ORIGINAL ARTICLE

How Gender Impacts Career Development and Leadership in Rehabilitation Medicine: A Report From the AAPM&R Research Committee

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ABSTRACT. Wagner AK, McElligott J, Chan L, Wagner EP II, Segal N, Gerber LH. How gender impacts career development and leadership in rehabilitation medicine: a report from the AAPM&R Research Committee. Arch Phys Med Rehabil 2007; 88:560-8.

Objective: To examine the role that gender plays in meeting the medical academic mission by assessing career development, leadership, and research productivity among rehabilitation researchers.

Design: Prospective, cross-sectional cohort study.

Setting: National survey.

Participants: Three hundred sixty rehabilitation professionals linked to the American Academy of Physical Medicine and Rehabilitation, Association of Academic Physiatrists, and/or the American Congress of Rehabilitation Medicine.

Intervention: Online or paper survey.

Main Outcome Measures: Research skills, resources and productivity, salary, leadership, and academic advancement.

Results: Results suggested that women rated themselves as being less skilled and having fewer resources for research compared with their male counterparts. Additionally, significantly fewer women applied for grant funding and had a lower publication rate compared with men. A proportionally larger number of women remained at lower academic ranks than men, and fewer women achieved senior academic ranks or positions of leadership. Even after adjusting for potential confounding factors, female sex remained a significant variable associated with lower salaries and lower manuscript production. Unlike men, female respondents tended to believe that being a woman was a negative factor with respect to academic advancement, leadership opportunities, salary, and resources.

Conclusions: Female rehabilitation researchers were less developed professionally than their male counterparts and saw themselves as disadvantaged. These findings have potential implications for attracting women into rehabilitation research and the rehabilitation research community's efforts to sustain its academic mission, to improve research capacity, and to meet the needs of the 52 million people in the United States with disabilities.

Key Words: Academic medical centers; Career mobility; Gender; Leadership; Rehabilitation; Research.

ACADEMIC MEDICAL CENTERS have a triple mission of clinical care, education, and research. Departments of physical medicine and rehabilitation (PM&R) and rehabilitation sciences within academic medical centers play a leading role in providing clinical care, education, and research to advance the field of rehabilitation science and improving the health of vulnerable populations such as people with disabilities. In the current health care and research funding environment, academic medical centers continue to face unprecedented challenges in sustaining this triple mission.[1-3] To sustain and achieve advances and leadership in medical science, the talents, perspectives, and skills of a diverse and vibrant faculty are required.

The Association of Academic Medical Centers (AAMC) has highlighted marked gender disparities for U.S. medical school faculty, in career choice, promotion, salaries, and leadership in academic medical centers.[4] The percentage of women entering medical school in the United States grew from 5.1% in 1960 to 50% by 2003.[4] Despite this rapid growth, several studies[5,6] have shown that women in many disciplines progressed through academic ranks more slowly than men, were promoted less, published less, and had lower salaries than men of comparable rank. It is particularly concerning that women have not been attaining important leadership roles.[7] In a 2003−2004 AAMC report, there were 108,000 U.S. medical school faculties of which 30% were women. Twenty-seven percent of associate professors were women, whereas only 12% of full professors and 10% of medical school deans were women.[4] A survey of emergency physicians at 105 emergency medicine residency training programs in the United States identified that women were less likely to hold major leadership positions, spent a greater percentage of time in clinical and teaching activities, published less in peer-reviewed journals, and were less likely to achieve senior academic rank.[8] Wright et al[5] identified similar significant gender differences in faculty salaries, ranks, tracks, leadership positions, resources, and perceptions in 1 U.S. medical school. This study identified that women earned 11% less than men, on average, after controlling for rank, years in rank, track, degree, specialty, and administrative positions. These differences in academic advancement and salary could not be attributed to differences in productivity or family commitments.[5] These data underscore the need to understand the key environmental drivers underlying an increasingly recognized gender gap between men and women

See commentary p 683.

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with research productivity, career advancement, leadership, and salary.

Despite the recognition of this gap between men and women in academic medicine, gaining an understanding of their root causes is complex. Vance and Larson,[9] in a review of the health care and business literature, showed that research on leadership in health care and business has been primarily descriptive to date. In addition, these authors identified that very limited research on leadership and health care outcomes exists. However, Bickel et al[10] cite a number of workplace issues that could lead to a cumulative disadvantage for women including (1) difficulty finding and obtaining effective career advancing mentorship, (2) inflexible tenure and advancement policies that may compromise desired family-work balance at a time when women may want to start families, (3) inherently less value placed (by both men and women) on work women do, (4) increased risk of burnout for women, (5) less control over clinical work flow, (6) more difficulties with physician-allied health professional relationships, (7) less cultural latitude to display assertive behavior in the workplace, and (8) lower compensation for the same work.

