890 in 2017;

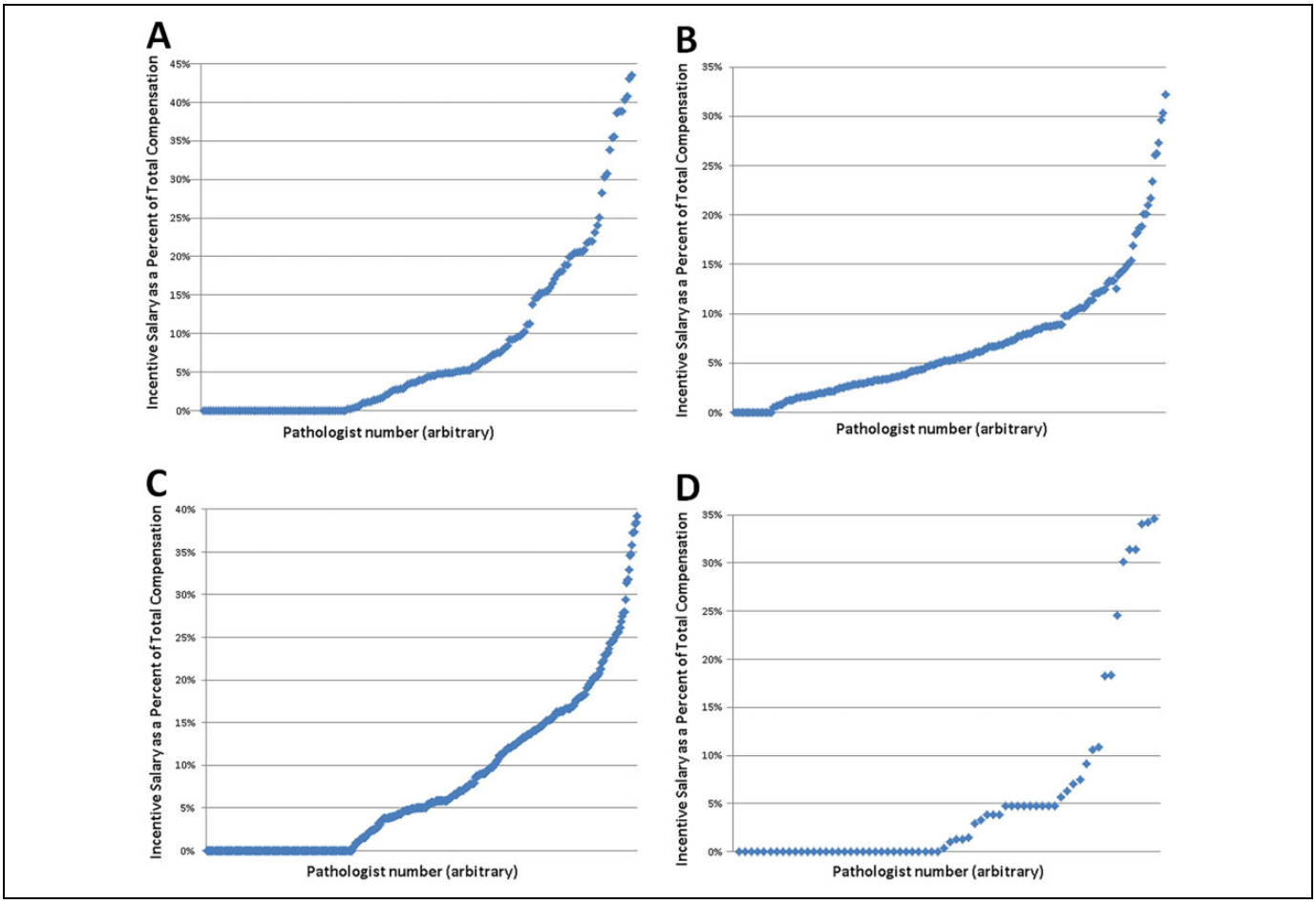

Figure 2. Incentive salary as a percentage of total compensation, by geographic region, across the entire data set of 836 practitioners. Panels A to D present data for the Midwest, Northeast, Southeast, and West regions, respectively.

