Medical School Ranking and Student Research Opportunities

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ABSTRACT

OBJECTIVE: This study aimed to characterize the current state of student research opportunities in a sample of US medical schools ranked in three different tiers.

METHODS: The authors examined the websites for five US medical schools in each of the first, second, and third tiers per National Institutes of Health funding and U.S. News & World Report rankings. Available research opportunities were identified and categorized.

RESULTS: There were 26 schools in the first (n=6), second (n=10), and third (n=10) tiers. From the first, second, and third tiers, 4/6 (67%), 1/10 (10%) and none, respectively, required a research experience (p=0.003); 6/6 (100%), 4/10 (40%) and 1/10 (10%), respectively, offered internally funded one-year research (p=0.002); and 5/6 (83%), 4/10 (40%) and 2/10 (20%), respectively, offered student research days (p=0.045).

CONCLUSIONS: Higher ranked schools provided more opportunities for student research by providing internally funded one-year research, requiring research, and offering student research days.

KEYWORDS: Medical student research; research program; research experience; medical school research opportunity

INTRODUCTION

Over the past five years medical student involvement in scholarly research at United States (US) medical schools has grown.[1] The Association of American Medical Colleges (AAMC) 2014 Medical School Graduation Questionnaire cited a 7.9% increase in the proportion of students who conducted a research project with a faculty mentor between 2010 and 2014 (**Table 1**). The proportion of students with sole or joint authorship of a research paper submitted for publication increased by 7.4% over the same time period (**Table 1**).

Medical schools can promote medical student research through a number of programs. Some schools require a research experience as part of the core curriculum; others offer optional scholarly tracks, annual student research days where students can showcase their research projects, summer research experiences, or an entire year dedicated solely to research. Several recent studies have evaluated student research opportunities at US medical schools. A 2015 systematic review by Chang et al characterized the outcomes associated with medical student research programs and found that the majority of students perceive their research experiences to be positive and author at least one article.[2] In their 2010 literature review, Bierer et al focused on a specific type of research program – scholarly concentrations – and found that the diversity of articles and variable results prevent definitive conclusions about the value of these programs.[3] Numerous studies have also evaluated student research programs at single institutions.[4-9] However, no studies to-date have comprehensively examined the available student research opportunities across a wide selection of medical schools or sought to compare research opportunities among medical schools in different tiers.

Given the recent trend toward increased student participation in research, it is important to identify the types of research programs presently available to medical students. This study aimed to characterize the current state of medical student research opportunities in a sample of US medical schools ranked in three different tiers.

METHODS

To determine the nature of research opportunities available to medical students, the authors examined the websites

Table 1. Student Participation in Research During Medical School

	2010	2011	2012	2013	2014	% Increase (2010–2014)
Independent study project for credit	41.4	42.2	42.4	42.4	43.8	5.8
Research project with faculty mentor	64.2	66.3	68.1	68.2	69.3	7.9
Authorship (sole or joint) of a research paper submitted for publication	39.1	40.6	41.8	41.7	42.0	7.4
Authorship (sole or joint) of a peer-reviewed oral or poster presentation					43.6	N/A
Thesis project	10.0	10.1	10.1	10.5	10.5	5.0

Source: https://www.aamc.org/download/397432/data/2014gqallschoolssummaryreport.pdf (Accessed September 15, 2015)

for five US medical schools ranked in each of the first, second (38-42) and third (76-80) tiers per National Institutes of Health (NIH) funding and U.S. News & World Report (USNWR) research rankings.

As USNWR only ranked schools to 84 in 2015, the authors capped both ranking lists at 80. When medical schools were tied in rank, schools closest in rank to the predetermined ranges were included. For each predetermined range, only the first five schools from each ranking list were included. Available research opportunities were grouped into the following categories: internal funded year-off research opportunities (e.g., year-long research awards from medical school funds); internal funded summer research opportunities; an annual student research day; external funded research opportunities for one year or longer; and external funded summer research opportunities. Research opportunities that fell outside these categories were noted but not ranked. Only funds provided to medical students directly, whether for stipends or research costs, were included. Combined MD-PhD programs were not included as participation involves students pre-selected for a research career.

Descriptive statistics, such as frequencies and percentages, were used to describe the availability of research opportunities within each tier. Chi-square analysis was performed to compare the availability of each type of research opportunity among the three tiers; the significance level was 5%.

RESULTS

There were 26 medical schools in the first (n=6), second (n=10), and third (n=10) tiers. The research opportunities at the schools from each tier are outlined in **Tables 2-4** and the chi-square analysis in **Table 5**. From the first (Table 2), second (Table 3), and third (Table 4) tiers, four (67%), one (10%) and none, respectively, required a research experience (p=0.003); six (100%), four (40%) and one (10%), respectively, offered internally funded one-year research (p=0.002); and five (83%), four (40%) and two (20%), respectively, offered a student research day (p=0.045).