Compared with other clinical specialties, there is a greater percentage of women in PM&R (41% compared with average of 30%). In addition, PM&R has higher rates of female associate and full professors compared with family practice and obstetrics and gynecology even though these specialties have a similar proportion of female faculty.[11] However, little is known about the role of women as leaders and researchers in the rehabilitation community.

Importantly, the rehabilitation community has increasingly recognized a need to identify ways to increase research capacity in a manner that advances the scientific field and better addresses the needs of its growing consumer population.[12] Exploration of how gender influences career choice, career advancement, research, and leadership potential of women in the rehabilitation sciences is essential to advance the field and also to enhance rehabilitation research capacity.[12] Therefore, the purpose of this study was to characterize the impact of gender on a number of personal and professional indices of productive research and successful careers in the field of rehabilitation medicine. Additionally, perceptions of diversity within the rehabilitation community were examined. Solutions for optimizing gender diversity and fully integrating women in the academic rehabilitation community are discussed in the context of these findings.

METHODS

Survey Development and Sampling

The survey development, sampling procedures, and response rates for this analysis have been previously described.[12] Briefly, an invitation to complete the survey was sent to professionals in the field of rehabilitation. To maximize the response rate, respondents were sent an introductory letter and frequent e-mail reminders. In addition, both online and paper surveys were made available. A total of 212 questions were included in the survey, and question formats included multiple choice, Likert rating scales, fill in the blank, and open-ended questions. For this analysis, demographic information, data regarding home life, training, academic rank, and salary were included. Additionally, information regarding research environment and resources, research productivity, personal research skills, personal research resources, and leadership roles was reported.

Study Population

Members of the American Academy of Physical Medicine and Rehabilitation (AAPM&R), the Association of Academic Physiatrists (AAP), and the American Congress of Rehabilitation Medicine (ACRM) were contacted for this survey. AAPM&R members were contacted if they had documented involvement in 1 of 20 AAPM&R special interest groups. Additionally, people known to be involved in publicly funded rehabilitation research were contacted for participation. There were a total of 360 surveys collected from over 100 institutions and used for analysis. Of those that responded, 70% held a medical (MD) or osteopathic (DO) degree, 6.1% held both an MD and a doctoral degree (PhD), 17% held a PhD, and 6.9% held other degrees. Because a major goal of this report was to understand how gender influences careers, leadership, and rehabilitation research capacity, analyses were performed only on those that indicated involvement in research within the past 5 years. As such, 271 respondents were included for the majority of the analysis (107 women, 164 men).

Statistical Analysis

Descriptive statistics, including means, medians, percentages, and standard error of the means, are reported. Means of each group are reported with medians in parentheses, except where noted. The number in each group used for each analysis is shown in the corresponding tables. Mann-Whitney nonparametric analysis was used to compare differences between the 2 groups for all continuous and Likert (ordinal)-scaled data. Chi-square analysis was used for categorical data. Yates correction for continuity is reported for 2×2 tables.

Logistic regression analyses were performed to examine factors affecting academic rank, tenure status, and grant applications. For the purposes of regression modeling, rank was dichotomized into junior (instructor, assistant professor) versus senior (associate professor, professor). Linear regression was used to evaluate factors affecting salary and publication record. Univariate analysis was used in each case to identify significant variables ($P<.05$) to include for multivariate modeling. In addition to gender, representative factors reflecting professional experience (eg, years out from training), resources (eg, start up funding), academic productivity (eg, grant dollars, number of grants, publication record), and leadership roles (eg, institutional and national) were included as independent variables in the models. A backward stepwise approach for single elimination of independent variables was used to create multivariate models. The least significant variable was eliminated at each step until all remaining variables each had a significant P value of .05 or less. To assess the additive effect of gender on the outcome, the variable gender was forced back into the model if it did not meet significance with initial multivariate model construction. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for the logistic models, and R^2 correlation values were computed for the linear models. All data analyses were conducted by using SPSS software,[a] and P less than .05 was considered statistically significant.