Table 4. Total Annual Salary by Subspecialty (in US$).*

	Derm	GI	SP	Cytopath	Heme	Renal	Neuro
Count	15	13	54	15	39	19	15
25th	239 121	206 022	203 478	227 172	221 177	218 910	184 365
Median	347 309	271 179	245 655	239 878	239 857	270 000	220 139
75th	395 901	356 494	269 282	280 488	290 000	304 860	264 419
Mean	313 502	285 096	247 969	266 156	264 197	279 900	237 275

Abbreviations: Cytopath, cytopathology; Derm, dermatopathology; GI, gastrointestinal pathology; Heme, hematopathology/hematology; Neuro, neuropathology; Renal, renal pathology; SP, general surgical pathology.
*Tabulated data indicate the median, mean, and 25th- and 75th-quartile annual salaries (in US$) for each specialty (SP and Cytopath) or subspecialty (Derm, GI, Heme, Renal, or Neuro) for which requisite data were reported on at least 10 (count) academic pathologists whose practice was limited to that specialty or subspecialty. Salary was defined to include base plus incentive pay, excluding benefits.

n = 258 vs US$289 405; n = 189). Whether these small differences are meaningful cannot be determined. As for workload, we compared data from the 2 surveys for general surgical pathologists, and found that the median wRVU workload (MGMA-type analysis) was quite comparable between the 2 surveys (5371 wRVUs in 2017 vs 5,786 wRVUs in 2015). We did find differences in median workload for subspecialists between the 2 surveys, but given the small number of individuals in both surveys in this pool, we believe the numbers are too small for meaningful comparison.

Discussion

The 2017 APC survey gathered comprehensive nationwide data on the compensation and wRVU productivity for academic anatomic pathologists in individual anatomic pathology

Table 5. Total Annual wRVU Productivity by Subspecialty.*

Raw (uncorrected) wRVUs, including all practitioners†							
	Derm	GI	SP	Cytopath	Heme	Renal	Neuro
Count	14	12	54	15	39	19	15
25th	5727	5293	2896	3068	3154	1410	825
Median	8023	5790	4936	4770	4607	3322	1361
75th	9832	6570	6568	5919	6965	5147	2363
Mean	7937	5851	4945	4765	4909	4038	1641
Raw (uncorrected) wRVUs, including only practitioners with cFTE 0.67 or greater‡							
wRVUs	Derm	GI	SP	Cytopath	Heme	Renal	Neuro
Count	10	7	29	10	15	8	4
25th	6803	5500	3227	4767	4153	1125	900
Median	8119	6075	6073	5495	5650	3516	1153
75th	10416	6697	7123	6763	6993	5811	4120
Mean	8550	6137	5611	5801	5499	3484	2058
wRVUs/cFTE, including only practitioners with cFTE 0.60 or greater§							
RVUs	Derm	GI	SP	Cytopath	Heme|	Renal	Neuro
Count	12	9	38	13	17	13	8
25th	8619	7843	4507	4704	6186	3804	1561
Median	9439	8320	7311	5817	8133	5147	2177
75th	11 599	8437	8807	6668	10 870	6714	3551
Mean	9872	8112	6996	5686	8749	4795	2549

Abbreviations: cFTE, clinical full-time equivalent; Cytopath, cytopathology; Derm, dermatopathology; GI, gastrointestinal pathology; Heme, hematopathology/hematology; Neuro, neuropathology; Renal, renal pathology; SP, general surgical pathology; wRVU, work relative value unit.

*Tabulated data indicate the median, mean, and 25th- and 75th-quartile annual wRVU production in 2016 by academic pathologists whose practices were limited to the indicated specialty (SP and Cytopath) or subspecialty (Derm, GI, Heme, Renal, or Neuro) that year.

†Raw (uncorrected) wRVU production in each specialty or subspecialty for which requisite data were reported for at least 10 (count) academic pathologists.

‡Raw (uncorrected) wRVU production only for the subset of pathologists within each group from panel A whose reported cFTE (defined as the proportion of full-time effort devoted to Part B service that year) was 0.67 or greater. This was intended to approximate the productivity benchmarking metric reported by the Medical Group Management Association (MGMA).

§Raw wRVU production normalized to reported cFTE only by the subset of pathologists within each group from panel A whose reported cFTE (defined as the proportion of full-time effort devoted to Part B service that year) was 0.60 or greater (| or 0.5 or greater for hematopathologists). This analysis was intended to approximate the productivity benchmarking metric reported by Vizient-AAMC Faculty Practice Solutions Center (FPSC).

subspecialties. Anonymized data were gathered on more than 160 faculty subspecialists from 43 academic pathology departments; these had been submitted by departmental leaders with a nuanced understanding of pathology practice patterns and terminology, which is likely to have maximized the validity of the data obtained. Based on data from this survey, the present study has yielded detailed information on salaries and wRVU outputs of single-subspecialty practitioners in 5 major fields of anatomic pathology and allowed comparison of those data with the corresponding values for cytopathologists and general surgical pathologists from the same survey database. These benchmarks were further substratified by academic rank, years at rank, academic degree, senior administrative title, and geographical region as summarized in the tables contained in this report.

