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The role of PhD faculty in advancing research in departments of surgery

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Abstract

Objective—To determine the academic contribution as measured by number of publications, citations, and NIH funding from PhD scientists in U.S. departments of surgery.

Summary Background Data—The number of PhD faculty working in U.S. medical school clinical departments now exceeds the number working in basic science departments. The academic impact of PhDs in surgery has not been previously evaluated.

Methods—Academic metrics for 3,850 faculty at the top 55 NIH-funded university and hospital-based departments of surgery were collected using NIH RePORTER, Scopus, and departmental websites.

Results—MD/PhDs and PhDs had significantly higher numbers of publications and citations than MDs, regardless of academic or institutional rank. PhDs had the greatest proportion of NIH funding compared to both MDs and MD/PhDs. Across all academic ranks, 50.2% of PhDs had received NIH funding compared to 15.2% of MDs and 33.9% of MD/PhDs ($p<0.001$). The proportion of PhDs with NIH funding in the top 10 departments did not differ from those working in departments ranked 11–50 ($p=0.456$). A greater percentage of departmental PhD faculty was associated with increased rates of MD funding.

Conclusion—The presence of dedicated research faculty with PhDs supports the academic mission of surgery departments by increasing both NIH funding and scholarly productivity. In contrast to MDs and MD/PhDs, PhDs appear to have similar levels of academic output and funding independent of the overall NIH funding environment of their department. This suggests that research programs in departments with limited resources may be enhanced by the recruitment of PhD faculty.

INTRODUCTION

The number of PhD faculty working in U.S. medical schools has been increasing for nearly four decades.[1] Currently, the number of PhDs employed by clinical departments is nearly 40% higher than those employed by basic science departments.[2] This trend is thought to be

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the result of several factors including increasing pressure on MD faculty to generate clinical revenue, growing emphasis placed on translational research by funding agencies, and greater technological specialization and training required to conduct cutting-edge research.[3–5] As a result of these changes, medical schools have seemingly adapted by hiring more dedicated research faculty with PhDs to help carry out and diversify their academic mission.

Departments of surgery have perhaps experienced even greater strain on their research enterprise compared to other departments, as academic medical centers rely heavily on surgeons to provide a major source of revenue.[6] Academic surgeons face considerable time constraints due to the high number of hours spent providing patient care relative to other medical specialties.[7] A possible side effect of this is a lag in research productivity compared to other clinical departments. A survey of members of the Society of University Surgeons found that only 46% reported that they were active researchers.[8] Additionally, studies have also shown that surgical NIH grant submissions are less likely to be funded than nonsurgical submissions, and when funded, receive smaller award amounts.[9,10] A proposed strategy for departments to overcome surgeons' limitations in conducting research is to increase the number of PhD faculty who have both advanced training and time devoted to surgical research.[3]

In 2014, 4.1% of PhD faculty working in U.S. medical schools had appointments in departments of surgery.[2] The objective of this study was to examine differences in the number of publications, citations, and NIH funding between faculty with MDs, MD/PhDs, and PhDs in U.S. departments of surgery. A secondary aim is to compare the performance of PhDs working in top 10 NIH funded departments of surgery compared to departments receiving less NIH funding (ranked 11–55). Lastly, we examined academic performance of MD faculty as a function of the percentage of PhDs working within their department.

METHODS

Data Source

Our study sample included faculty working in the top 50 U.S. university-based departments of surgery with the highest amounts of NIH funding according to the Blue Ridge Institute for Medical Research.[11] Our sample also included 5 additional NIH funded hospital-based departments of surgery that were associated with, but separate, from a medical school. In total, 55 departments of surgery were included in our sample. Departmental websites were used to generate a list of faculty members working at these institutions. A total of 3,850 surgical faculty were identified and information on academic rank, division, and titles were collected from departmental websites as well. Additional data on the number of publications, citations, and H index for each faculty member was obtained from Elsevier's SCOPUS bibliographic database (www.scopus.com). History of NIH funding for each faculty member was collected using the NIH online data repository of funding, NIH RePORT (http://report.nih.gov) and checked using Grantome online database (http://grantome.com). Binary variables were created to categorize whether or not faculty had any type of NIH funding and whether or not faculty had received funding through specific mechanisms such as K awards, R21, R01, P01, and U01. Data collection occurred between

September 1, 2014 and January 31, 2015. Additional information on how the surgical faculty database used in the study was developed has been previously published.[12]

Analysis

The objective of this study was to examine differences in the number of publications, citations, and NIH funding between faculty with MDs, MD/PhDs, and PhDs in U.S. departments of surgery. Descriptive statistics on the number of MDs, MD/PhDs, and PhDs at each academic rank (instructor, assistant, associate, and professor), departmental division, and institutional funding rank (top 10 NIH funded institution vs. institutions ranked 11–55) are reported.