RESULTS

Population Demographics

Respondents who reported engaging in research activities in the last 5 years were used for this analysis. Male respondents were slightly older than female respondents. The mean age of male respondents was 47.3 years, and the mean age for female respondents was 45.1 years ($P=.07$). There were no significant differences in racial distribution for men and women. Seventy-

nine percent of the women and 81.3% of the men were white. Eighty-one percent of respondents held an MD or DO degree, and 18.7% held a degree other than an MD or DO. Additionally, there were no significant differences between sex groups for practice location for both physicians and nonphysicians. The majority of physicians worked in an academic or academic-affiliated institution (women, 72.4%; men, 76.8%). The remainder reported working in a Veterans Affairs (VA) setting (women, 6.6%; men, 6.7%), private practice (women, 14.5%; men, 9.7%), or other venues. Seventy-one percent of female nonphysicians worked in an academic setting, and 56% of the men in this group worked in academics. Significantly more men reported holding both an MD and PhD compared with women (9.8% vs 0.9%, $P=.001$). Women had significantly less years of experience since graduating from residency or graduate training compared with men (12.4y vs 15.2y, $P=.02$), as well as fewer years of postdoctoral research fellowship training than men (.28y vs .66y, $P=.02$). Female respondents reported spending approximately 22.2% of their time engaging in funded or internally sponsored research activities, which was similar to men (26.1%) ($P=.30$). Additionally, more women reported working part time for at least some portion of their career (36.8% vs 13.5%, $P<.001$).

Home Responsibilities

Significantly more male respondents had children compared with female respondents (82.8% vs 66.0%, $P=.003$). However, of those reporting having children, significantly fewer men were the primary or shared caregiver for their children (49.6% for men vs 75% for women, $P<.001$). Additionally, 42.7% men reported that their spouse is the primary caregiver, whereas only 10.3% of women reported their spouse as being the primary caregiver ($P<.001$). Moreover, 41.7% of women reported that they are the primary person responsible for household chores, whereas only 9.4% of men reported being the primary person responsible for household ($P<.001$). Interestingly, for those who were married, the number of hours that female respondents reported that their spouses worked is significantly more than what male respondents reported for their spouses (42.6h/wk vs 23.0h/wk, $P<.001$). More women than men changed jobs because of their spouses (28.3% vs 10.6%, $P<.001$).

Academic Rank and Tenure

Although there were no significant differences in the number of years spent at their current rank (women, 5.31y vs men, 6.43y), men generally held higher ranks than women ($P<.001$). Thirty percent of men reported being at the full professor level, whereas 8.3% of women reported being at this level. These findings are consistent with 2004 AAMC data on rank for academic rehabilitation medicine departments.[4] Although the percentage at the associate professor level was similar between sex groups (women, 22.6% vs men, 27.7%), women were more likely to hold assistant professor (women, 48.8% vs men, 36.2%) or instructor (women, 7.1% vs men, 2.3%) ranks. Interestingly, there were significant differences noted in the proportions of each group reporting their future goal for academic rank ($P<.001$). Eighty-one percent of men reported their goal for academic rank being full professor, whereas only 56.3% of women reported this as their goal. Although men and women similarly reported that their institution offered a tenure stream, significantly fewer female academicians reported that their positions were inside the tenure stream (25.6% vs 42.9%, $P=.02$). Additionally, female academicians self-reported that they worked fewer hours than their male counterparts (54.3h vs 59.8h, $P<.001$).

Academic Productivity

Women reported being less productive with their publication record compared with men. Women reported publishing an average of 2.66 publications as a first or senior author in a rehabilitation journal over the past 5 years, whereas men reported 4.28 publications ($P=.03$). Additionally, women reported having only published an average of 1.09 publications over the last 5 years as a first or senior author in a nonrehabilitation journal, whereas male respondents reported having published an average 2.97 publication in nonrehabilitation journals in the last 5 years ($P=.001$). Total number of publications authored or coauthored over the course of their career was also significantly less for women compared with men (12.3 vs 26.9, $P<.001$).

Fewer women also reported that they had applied for a research grant (58.9% vs 76.5%, $P<.001$). However, for those respondents who had applied for a grant, no sex differences were noted with the number of federal grants currently held as a principal investigator (women, 2.26 vs men, 2.27) or coinvestigator (women, 1.90 vs men, 2.11), the amount of federal grant funding (women, $1.56 million vs men, $2.60 million), or percentage of salary that was grant funded (women, 52.3% vs men, 38.5%). There was a trend toward fewer years of federal grant funding for women compared with men (8.5y vs 10.5y, $P=.06$), possibly because of the shorter number of years in their postgraduate career compared with men.

Research Skills and Resources

Although not statistically significant, women reported having less startup funding associated with their position compared with men ($26,769 vs $47,013). The majority of both groups (women, 75.7%; men, 71.6%) received no startup funding with their current position. Table 1 describes respondent's opinion on the adequacy of current position resources. For many categories, both men and women believed the resources accessible to them in their current positions were less than adequate. However, women almost uniformly reported significantly worse scores than men for adequacy of these resources. Table 2 displays how men and women rated themselves for a variety of personal research skills. Here women rated themselves as significantly less prepared for understanding and implementing research design and methods, being a mentor, and being able to publish or present their work. Additionally women believed that they had less basic science and translational research skills and were less qualified to lead a research team. There was also a trend ($P=.06$) for women to report less skill with statistical methods and interpretation.