A key finding of this study is that average annual wRVU productivity varies widely across different subspecialties. Median raw annual wRVU outputs of academic dermatopathologists and GI pathologists, for example, were found to exceed those of neuropathologists by 5.8- and 4.2-fold, respectively, and were 17% to 74% higher than the corresponding values for generalist surgical pathologists, cytopathologists, or hematopathologists (Table 4). We do not believe that academic department chairs will be surprised by those disparities, nor find them a valid reflection of either clinical workload or relative value across these vital, demanding clinical disciplines.

Our findings suggest that wRVUs have limited validity as a measure of pathologist workloads or productivity for individual practitioners. This is particularly true for academic pathology departments, where a variety of practice models and wide disparities in effort allocations exist among institutions, especially when comparing across subspecialties. Accordingly, caution must be exercised when applying wRVUs to define individual productivity benchmarks or to set targets for incentive-based compensation models. Concerns arise when wRVU output is normalized to cFTE, since the allocation model used to assign cFTE values to individual practitioners varies widely among departments and institutions.[2] Normalizing wRVUs by

dividing by clinical effort allocation can significantly overstate actual wRVU production, yielding artificial "benchmark" values for median wRVU output that are achieved by only a small fraction of practitioners (Table 5). These findings argue that the use of wRVUs as a productivity metric in anatomic pathologists should be narrowly tailored to local practice environments or that alternative systems of workload measurement should be considered.

Indeed, it is both notable and reassuring that, aside from the higher salaries presently commanded by dermatopathologists, median compensation varies relatively little, either between the other 4 subspecialties we examined or in comparison to general surgical pathologists and cytopathologists nationally (Table 4). We view this as evidence that pathology departments set compensation in a relatively egalitarian manner that presumably reflects market forces and is not closely linked to individuals' wRVU productivity. Thus, although wRVUs are a poor marker for productivity, academic departments have found a way to balance workloads and compensation across subspecialties. In addition, most academic pathology departments take into account not only clinical productivity but also administrative, educational, and research metrics; thus finding ways to reward pathology faculty across all the academic missions. Finally, the trend toward ever-higher clinical productivity bears close watching, as this may impact our other academic missions, especially if unaccompanied by commensurate salary increases.

As for alternative systems of measuring workload and productivity in pathology, Cloetingh et al[5] compared 3 methods for measuring workload in surgical pathology and cytopathology: (1) the wRVU system, (2) a point system developed by the Royal College of Pathologists (RCP),[6] and (3) a slide-count system developed by the authors at the University of Washington in Seattle (UW).[5] They found that the wRVU system favors specialties with higher volumes of small specimens (eg, dermatopathology), whereas the RCP system provides more weight for higher complexity specimens, and the UW system favors specialties with extensively sampled large specimens. Horne et al,[7] however, specifically applied the RCP system to dermatopathology workload in a time-motion study, and concluded that this system underestimated workloads achieved by experienced dermatopathologists, and thus was not ideally applicable to that subspecialty.

Meijer et al[8] measured the actual time that pathologists spent in various steps of specimen preparation and diagnosis (eg, gross examination, microscopical examination, dictation, etc). These authors found that such time measurements correlate well with numbers of tissue blocks and/or slides per specimen, thus suggesting that counts of tissue blocks or slides might be a useful system for measuring pathologist workload in a variety of practice settings.

Yet another system for measuring workload in surgical pathology was developed by Cheung et al[9] at the University of Toronto and is known as the Automatable Activity-Based Approach to Complexity Unit Scoring (AABACUS). This system uses clinical laboratories' information systems to calculate "complexity factors" for different activities and, based on these, generates "complexity units" (CUs) for each of activity performed. The system has the advantage that it can be automated (as the name suggests), thus requiring little additional work after initial implementation. A major finding in this latter study is that the resulting CU counts are generally comparable for different anatomic pathology subspecialists, ranging from dermatopathology to neuropathology, which may suggest that AABACUS is a better index of actual work performed than are other extant systems.