The three primary outcomes of interest in this study were compared between MD, MD/PhD, and PhD faculty at the same academic rank in order to control for career stage. For example, the number of publications for a PhD faculty member at the assistant professor rank was only compared to assistant professors with MDs and MD/PhDs. Additionally, departments were ranked and grouped into quintiles according to the percentage of departmental faculty with PhDs in order to compare the academic performance of MD faculty across PhD percentage quintiles. Continuous outcome variables were evaluated using one-way ANOVA and independent samples T tests. Categorical outcome variables were analyzed using chi square and Fisher's exact tests. All tests were two-tailed and alpha was set at 0.05.

RESULTS

In our study sample, we found that the greatest percentage of PhDs were working in divisions of research (30.5%), general surgery (19.3%), cardiothoracic (9.9%), oncology (8.5%), and transplant (7.6%). Divisions with the lowest percentage of PhDs were vascular (1.7%), acute care surgery (2.4%), pediatric surgery (2.5%), and plastic surgery (4.0%). Most MD/PhDs were working in divisions of general surgery (21.2%), transplant (17.3%), cardiothoracic (14.5%), and oncology (12.3%). Divisions with the lowest percentage of MD/PhDs were ENT (0.6%), urology (0.6%), trauma/critical care (2.2%), acute care surgery (2.2%), and vascular (4.5%). Among PhD faculty, the most common academic rank was assistant professor (28.1%), followed by associate professor (26.2%), full professor (24.0%), and instructor (21.7%). In contrast, the most common academic rank for both MDs and MD/PhDs was full professor (32.6% and 42.5%, respectively). Over 40% of PhDs and 37.5% of MD/PhDs were working in top 10 NIH-funded departments. (Table 1)

At the instructor, assistant, and associate ranks, PhDs had a significantly greater number of publications, citations, and H indexes than MDs. (Table 2) There were no differences between the number of publications or citations of PhD and MDs at the professor rank (p=1.000 and 0.897). PhDs and MD/PhDs did not significantly differ in their number of publications or citations at any rank, with the exception of assistant professor, where MD/PhDs had an average of 16.6 more publications than PhDs (p=0.049). (Table 3)

PhDs had a significantly higher percentage of NIH funded researchers at each academic rank (79.2% professor, 62.1% associate, 33.9% assistant, 25.0% instructor) compared to both MDs and MD/PhDs. MD/PhDs were significantly more likely than other faculty to have

received a K award, whereas significantly more PhDs had received funding through R21, R01, P01, and U01 funding mechanisms than MD and MD/PhD faculty. (Table 4)

When comparing the number of publications and citations between PhD faculty working in a top 10 NIH funded institution and PhD faculty working in institutions ranked 11–55, we found no significant differences. There was also not a significant difference between percentages of PhD faculty with NIH funding in top 10 departments and departments ranked 11–50. (Table 5)

There were significant differences in the percentage of MD faculty receiving NIH funding across departmental PhD quintiles. Overall, the rates of MD NIH funding were highest in departments with the largest percentage of PhD faculty ($p<0.001$). Specifically, R01 grants were more commonly awarded to MDs in departments that belonged to the highest PhD percentage quintile ($p=0.003$). The mean number of publications by MD faculty did not significantly differ across quintiles ($p=0.488$) (Table 6)

DISCUSSION

Overall we found that PhDs were most likely to work in divisions of research in surgery departments. Also, a large percentage of both MD/PhDs and PhDs worked in general surgery, cardiothoracic, oncology, and transplant surgery divisions. Vascular, plastic, and trauma/critical care surgery divisions tended to have fewer MD/PhDs and PhDs than other divisions. Our results demonstrated that MD/PhD and PhD faculty working in departments of surgery published significantly more than their MD counterparts at the same academic rank. Additionally, a significantly higher percentage of PhDs had received NIH funding than MDs and MD/PhDs. When comparing PhDs working in the top 10 departments of surgery versus those working in departments ranked 11–55, we found no significant differences in their academic performance. Lastly, the number of MDs with R01 grants was significantly higher in departments with a greater percentage of PhD faculty.