Salary and Compensation

Annual salary, including incentive pay, is reported for the group of respondents who were MDs or DOs and practiced full-time. Table 3 reports salary by practice location for both men and women. Table 4 shows salary by rank for those who reported being in an academic setting. Regardless of practice setting or academic rank, women reported smaller salaries compared with their male counterparts.

Leadership

Table 5 describes leadership roles for men and women at the institutional level as well as within national societies. In each case, women lagged significantly behind men in terms of leadership positions held. Although similar proportions of both men and women reported having a mentor, women received fewer research awards, participated in and led fewer institutional and national society committees, and held fewer direc-

Table 1: Respondent Opinion With Respect to Current Position Resources*

Resource	Women	Men	*P*
Office space	2.78 (3)	2.18 (2)	.000
Laboratory space	3.98 (5)	3.52 (4)	.004
Secretarial support	3.42 (3.5)	3.01 (3)	.006
Research assistant support	3.85 (4)	3.51 (4)	.051
Access to graduate student support for research	4.02 (4)	3.57 (4)	.001
Access to resident support for research	3.92 (4)	3.38 (3)	.000
Departmental startup funding	4.09 (4)	3.69 (4)	.009
Departmental subsidized protected research time	4.03 (4)	3.56 (4)	.002
Department honors protected research time	3.82 (4)	3.44 (4)	.051
Access to statistical support	3.16 (3)	2.64 (2)	.000
Access to PhD collaborators	3.01 (3)	2.42 (2)	.001
Access to MD collaborators	2.93 (3)	2.62 (3)	.029
Access to interdisciplinary collaborators	2.80 (3)	2.46 (2)	.011
Access to interdepartmental collaborators	2.84 (3)	2.52 (2)	.027
Access to professional development mentor(s)	3.33 (3)	2.94 (3)	.010

NOTE. Values are mean (median).
*Scaling for question: excellent, 1; good, 2; adequate, 3; inadequate, 4; not available, 5.

torship positions. Additionally, they were less likely to participate in the peer review processes for journals and funding agencies.

Diversity Perceptions

Table 6 describes self-reported perceptions that men and women had about career development, access to mentorship, and leadership and promotion opportunities for women in the field of rehabilitation medicine. As a group, men reported that female sex was a neutral factor when considering each of the categories listed. In contrast, women reported that female sex was almost uniformly a negative factor with each category.

Table 2: Respondent Opinion With Respect to Personal Research Skills*

Research Skill	Women	Men	*P*
Research design and methods	2.53 (3)	2.18 (2)	.002
Statistical approach and interpretation	3.09 (3)	2.86 (3)	.063
Performing quantitative statistics	3.34 (4)	3.21 (3)	.261
Grant-writing skills	2.97 (3)	2.79 (3)	.223
Grant funding resources	3.25 (4)	3.05 (3)	.163
Research mentorship	3.08 (3)	2.70 (3)	.007
Research publication skills	2.87 (3)	2.37 (2)	.000
Research presentation skills	2.57 (2)	2.04 (2)	.000
Basic science techniques	3.88 (4)	3.55 (4)	.036
Translational research skills	3.54 (4)	3.14 (3)	.004
Research team management	3.12 (3)	2.70 (3)	.004

NOTE. Values are mean (median).
*Scaling for question: excellent, 1; good, 2; adequate, 3; inadequate, 4; not available, 5.

Table 3: Current Total Salary Including Incentive Pay*

Practice Setting	Sex	Mean ($)
Private practice	Women	170,083
	Men	258,614
Academic	Women	132,608
	Men	182,325
Academic affiliated	Women	168,864
	Men	201,417
VA	Women	151,143
	Men	164,375
Other	Women	163,333
	Men	186,600
Total	Women	151,380
	Men	201,003

*All full-time MD and DO respondents (2004) used in analysis (N=360).

Regression Analysis

In univariate analysis, years out of training, publication record, federal funding, institutional and national leadership, and gender had a positive significant association with the probability of attaining a senior rank. Multivariate regression modeling (table 7) suggested that the factors most influential on rank were years out of school, first or senior author publications over the last 5 years, institutional leadership positions, and federal funding over the last 5 years. After adjusting for these factors, gender did not have a significant additive effect on the probability of achieving a senior rank. For tenure status, univariate analysis suggested that publication record, number of years out from training, gender, grant funding, and institutional leadership all were positively associated with an increased probability of attaining tenure. In multivariate analysis, career publications and institutional leadership positions remained significantly associated with tenure status. After adjusting for these factors, gender did not have a significant additive effect on the probability of achieving tenure (table 8). In both models, many of the factors positively impacting rank and tenure status were also negatively associated with gender in descriptive analysis.