As mentioned above, workload assessment for autopsy or forensic pathologists is particularly problematic, as their work products have no assigned wRVU value and do not involve billing to third-party payers. The Autopsy Committee of the College of American Pathologists developed a recommendation,[10] based on a survey of autopsy pathologists, that one full adult autopsy be valued at 5.5 times a CPT code 88309-26, with an additional value of 1.5 times 88309-26 attributed for full-brain examination. They also recommended a value of 4 times 88309-26 be attributed for a fetal or neonatal autopsy.

Our study is survey based and, as such, we cannot independently verify the data submitted nor establish that the results are representative of all academic departments. However, the substantial number of departments participating in the survey (43 academic departments of pathology) represents nearly half of the 88 US academic medical centers who are members of the Association of Academic Health Centers.[3] Responding departments were not required to submit data for every faculty practitioner but instead were given the option of providing data only for a minimum of 10 representative practitioners. This was to encourage survey participation by larger departments, which might otherwise find the survey overly burdensome, but it may have introduced selection bias. For the 2017 survey, departments were asked to focus on single subspecialty practitioners where possible, thus enriching the survey population in this regard. This approach was different from that of previous APC surveys, which did not request such selective inclusion,[2] and it is this enrichment that allowed us to perform, for the first time, meaningful analysis of subspecialty practice in US academic pathology departments.

Summary and Conclusions

The use of wRVUs as a measure of workload and productivity by pathologists is inherently flawed. Although wRVUs might be of some use in comparing pathologists who have identical practice patterns (eg, general surgical pathologists, cytopathologists, or practitioners of a single given subspecialty), this measurement system fails dramatically when used to compare different anatomic pathology subspecialties, even when restricted to nonautopsy and nonforensic practices. Of course, the lack of a valid, standardized, and widely accepted workload measurement system for clinical pathology practice is well recognized.

Unfortunately, insofar as the wRVU system has been adopted as the metric for payment by the government and most insurers, it inextricably forms the basis for reimbursement and,

consequently, for compensation. If, as is widely assumed, future reimbursement shifts increasingly from a fee-for-service model centered on wRVUs to value-based payments, it is possible that wRVUs will lose their importance other than as a benchmark for departmental staffing. Until that time, we recommend that pathology departments try to use wRVU production as a department-wide rather than an individual benchmark, although it is still highly problematic as the former. Additionally, we recommend that pathology chairs understand both the effort allocation and the subspecialty issues associated with wRVU benchmarks in order to more effectively advocate for their faculty and to design equitable compensation policies. Fortunately, this seems currently to be case for most departments who participated in the 2017 APC survey.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Hsiao WC, Braun P, Yntema D, Becker ER. Estimating physicians' work for a resource-based relative-value scale. *N Engl J Med*. 1988;319:835-841.
2. Ducatman BS, Parslow T. Benchmarking academic anatomic pathologists: The Association of Pathology Chairs Survey. *Acad Pathol*. 2016;3:2374289516666832. doi:10.1177/2374289516666832.
3. Members—Association of Academic Health Centers Web site. http://www.aahcdc.org/About/Members. Accessed August 24, 2018.
4. Association of Pathology Chairs Regional Map. Association of Pathology Chairs. https://apc.memberclicks.net/assets/docs/Directory/us-map-regions.png. Accessed August 24, 2018.
5. Cloetingh D, Schmidt RA, Kong CS. Comparison of three methods for measuring workload in surgical pathology and cytopathology. *Am J Clin Pathol*. 2017;148:16-22.
6. The Royal College of Pathologists. Guidelines on staffing and workload for histopathology and cytopathology departments (4th ed). 2015. https://www.rcpath.org/asset/AAAE5525-894F-472C-AE2DFA281829E3D1/. Accessed August 10, 2018.
7. Horne GJ, Barber DF, Bruecks AK, Maung RT, Trotter MJ. Workload measurement in subspecialty dermatopathology. *J Clin Path*. 2009;62:435-438.
8. Meijer GA, Oudejans JJ, Koevoets JJ, Meijer CJ. Activity-based differentiation of pathologists' workload in surgical pathology. *Virchows Arch*. 2009;454:623-628.
9. Cheung CC, Torlakovic EE, Chow H, Snover DC, Asa SL. Modeling complexity in pathologist workload measurement: the Automatable Activity-Based Approach to Complexity Unit Scoring (AABACUS). *Mod Pathol*. 2015;28:324-339.
10. Sinard JH. Autopsy Committee of the College of American Pathologists; Accounting for the professional work of pathologists performing autopsies. *Arch Path Lab Med*. 2013;137:228-232.