Research opportunities that fell outside these categories included for-credit research offered by three schools in the first tier and one school in the second tier (Tables 2, 3). In addition, one school in the first tier offered weekly group scholarship sessions (Table 2) and one school in the first tier and another in the third tier each offered an M.D. with Research Honors (Tables 2, 4).

DISCUSSION

We sought to characterize current research opportunities at US medical schools by examining the websites of schools in the first, second, and third tiers from two separate ranking systems. We found that higher ranked medical schools were more likely to require a research experience, provide internally funded one-year research, and offer a student research day.

The role of required versus elective research experience on student satisfaction and scholarly productivity remains uncertain. In their systematic review, Chang et al found that students in elective research programs were both more satisfied with their research experiences and had similar rates of publications and presentations as students in mandatory research programs.[2] The authors attributed differences in satisfaction to the inherent self-selection bias of voluntary research programs or to the additional funding or distinctions offered by some elective programs.[2] However, the studies included in Chang's report were limited in number and

Table 2. Top-Ranked Medical Schools by NIH Funding 2014 & U.S. News & World Report – Best Medical Schools 2015 (Research)

Medical School	NIH Ranking	US News & World Report Ranking	Required Research	Optional Scholarly Track	Internal Funded Year-Off	Internal Funded Summer Opportunities	Research Day	External Funded Year-Off	External Funded Summer Opportunities	Additional Research Opportunities & Services Supporting Student Research
University of California San Francisco	1	4		X	X	X	X	X	X	Up to 4 months of for-credit research permitted Optional weekly group scholarship discussion sessions
Johns Hopkins University	2	3	X		X	X	X	X	X	
University of Pennsylvania	3	4	X		X	X		X	X	
Washington University	4	-			X	X	X	X	X	For-credit research permitted
Stanford University	5	2	X	X	X	X	X	X	X	For-credit research permitted
Harvard University	-	1	X		X	X	X	X	X	MD with Honors offered

Sources: http://www.brimr.org/NIH_Awards/2014/NIH_Awards_2014.htm (Accessed November 24, 2014)
http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-medical-schools/research-rankings (Accessed November 24, 2014)

Table 3. Mid-Ranked[a] Medical Schools by NIH Funding 2014 & U.S. News & World Report – Best Medical Schools 2015 (Research)

Medical School	NIH Ranking	US News & World Report Ranking	Required Research	Optional Scholarly Track	Internal Funded Year-Off	Internal Funded Summer Opportunities	Research Day	External Funded Year-Off	External Funded Summer Opportunities	Additional Research Opportunities & Services Supporting Student Research
Purdue University at Indianapolis	38	-				X		X	X	
University of Virginia	39	-		X	X	X	X	X	X	For-credit research permitted
University of Utah	40	-	X			X	X	X	X	
University of Iowa	41	-		X	X	X	X	X	X	
University of Miami	42	-								
Dartmouth College	-	34								
Ohio State University	-	34			X	X		X	X	
University of Maryland	-	34				X	X	X		
University of Minnesota	-	34				X		X	X	
University of Rochester	-	34		X	X	X		X		

[a] 38th through 42nd ranked U.S. medical schools. Note that because many USNWR rankings are tied, only the first five from each predetermined range are included.

Table 4. Low -Ranked[a] Medical Schools by NIH Funding 2014 & U.S. News & World Report – Best Medical Schools 2015 (Research)

Medical School	NIH Ranking	US News & World Report Ranking	Required Research	Optional Scholarly Track	Internal Funded Year-Off	Internal Funded Summer Opportunities	Research Day	External Funded Year-Off	External Funded Summer Opportunities	Additional Research Opportunities & Services Supporting Student Research
Tulane University	76	-		X		X	X	X	X	
SUNY Stony Brook	77	-		X		X		X	X	
Brown University	78	-		X		X		X	X	
Tufts University	79	-		X		X`		X		MD with Research Honors offered
University of Tennessee	80	-		X	X	X		X	X	
Georgia Regents University	-	75				X				
St. Louis University	-	75								
University of Missouri	-	75				X	X			
University of Hawaii – Manoa	-	78								
University of Louisville	-	78		X		X				

[a] 76th through 80th ranked U.S. medical schools. Note that because many USNWR rankings are tied, only the first five from each predetermined range are included.

Table 5. Available research opportunities among three medical school tiers

	First Tier Medical Schools (N = 6) n (%)	Second Tier Medical Schools (N = 10) n (%)	Third Tier Medical Schools (N = 10) n (%)	P valuea
Required Research	4 (67)	1(10)	0 (0)	0.003
Optional Scholarly Track	2 (33)	3 (30)	6 (60)	0.35
Internal Funded Year-Off	6 (100)	4 (40)	1 (10)	0.002
Internal Funded Summer Opportunities	6 (100)	8 (80)	8 (80)	0.49
Research Day	5 (83)	4 (40)	2 (20)	0.045
External Funded Year-Off	6 (100)	8 (80)	5 (50)	0.08
External Funded Summer Opportunities	6 (100)	6 (60)	4 (40)	0.06

[a] Calculated using $\chi 2$ tests.

used disparate metrics to evaluate student satisfaction and publication and presentation rates. In addition, the authors did not include the role of required research in students' choice of a medical school; students who are highly interested in research may be drawn to schools with more established research programs and devote more extracurricular time to scholarly pursuits.