Table 4: Current Total Salary Including Incentive Pay for Academicians*

Academic Rank	Sex	Mean ($)
Instructor	Women	103,333
	Men	130,000
Assistant	Women	134,767
	Men	154,618
Associate	Women	150,534
	Men	193,545
Full	Women	176,000
	Men	226,333
Other	Women	125,667
	Men	180,000
Total	Women	132,608
	Men	182,325

*All full-time MD and DO respondents (2004) in academics used in analysis (n=214).

Table 5: Leadership Roles Held by Respondent

Leadership Position	Women	Men	*P*
Has received national award(s) for research (%)	16.8	32.9	.005
Has served on any type of federal scientific review board (eg, NIH NIDRR, CDC, VA) (%)	27.9	43.5	.015
No. of leadership positions held in last 5y	0.70	1.28	.000
No. of institutional or departmental committees ever served over last 5y	4.00	6.01	.003
No. of institutional or departmental committee ever chaired over last 5y	0.90	2.52	.000
No. of national committees served over last 5y	1.55	2.64	.009
Number of national committees chaired over last 5y (eg, AAP, AAPM&R, ACRM)	0.38	1.18	.007
No. of national organizations in which you have been an officer in the last 5y	0.40	0.78	.007
No. of journals in which you are currently a reviewer	1.42	2.64	.000
No. of journals in which you are currently an editor	0.15	0.49	.001

Abbreviations: CDC, Centers for Disease Control and Prevention; NIDDR, National Institute on Disability and Rehabilitation Research; NIH, National Institutes of Health.

Gender was most strongly associated with salary in univariate analysis. Other significant variables included publication record, years out of training, leadership positions, rank, and tenure status. In multivariate analysis, female sex remained the most significant negative predictor of higher salary. More national and institutional leadership positions as well as more hours worked and years out from training were positively associated with higher salaries (table 9).

Univariate regression of factors associated with leadership positions (defined as chairmanships, directorships, committee chairs at an institutional or national level) was also explored. Once again, grant funding, publication record, years out from training, gender, and hours worked were positively associated with more leadership positions. In multivariate analysis, more hours worked, more years out from training, and higher current grant dollars remained positively associated with more leadership positions. There was also a trend for total publication record to be significantly associated with more leadership positions ($P=.06$). Gender, however, was not significantly associated with leadership positions after adjusting for hours worked, years out from training, current grant dollars, and total publication record (table 10). Because grant funding and publication record significantly influenced the endpoints of rank, tenure, leadership, and both were significantly associated with gender, we sought to further evaluate the factors affecting total publication record and probability of writing a grant.

Table 6: Perceptions About Gender Diversity*

Being a Woman in the Rehabilitation Professional Community Is a Factor When Considering	Women	Men	*P*
Academic rank	3.30 (3)	2.99 (3)	.000
Ability to get promoted	3.41 (3)	2.97 (3)	.000
Tenure status	3.37 (3)	2.97 (3)	.000
Starting salary	3.65 (4)	3.16 (3)	.000
Salary increases	3.52 (3)	3.12 (3)	.000
Degree of protected research time	3.25 (3)	3.01 (3)	.000
Degree of patient and clinical responsibilities	3.03 (3)	2.93 (3)	.041
Degree of teaching responsibilities	2.99 (3)	2.92 (3)	.113
Departmental research support	3.19 (3)	2.95 (3)	.000
Ability to find good mentorship	3.31 (3)	2.97 (3)	.000
Departmental leadership and status	3.30 (3)	2.99 (3)	.000

NOTE. Values are mean (median).
*Scaling for question: very positive factor, 1; positive factor, 2; neutral, 3; negative factor, 4; very negative factor, 5.

Univariate analysis showed that more years out from training, male sex, and more postgraduate research training were significantly associated with higher publication productivity. In multivariate analysis, years out from training, male sex, and more years of research training remained positively associated with a better publication record (table 11). Univariate factors associated with an increased probability of writing a grant include more hours worked, years out from training, gender, research training, and more startup funding. In multivariate analysis, years out from training, research training, and hours worked remained statistically significant. After adjusting for these factors, gender did not have a significant additive effect on the probability of writing a grant (table 12).