To date, few studies have examined the academic performance of PhDs in clinical departments, despite the fact that more PhD faculty are now working in these departments than basic science departments. Our results are similar to other national studies that have examined publication rates among anesthesiology faculty, which have found that MDs were 73% less likely to publish in a two year period than PhDs and 55% less likely to publish than MD/PhDs.[13] Furthermore, this study also reported that for each additional MD/PhD or PhD faculty member added to a department, a corresponding increase of 1–2 publications per two year period could be expected.[13] Together, these findings suggest that hiring more faculty with PhDs may be a viable strategy for departments of surgery interested in increasing their academic output. This is likely due to the fact that these faculty members may not only have more dedicated time for research, but they are also in many instances bringing a complementary skill set for conducting research due to advanced training and prior research experience in non-surgical scientific and medical fields. Furthermore, specifically investing in hiring PhDs may be more cost-effective for departments than allotting more dedicated research time to MD faculty, who are needed to generate clinical revenue and typically have higher salaries.[14]

In addition to increasing academic output and funding, there are several other potential benefits of appointing PhD faculty in surgical departments. One example is that they may facilitate interdisciplinary collaboration through joint appointments in other departments, which can be critical for efficiently carrying out translational research.[4] Translational research requires interdisciplinary teams and it is often difficult for surgeons to obtain funding independently without collaborating.[9] Our results that MDs working in departments with a greater percentage of PhDs are more likely to have NIH funding, and, specifically, R01 funding corroborate these previous findings. Improved access to cross-disciplinary collaborations may provide additional resources and expertise, such as specialized equipment or postdoctoral fellows, which may make conducting large-scale research studies more feasible for clinicians.

Some evidence suggests that MD/PhDs may have more barriers to participating in collaborative research than PhDs do. A national survey of chairs of surgery at U.S. medical schools found that only 27.2% of MD/PhDs collaborated outside their departments whereas 80.8% of PhDs did.[4] Furthermore, the same study showed that surgeons are less likely to participate in institution-wide efforts than departmental activities.[4] This may indicate that surgeons' require closer proximity to their collaborators than other clinician researchers. Barriers to collaboration such as organizational silos and limited communication are reduced when researchers and clinicians reside within the same department. Employing PhD researchers in the same department provides surgeons with ready access to researchers interested in the surgical applications of their research. Additionally, the presence of PhDs in departments of surgery may help clinician-researchers by serving as research mentors who can offer expertise even on projects they are not directly involved in. This may be especially important for divisions that have low numbers of clinician-scientists, such as trauma/critical care and vascular surgery.

Another unique finding of our study was that the academic output and funding history of PhD faculty did not differ between the top 10 departments with the highest amount of funding and departments ranked 11–55. This suggests that departments with fewer financial resources to dedicate towards research may especially benefit from PhD researchers who are able to sustain academic productivity and obtain NIH funding in lower resource settings. Given the current funding environment, surgeon-scientists often need to commit a greater percentage of their time to research, which is costly, or collaborate as part interdisciplinary group to successfully compete for grants in the larger research community.[9] Hiring PhDs within surgery departments provides built-in access to collaborators who have dedicated time to pursue the academic research mission.

Finally, it is important to note that surgeons at modern academic medical centers are facing increased clinical pressure to produce RVUs. Growing clinical demands limit the amount of time surgeons can dedicate to the research mission, which, although important, may be secondary to providing surgical care for patients. By providing dedicated support for research activities, PhDs may be able to extend the academic mission of surgery departments while allowing clinicians to focus more on patient care.