An important characteristic to consider across all research opportunities is level of funding available to both students and faculty mentors. We found that top-ranked medical schools were more likely to require a research experience and offer internally funded year-off research. This suggests that higher funding levels are available at these institutions, given the greater resource requirements inherent in both longer and required programs. Although it is difficult to determine exact available funding levels based on school websites alone, many of the top-ranked schools that required research also listed associated internal funding for these programs. A study by Jacobs et al at a single medical school reported that student research productivity and satisfaction with research was facilitated by financial incentives, with 79% of students satisfied with their research experience and 75% coauthoring at least one published article.[6] In addition, 28% of faculty cited lack of funding as a reason why they chose not to work with students on a research project.[6] Similarly, Hunskaar et al examined students in a two-year elective research program implemented across four schools and reported an association between level of funding availability and student satisfaction rates, with higher rates of dissatisfaction found among students in lower-funded programs.[10] Funding of students' research was also crucial to faculty mentors' interest in recruiting students to the research program.[10] Although the studies from Jacobs and Hunskaar lacked control groups and relied on questionnaires for data, their findings suggest that adequate funding for student research projects – e.g., educational,[11,12] faculty,[13] or departmental[14] grants – is an essential characteristic for promoting greater medical student satisfaction and involvement in research.

An additional program characteristic that may promote medical student research is program length and allotted research time. Among top-ranked schools that required a research experience, there was a high degree of flexibility in terms of allowable research time, ranging from a minimum of three months to a maximum of several years. Top-ranked schools were also more likely to provide internal funding for year-off research, though the number of schools offering internal funding for summer research did not differ across tiers. Dyrbye et al examined allotted research time in a mandatory research program and found that more students in a required 21-week research experience were first authors than those in a 17/18-week experience.[5] However, other measures of research productivity did not change with decreased allotted research time. The authors concluded that a required medical research experience facilitated greater research productivity, with shorter experiences yielding similar outcomes as longer experiences.[5] Jacobs et al also examined allotted research time and found that allowing medical students up to six years to complete course requirements facilitated student research and high student publication rates.[6] Allowing students more time to engage in an in-depth research project may be necessary for project completion, especially given the many unforeseen setbacks inherent in conducting research and the limited available time for activities outside the core medical school curriculum. However, it is also important to make sure that students have detailed timelines and goals to make sure they maximize the use of the allotted research time.[15]

Providing students with excellent support and opportunities for presenting their research projects likely plays an important role in encouraging student research.[9,16] We found that top-ranked schools were more likely to offer a student research day during which students could present their research and view the research projects of their peers. Zier et al found that infrastructure created to support student research activity, including a student research day, increased student interest and participation in research.[9] In addition, the percentage of graduating students publishing peer-reviewed manuscripts increased from 11% to 25% between two and eight years following implementation of these structured research opportunities.[9] This trend is likely due to

maturation and improvement of research programs; as more students participate over time, specific program characteristics can be tailored to better meet student needs and foster increased productivity. Langhammer et al also examined research program maturation and student participation rates at a single medical school[7]: the evolution of a Distinction in Research (DIR) track coincided with a greater proportion of students taking six months to a year off for research, which the authors attributed to the increased visibility of funding opportunities for year-out programs and maturation of the DIR program to provide an intensive research training experience.[7] Given the retrospective study design, it is difficult to conclude that greater student participation rates stem from program maturation. However, for medical schools implementing student research programs, more mature programs may serve as better models.

Our finding that higher ranked medical schools offered more student research opportunities is consistent given our use of NIH and USNWR research rankings, which rank schools according to total NIH awards[17] and a weighted average that includes research indicators,[18] respectively. Research programs and opportunities offered by schools in the first tier may serve as a template for schools in the second and third tiers. However, while schools in the first tier may offer more student research opportunities, additional evidence is needed to determine the efficacy of particular program features in promoting student research productivity.

This study has several limitations. We used school websites as the sole determinant of research opportunities available to medical students. Some schools may require a school login to view certain research opportunities, or may inform students of research opportunities through other means such as e-mail or information sessions. In addition, despite its popular appeal, the USNWR methodology has been criticized on a number of grounds[19]; hence, we used a ranking system based on listings from both USNWR and the NIH. Due to high variability in school website design, it is also possible that we may have missed certain research opportunities on school websites that had poor organization and navigational features. To help promote student scholarly activity, we recommend schools keep their web pages on student research opportunities up-to-date with thorough descriptions of opportunities, including length, funding source, requirements, deadlines, and a clearly delineated research contact person.

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