DISCUSSION

To our knowledge, this was the first study to assess the role of gender in research participation and productivity, as well as career development and leadership in the rehabilitation community. The unadjusted results of this survey suggested that there are many significant differences between male and female rehabilitation professionals in regard to important factors that lead to a successful academic career including development of research skills, allocation of resources, salary, external funding, publications, and preparation for research. Because some of the outcomes we assessed, such as salary and rank, were affected by many factors, we performed multivariate analyses in an attempt to control for these variables. After controlling for a variety of confounding factors, we found that gender remained an independent and significant factor in salary and manuscript production but not rank, tenure, and leadership positions. However, given the interrelationships among gender and factors ultimately affecting rank, tenure, and leadership; gender gaps within these domains must still be considered. Additionally, we

Table 7: Results for Backward Stepwise Multivariate Regression Analyses for Factors Affecting Academic Rank (junior, senior) (n=197)

Variable	*P*	OR	95% CI for OR
Years out of school	.000	1.232	1.143−1.329
Publications past 5y	.001	1.101	1.039−1.166
Institutional leadership positions past 5y	.007	1.284	1.071−1.539
Total years federal funding	.015	1.146	1.026−1.279

Table 8: Results for Backward Stepwise Multivariate Regression Analyses for Tenure (n=203)

Variable	*P*	OR	95% CI for OR
Total publications	.000	1.041	1.025−1.057
Institutional leadership positions past 5y	.003	1.244	1.077−1.437

found that there were many personal life characteristics that differed between sex groups.

Our results confirmed the findings of others and extended them to include the rehabilitation community interested in pursuing an academic mission.[5,6,8,10,13-15] For instance, Tesch et al[15] has reported that, among a cross-section of medical school faculty, women physicians were promoted more slowly than men. Bickel et al[10] reported that women lagged behind men in academic rank across both medical and surgical specialties. One previous study[13] evaluating cardiothoracic surgeons reported slower academic advancement, lower salaries, less publication productivity, and gender bias for women during the course of their careers. Similar to our study, personal life characteristics differed between sex groups, with men having more children and less household and childcare responsibilities.[13] Similar results were also noted in a population of general surgeons surveyed.[14] It is interesting that, similar to our study, Schroen et al[14] reported that women lagged behind men in academic rank, tenure status, and (importantly) career aspirations to achieve high academic ranks and position of leadership.

Female physiatrists conducting rehabilitation research within the last 5 years fared substantially less well than men financially. They were paid less at all faculty ranks. Additionally, although gender disparities in compensation appeared to occur regardless of practice setting, they were least noticeable in the VA setting. In our study, gender remained a significant predictor of compensation among academics, even after adjusting for other independent variables (such as productivity, seniority, leadership) associated with gender. To make appropriate gender comparisons, salary analysis was limited to full-time physicians because they were the largest subgroup of respondents. Although the survey results did not identify conclusive reasons for this finding, sex discrimination or cultural or environmental biases regarding the value and contributions of female physiatrists to the academic mission cannot be dismissed. Additionally, it is well documented that women do not negotiate as frequently and as successfully as men for resources, salary, and promotion. The reasons for this phenomenon are complex.[16]

Sex differences in salary are pervasive across all job classes. In fact, the U.S. Census Bureau reported that, even when adjusting for differences in work patterns and other key variables, women still earned approximately 80% of what men did across all job classes and categories in the year 2000.[17] Sex differences with physician compensation were more pronounced, with female physicians earning approximately 63% of what male physicians earned across all medical and surgical specialties.[17] In our cohort, our unadjusted results suggested that female physiatrists earned approximately 75% of what male physiatrists did. Despite increased awareness regarding equitable compensation and the fact that women comprise such a large segment of the population in medicine, this disparity still remains. As such, a high priority should be placed on understanding the issue and eliminating wage discrimination.

Table 9: Results for Backward Stepwise Multivariate Regression Analyses for Salary*

Variable	β	*P*
Sex	.262	.000
Institutional leadership positions past 5y	.245	.000
Hours worked	.183	.006
National leadership positions past 5y	.153	.016
Years out of school	.145	.029

*n=191, R^2=.345.

Table 10: Results for Backward Stepwise Multivariate Regression Analyses for Leadership*

Variable	β	*P*
Hours worked	.240	.000
Years out of school	.223	.002
Current grant dollars	.200	.004
Total publications	.152	.059

*n=211, R^2=.235.