Limitations

This study has several limitations due to its data sources and retrospective design. Departmental websites were used to identify faculty included in the study and these sites may not have been up to date or provided complete information on all faculty employed by the department. Other important data such as percent effort dedicated to research versus clinical and teaching activities, which may account for differences in research productivity, were not available in our sources. Additionally, it is possible that departments employed many PhDs identified in our cohort as non-independent faculty members. Nationally, medical schools have been employing fewer PhDs as tenure-track faculty.[15] As a result, our study of surgical faculty may be biased by the fact that the PhD faculty working in these departments may have been higher performing researchers who were able to compete successfully for a faculty position. Therefore, our study only captures the impact of PhDs on faculty in departments and not those working as staff. Finally, the only funding source for grants our study considered was NIH funding. It is likely that faculty in our dataset also obtained funding from other sources such as the Department of Defense or other grant-making foundations. Unfortunately, information on these types of grant is not publicly reported so we were unable to incorporate it into our study.

Another limitation of our study is due to its cross-sectional design. Although we found that a larger percentage of PhDs worked in top 10 NIH-funded departments, we do not know whether the presence of PhDs increased the national ranking of these institutions or whether more PhDs were hired due to the better financial environment of these departments. We also cannot determine whether or not hiring more PhDs leads to increased collaboration between researchers and clinicians and whether this results in higher numbers of departmental publications.

Lastly, our study only compared differences between faculty with terminal degrees. We do not know the impact of having a master's level degree on MD productivity. For example, our study was not able to compare the performance of MDs with other MDs that have an additional master's degree such as an MPH. It is possible that master's degrees may mitigate the disparity in academic productivity between MDs and PhDs by providing MDs with more experience and training in research methodology.

Conclusion

Independent of rank and institution, faculty with PhDs had significantly more publications, citations, and NIH funding than faculty with MDs. Investing in PhD faculty with focused research commitments may help surgery departments increase academic output and NIH funding. Furthermore, the presence of faculty with dedicated research training within surgical departments may yield greater advancements in scientific knowledge through interdisciplinary and translational research collaborations. Ultimately, patient care is improved through research and departments of surgery must find new ways to advance this central mission.

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Table 1

Characteristics of academic faculty in the top 55 Departments of Surgery

	MD	MD/PhD	PhD	Total
Academic Rank				
Instructor	362 (11.6%)	14 (8.0%)	48 (21.7%)	424
Assistant	997 (31.9%)	48 (27.6%)	62 (28.1%)	1107
Associate	749 (23.9%)	38 (21.8%)	58 (26.2%)	845
Professor	1021 (32.6%)	74 (42.5%)	53 (24.0%)	1148
Division				
Acute Care Surgery	77 (2.3%)	4 (2.2%)	2 (0.9%)	83
Cardiothoracic Surgery	331 (9.8%)	26 (14.5%)	22 (9.9%)	379
General Surgery	727 (21.5%)	38 (21.2%)	43 (19.3%)	808
Surgical Oncology	325 (9.6%)	22 (12.3%)	19 (8.5%)	366
Pediatric Surgery	259 (7.7%)	10 (5.6%)	7 (3.1%)	276
Plastic Surgery	276 (8.2%)	10 (5.6%)	9 (4.0%)	295
Science/Research	19 (0.6%)	8 (4.5%)	68 (30.5%)	95
Transplant Surgery	241 (7.1%)	31 (17.3%)	17 (7.6%)	289
Trauma/Critical Care Surgery	232 (6.9%)	4 (2.2%)	8 (3.6%)	244
Vascular	278 (8.2%)	8 (4.5%)	5 (2.2%)	291
Other	617 (18.2%)	18 (10.1%)	23 (10.3%)	658
Institutional Rank				
Top 10	879 (26.0%)	67 (37.4%)	91 (40.8%)	1037
Ranks 11–50	2503 (74.0%)	112 (62.6%)	132 (59.2%)	2747

Table 2

Scholarly output by degree type and academic rank

	Number of Publications		Number of Citations		H Index	
Rank and Degree	**Average (SD)**	**p value**	**Average (SD)**	**p value**	**Average (SD)**	**p value**
Instructor		0.013		<0.001		<0.001
MD	14.6 (31.4)		278.2 (630.8)		6.4 (6.1)	
MD/PhD	23.4 (35.6)		542.8 (588.5)		7.8 (6.6)	
PhD	29.5 (44.6)		786.8 (1,399.8)		10.1 (8.1)	
Assistant Professor		<0.001		<0.001		<0.001
MD	18.4 (27.5)		299 (555.6)		6.3 (13.1)	
MD/PhD	48.3 (110.4)		1078.6 (2686.9)		13.1 (11.4)	
PhD	31.6 (32.8)		894.9 (1088.0)		12.2 (8.7)	
Associate Professor		<0.001		<0.001		<0.001
MD	42.3 (40.4)		938.6 (1650.4)		12.6 (9.0)	
MD/PhD	68.0 (52.2)		1694.8 (1346.4)		18.8 (9.1)	
PhD	63.2 (42.9)		2135.2 (2172.3)		21.1 (9.6)	
Professor		0.981		0.487		0.035
MD	128.8 (337.8)		3243.3 (4249.4)		22.9 (14.6)	
MD/PhD	135.6 (111.9)		3577.9 (4052.2)		26.0 (15.4)	
PhD	133.4 (120.1)		3863.5 (3222.1)		27.1 (12.5)	