Another key area in which women lagged behind men in the rehabilitation community was in the area of leadership. Women in rehabilitation did not attain as many leadership positions within their university or nationally. Explanations for this were not clear from the survey data. It could be that women were not offered these jobs or perhaps turned them down more often than men. Although similar numbers of women and men reported having a professional development mentor, satisfaction with access to good mentors and self-rated mentorship skills lagged for women. These factors could adversely affect the ability of women to develop the professional networks necessary for involvement with leadership positions. Regardless, women seemed less well integrated into the interdepartmental committee structures and had fewer hospital-wide responsibilities. In multivariate analysis, gender did not remain a significant factor after controlling for other variables. However, because the primary factors in multivariate analysis affecting the acquisition of leadership positions were related to academic productivity, an area in which women lag behind, gender still appeared to be integrally related to leadership in rehabilitation medicine. Because administrative and committee activities are often necessary for tenure and promotion, the lack of participation in these activities by women likely has a significant impact on both career and financial advancement. As women engage in scholarly activities and participate in administrative duties important to rehabilitation departments, the value of these activities need to be adequately recognized to result in appropriate academic advancement, promotion, and salary increases.[5]

Women published less and obtained considerably less public or private funding than men. These findings were also consistent with other studies examining the careers of women in academic medicine.[6,8,13,15,18] For the group of women who chose to write grant applications, the level of funding was

Table 11: Results for Backward Stepwise Multivariate Regression Analyses for Factors Affecting Total Publications*

Variable	β	*P*
Years out of school	.441	.000
Gender	.151	.005
Postgraduate training	.130	.015

*n=271, R^2=.270.

Table 12: Results for Backward Stepwise Multivariate Regression Analyses for Factors Affecting Writing a Grant (n=271)

Variable	*P*	OR	95% CI for OR
Years out of school	.000	1.116	1.070−1.164
Hours worked	.000	1.038	1.025−1.051
Postgraduate training	.010	1.518	1.106−2.082

comparable to that of men who applied for grant funding. Reasons for less success within these domains could be both professional and personal. With respect to resources for research, there was not a single item in which women indicated that they were better supported than men. Additionally, female respondents reported being less capable to conduct research compared with male respondents. One study[19] suggests that women in training programs felt less capable of conducting research compared with male counterparts participating in the same program. Importantly, women in our study were more likely than men to feel that gender played a role in the disparities described in the survey with respect to resources, environment, leadership opportunities, and advancement. Differences in perceptions (see table 6) about the presence of a gender gap with resources and advancement were supported by the fact that, unlike their male counterparts, 75% of female respondents were not in a tenure-track position, had less startup funding, had inferior salaries, and lagged behind men in leadership positions and promotion through the academic ranks.

Our survey results regarding research productivity may have been influenced by the fact that more men than women reported having combined MD and PhD degrees and reported spending more time in fellowship training. However, there also may be potential sex differences in this type of self-reporting scheme that reflect confidence with research skill levels or a bias with interpretation of skill level within the context of the survey questions posed. Conversely, sex differences in research productivity may be because of substantially differing personal responsibilities or choices. Although about half of both male and female respondents said they shared childcare and other caregiver roles, women were more likely to take on the role of primary caregiver.

Although men and women seemed to be attracted to academic careers for similar reasons, women were less satisfied with both their educational preparation for research and their research environment. Our survey suggests that, similar to many other studies from other specialties, women in rehabilitation medicine did not achieve senior academic ranks or tenure as frequently as men.[10,11,13-15] Importantly, women also were less likely to aspire to promotion to full professor. Slightly more than half the women (56%) in our cohort aspired to reach the professor level, whereas 81% of men wanted to attain this rank. Relative differences in reporting for this question may be related to lack of participation of women in activities required to achieve this rank. In the traditionally male-dominated arena of academic medicine, it is possible that women are not being encouraged to participate in activities commonly accepted as important for promotion or advancement. It is also possible that women lack female role models who can successfully mentor them. Additionally, there also may be gender differences in the personal and cultural value men and women place on their participation in these activities.[10,20,21] Unfortunately, AAMC reported that the proportion of men to women at senior ranks has remained largely unchanged for the last 15 to 20 years.[20] As such, a path of significant cultural change that leads to an improvement for how women in academic medicine advance through the ranks is both challenging and complex.

This survey did not provide conclusive evidence for why these sex differences exist. Future research should specifically address this question. Results could be because of different financial or cultural expectations, differing personal or professional goals, or outright sex discrimination. However, what is clear is that the field of rehabilitation research needs to increase its capacity.[12] Because 50% of medical students are women, the future of any specialty, including PM&R, is intimately linked with its ability to develop and effectively use women.[10] From this perspective, it is important that we recruit and retain a higher number of all rehabilitation researchers, including women. To do this, we will need to address gender barriers, particularly within the professional environment. Our findings may have wider implications for the medical profession as a whole, particularly given that rehabilitation medicine has a greater percentage of women than other clinical specialties.

Several other industry groups have been reexamining their work culture in order to retain and develop higher numbers of women.[22] The potential advantages of fostering diversity and leadership have been shown in the corporate world. For example, IBM's strategy in taking full advantage of a diverse market for talent was strongly associated with the generation of billions of dollars of new revenue.[23] Morahan and Bickel[22] have suggested that the medical community adopt some of the positive changes occurring in the business community by eliminating environmental factors that disadvantage women, rewarding team work and collaboration, and valuing diversity and work effectiveness. To promote the development and advancement of women, the U.S. Department of Health and Human Services included women's leadership as a required component of the nationally funded Centers of Excellence in Women's Health. Establishing a network of women working together has been aimed to reduce feelings of isolation and encourage role modeling as a strategy to train a cadre of female researchers.[24]

Development of a mentorship program for residents, students, and entering faculty, as well as chairs and senior faculty may very well have a positive impact on the rehabilitation research enterprise. When implementing these mentorship programs, the specific needs of women within the current culture and environment and leadership methods to effectively use human resources and increase intellectual capital through faculty development should be emphasized. Disparities might also be addressed through reexamining academic procedures for promoting diversity when recruiting new faculty. Furthermore, qualified women should be placed in the tenure track. Salary and incentive structures should be equally applied for both men and women, with leadership checking regularly to ensure that sex-related compensation inequities do not occur. Developing a standard metric for promotion may lead to increased participation, compensation, and opportunity for women in academic research. Contributions to the overall academic enterprise, including teaching, mentoring, program development, and research, should be taken into account. Specific federally funded training programs targeting women in rehabilitation research are warranted in light of the current findings regarding women's perceptions about their research skills. Additionally, increased participation in senior level career development forums such as the Executive Leadership in Academic Medicine program for women at AAMC[25] and AAMC's Early Career Women Faculty Professional Development (for which the Foundation for PM&R provides a scholarship)[26] may be helpful to generate more women interested in and capable of pursuing leadership positions.

Previous reports[10] have suggested that academic reward and disadvantage are largely created and reinforced at the depart-

ment level and that chairs play a key role in integrating and advancing both women and minorities. Recently, AAMC has reported that department chairs believed that the constraints of traditional gender roles, manifestations of sex discrimination in the medical environment, and lack of effective mentors are among the most prominent barriers for women in medicine. Among the intervention strategies discussed, mentorship networks, extending the tenure clock, and institutional mechanisms for addressing unprofessional conduct were considered effective strategies by the chairs interviewed.[27] Although specific interventions for mentorship, improving the tenure process, and reporting misconduct may be helpful, major changes in the organizational culture in rehabilitation medicine are likely to be the most fruitful. Here, chairs may also take a leading role by being held personally accountable for encouraging diversity. They should be rewarded for creating a flexible and effective work environment and promoting academic advancement for women. In light of the survey findings presented, it is critically important that we in the rehabilitation community examine these cultural issues within our discipline and departments. We must actively engage our peers and our leaders in a meaningful dialog with the goal of promoting the entry and retention of women into academic and research positions. These explorations should be broad and include issues surrounding diversity, salaries, resource allocation, academic advancement, work effectiveness, job satisfaction, research capacity, and the academic rehabilitation mission.

Study Limitations

Our study had several limitations. The survey invitation was to all members of AAP, AAPM&R, and ACRM. However, many of the societies enlisted to participate in this survey were comprised of large numbers of private practitioners and people without a primary interest in research or academics. This sampling strategy, although inclusive, may have led to many people choosing not to respond to the survey. In addition, there was always the possibility of selection bias in our study. However, data suggested that faculty from over 100 institutions responded to the survey. AAMC reported that in 2004 there was approximately 1046 faculty in academic rehabilitation departments.[11] Given that a minority of rehabilitation faculty actively engage in research, it is likely that the survey has captured a substantial percentage of those in the academic rehabilitation community conducting research. Because of the sampling strategy, the vast majority of our respondents were physicians. Thus, our results may not extend as well to those PhDs performing rehabilitation research. However, the majority of respondents did report participating in research over the last 5 years, suggesting that the survey captured a fairly large proportion of the small rehabilitation community interested in the academic and research mission. Additionally, some key data points like rank were consistent with AAMC data,[4] suggesting that the respondents were a representative sample of academicians and researchers in rehabilitation. The respondents were a relatively young group and because of the cross-sectional nature of the study, we lack robust data on salary, promotion, resources, and environment for respondents over time.

CONCLUSIONS

Our results suggest that women in the academic rehabilitation community are less successful than their male counterparts and see themselves as disadvantaged. The issues raised by this study require aggressive actions in identifying root causes for gender disparities and creating effective action plans to correct compensation discrepancies and promote academic development and leadership for women within the rehabilitation community. Importantly, these findings have implications for the rehabilitation research community's efforts to sustain its academic mission, to improve research capacity, and to meet the needs of the 52 million people in the United States with disabilities.

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Supplier

a. Version 12.0; SPSS Inc, 233 S Wacker Dr, 11th Fl, Chicago, IL 60606.