P values are determined from one-way ANOVA which compared averages between faculty with different degree types at the same academic rank

Table 3

Mean differences in publications and citations between PhDs and other faculty

	Publications				Citations			
Rank and Degree	**Mean Difference**	**LCL**	**UCL**	**p value**	**Mean Difference**	**LCL**	**UCL**	**p value**
Instructor								
MD	14.845	2.449	27.241	0.013	508.534	215.617	801.451	<0.001
MD/PhD	6.063	−19.841	31.966	1.000	244.021	−362.224	850.266	1.000
Assistant Professor								
MD	13.191	1.860	24.522	0.016	595.910	337.765	854.056	<0.001
MD/PhD	−16.639	−33.232	−0.046	0.049	−183.670	−561.587	194.247	0.732
Associate Professor								
MD	20.934	7.459	34.409	0.001	289.944	103.040	476.848	<0.001
MD/PhD	−4.810	−25.431	15.810	1.000	−16.485	−307.909	274.940	1.000
Professor								
MD	4.586	−103.791	112.964	1.000	620.224	−810.953	2051.400	0.897
MD/PhD	−2.120	−140.452	136.212	1.000	285.548	−1534.303	2105.400	1.000

Mean difference compared to PhDs at the same academic rank. LCL = lower 95% confidence limit of difference. UCL =upper 95% confidence limit of difference.

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Table 4

Percentage of faculty with NIH funding by degree type and academic rank

	K Award		R21		R01		U01		P01		Any NIH Funding	
Rank and Degree	**n (%)**	**p value**	**n (%)**	**p value**	**n (%)**	**p value**	**n (%)**	**p value**	**n (%)**	**p value**	**n (%)**	**p value**
Instructor		<0.001		0.001		<0.001		0.02		0.918		<0.001
MD	1 (0.3%)		3 (0.8%)		2 (0.6%)		0 (0.0%)		1 (0.3%)		11 (3.0%)	
MD/PhD	2 (14.3%)		0 (0.0%)		1 (7.1%)		0 (0.0%)		0 (0.0%)		2 (14.3%)	
PhD	2 (4.2%)		4 (8.3%)		6 (12.5%)		1 (2.1%)		0 (0.0%)		12 (25.0%)	
Assistant Professor		0.026		<0.001		<0.001		<0.001		NE		<0.001
MD	21 (2.1%)		7 (0.7%)		13 (1.3%)		0 (0.0%)		0 (0.0%)		64 (6.4%)	
MD/PhD	3 (6.3%)		1 (2.1%)		2 (4.2%)		1 (2.1%)		0 (0.0%)		8 (16.7%)	
PhD	4 (6.5%)		6 (9.7%)		13 (21.0%)		1 (1.6%)		0 (0.0%)		21 (33.9%)	
Associate Professor		0.017		<0.001		<0.001		<0.001		<0.001		<0.001
MD	39 (5.2%)		9 (1.2%)		26 (3.5%)		2 (0.3%)		2 (0.3%)		103 (13.8%)	
MD/PhD	6 (15.8%)		3 (7.9%)		5 (13.2%)		3 (7.9%)		2 (5.3%)		14 (36.8%)	
PhD	5 (8.6%)		11 (19.0%)		22 (37.9%)		2 (3.4%)		5 (8.6%)		36 (62.1%)	
Professor		0.020		<0.001		<0.001		0.062		<0.001		<0.001
MD	53 (5.2%)		31 (3.0%)		146 (14.3%)		31 (3.0%)		28 (2.7%)		298 (29.2%)	
MD/PhD	7 (9.5%)		9 (12.2%)		22 (29.7%)		5 (6.8%)		3 (4.1%)		35 (47.3%)	
PhD	7 (13.2%)		10 (18.9%)		38 (71.7%)		4 (7.5%)		14 (26.4%		42 (79.2%)	

P values determined from Fisher's exact test. Tests compared the proportion of faculty with each type of funding by degree type who were at the same academic rank. NE = not estimated.

Table 5

Comparison of academic productivity between faculty at top 10 NIH-funded departments and those at departments ranked 11–55

	Publications, mean (SD)			Citations, mean (SD)			NIH Funding, n (%)		
Rank and Degree Type	**Top 10**	**Ranks 11–55**	**p value**	**Top 10**	**Ranks 11–55**	**p value**	**Top 10**	**Ranks 11–55**	**p value**
Instructor									
MD	19.9 (31.4)	14.4 (31.4)	0.489	426.8 (449.6)	271.2 (637.9)	0.386	2 (5.7%)	9 (2.8%)	0.332
MD/PhD	12 (n/a)	24.5 (37.2)	NE	1023 (n/a)	499.1 (596.5)	NE	1 (33.3%)	1 (9.1%)	0.287
PhD	29.3 (13.4)	29.5 (46.5)	0.992	300.3 (248.8)	831.0 (1453.7)	0.474	1 (25.0%)	11 (25.0%)	1.000
Assistant Professor									
MD	21.4 (27.0)	17.1 (27.7)	0.024	342.9 (510.2)	279.7 (573.8)	0.104	32 (10.1%)	32 (4.7%)	0.001
MD/PhD	53.2 (157.3)	44.6 (58.7)	0.797	1305.4 (3908.9)	910.6 (1240.2)	0.624	3 (14.3%)	5 (18.5%)	0.696
PhD	31.4 (30.6)	32.0 (36.1)	0.944	942.9 (1136.9)	832.0 (1038.4)	0.699	11 (31.4%)	10 (37.0%)	0.644
Associate Professor									
MD	46.5 (37.3)	40.8 (41.4)	0.098	1060.4 (1544.1)	895.2 (1686.0)	0.236	34 (17.4%)	69 (12.5%)	0.089
MD/PhD	57.0 (38.8)	74.4 (58.4)	0.328	1577.2 (869.2)	1753.6 (1544.9)	0.717	5 (35.7%)	9 (37.5%)	0.912
PhD	65.7 (39.8)	59.8 (47.3)	0.609	2362.1 (2508.9)	1823.1 (1598.8)	0.36	20 (60.6%)	16 (64.0%)	0.792
Professor									
MD	174.1 (589.3)	109.2 (109.9)	0.005	3923.8 (4791.3)	2941.6 (3952.2)	0.001	127 (39.9%)	171 (24.4%)	<0.001
MD/PhD	134.4 (137.0)	136.3 (94.0)	0.944	3755.4 (5168.9)	3463.5 (3194.8)	0.765	18 (62.1%)	17 (37.8%)	0.041
PhD	160.5 (124.5)	118.3 (116.7)	0.223	4306.3 (3148.5)	3608.5 (3284.4)	0.458	14 (73.7%)	28 (82.4%)	0.456

All comparisons are between faculty at the top 10 NIH-funded institutions versus those at departments ranked 11–55 for each rank/degree combination. Means were compared using independent samples T tests and proportions were compared using Fisher's exact test. N/A indicated where standard deviation was not calculated due to 2 of the 3 MD/PhD instructors in the top ten 10 departments having no publication information available. NE indicates not estimated.

Table 6

Percentage of MD Faculty with NIH funding Across Departmental PhD Percentage Quintiles

	Lowest	Low	Medium	High	Highest	p
Any NIH Award	6.4%	8.0%	8.2%	6.0%	12.6%	<0.001
K01	15.0%	5.5%	4.3%	13.0%	13.8%	0.072
R21	1.0%	1.6%	2.0%	0.7%	2.2%	0.096
R01	4.0%	5.9%	5.9%	4.4%	8.7%	0.003
P01	1.9%	0.7%	0.8%	0.8%	0.9%	0.209
U01	1.7%	1.0%	1.0%	0.7%	0.9%	0.485

Departments of surgery were ranked according to the percentage of faculty members with PhD degrees and grouped into quintiles. The proportion of MD faculty with NIH funding in each quintile are shown