Published Ahead of Print on October 10, 2018 as 10.1212/WNL.0000000000006497

ARTICLE

Age and sex differences in burnout, career satisfaction, and well-being in US neurologists

Kathrin LaFaver, MD, Janis M. Miyasaki, MD, Christopher M. Keran, BA, Carol Rheaume, MSPH, Lisa Gulya, MA, Kerry H. Levin, MD, Elaine C. Jones, MD, Heidi B. Schwarz, MD, Jennifer R. Molano, MD, Amy Hessler, DO, Divya Singhal, MD, Tait D. Shanafelt, MD, Jeff A. Sloan, PhD, Paul J. Novotny, MS, Terrence L. Cascino, MD, and Neil A. Busis, MD

Correspondence
Dr. Busis
busisna@upmc.edu

Neurology® 2018;00:1-14. doi:10.1212/WNL.0000000000006497

Abstract

Objective
To examine age and sex differences in burnout, career satisfaction, and well-being in US neurologists.

Methods
Quantitative and qualitative analyses of men's (n = 1,091) and women's (n = 580) responses to a 2016 survey of US neurologists.

Results
Emotional exhaustion in neurologists initially increased with age, then started to decrease as neurologists got older. Depersonalization decreased as neurologists got older. Fatigue and overall quality of life in neurologists initially worsened with age, then started to improve as neurologists got older. More women (64.6%) than men (57.8%) met burnout criteria on univariate analysis. Women respondents were younger and more likely to work in academic and employed positions. Sex was not an independent predictive factor of burnout, fatigue, or overall quality of life after controlling for age. In both men and women, greater autonomy, meaning in work, reasonable amount of clerical tasks, and having effective support staff were associated with lower burnout risk. More hours worked, more nights on call, higher outpatient volume, and higher percent of time in clinical practice were associated with higher burnout risk. For women, greater number of weekends doing hospital rounds was associated with higher burnout risk. Women neurologists made proportionately more negative comments than men regarding workload, work–life balance, leadership and deterioration of professionalism, and demands of productivity eroding the academic mission.

Conclusions
We identified differences in burnout, career satisfaction, and well-being in neurologists by age and sex. This may aid in developing strategies to prevent and mitigate burnout and promote professional fulfillment for different demographic subgroups of neurologists.

RELATED ARTICLE

Editorial
Burnout in Neurology: Extinguishing the embers and rekindling the joy in Practice
Page XXX

From the Department of Neurology (K.L.), University of Louisville, KY; Department of Medicine (J.M.M.), University of Alberta, Canada; Member Insights Department (C.M.K., C.R., L.G.), American Academy of Neurology, Minneapolis, MN; Department of Neurology (K.H.L.), Cleveland Clinic, OH; Consulting Neurologist (E.C.J.), Specialists on Call, Bristol, RI; Department of Neurology (H.B.S.), University of Rochester School of Medicine and Dentistry, NY; Department of Neurology and Rehabilitation Medicine (J.R.M.), University of Cincinnati College of Medicine, OH; Department of Neurology (A.H.), University of Kentucky College of Medicine, Lexington; Department of Neurology (D.S.), University of Oklahoma College of Medicine, Oklahoma City; WellMD Center (T.D.S.), Stanford Medicine, CA; Division of Biomedical Statistics and Informatics (J.A.S., P.J.N.) and Department of Neurology (T.L.C.), Mayo Clinic, Rochester, MN; and Department of Neurology (N.A.B.), University of Pittsburgh School of Medicine, PA.

Go to Neurology.org/N for full disclosures. Funding information and disclosures deemed relevant by the authors, if any, are provided at the end of the article.

Glossary

AAN = American Academy of Neurology; **CI** = confidence interval; **MBI-HSS** = Maslach Burnout Inventory–Human Services Survey; **QOL** = quality of life.

Physician burnout, characterized by emotional exhaustion, depersonalization, and low personal accomplishment, is increasingly recognized as a crisis for the US health care system.[1] Burnout can lead to personal dissatisfaction, depression, and increased suicide risk[2] as well as compromised patient care.[3] Burned out physicians may leave the workforce, reduce hours or call availability, and worsen the already existing shortage of neurologists.[4,5]

In our 2016 survey of US neurologists, 64.6% of women and 57.8% of men had at least one symptom of burnout.[6] However, our previous analysis found that age but not sex was an independent correlate of burnout.[6] Previous studies identified age- and sex-specific associations with physician burnout, career satisfaction, and well-being.[7–12] Since burnout has been recognized as a major problem among neurologists,[6] we reanalyzed our survey results using additional quantitative and qualitative methods to further explore age- and sex-specific factors associated with neurologist burnout.

Possible contributors to age-related differences include career stage and characteristics of home life.[10] Possible contributors to sex-related differences include the unique challenges women physicians face: sex discrimination,[13] harassment,[14] work–home conflicts,[15] and childbearing and family responsibilities,[16] which may be most burdensome in early career stages. Among a group of early career academic physicians, women spent 8.5 hours per week more on domestic activities compared to their male colleagues.[17] In academia, fewer women are promoted to the rank of full professor[18] and other leadership positions. Women physicians earn less than their male peers[19] and neurology is among the specialties with the highest gender pay gap.[20]

We report differences in characteristics of burnout, career satisfaction, and well-being associated with neurologist age and between men and women neurologists.

Methods

Study population

The survey population included practicing neurologists who were current members of the American Academy of Neurology (AAN) and had a primary address in the United States. Details of the survey population and study methods were published previously.[6] The present study focuses on that sample of 4,127 practicing US neurologists. They were provided the survey instrument by mail, email, and fax, if available.

Standard protocol approvals, registrations, and patient consents

Consent to participate in the study was implied by completing the survey. After the de-identified data were provided to the AAN, the study was reviewed and granted exempt status by the University of Pittsburgh Institutional Review Board.

Study measures

The survey[6] consisted of 57 questions covering personal and professional characteristics with standardized instruments to measure burnout and career satisfaction (supplement e-1, doi.org/10.5061/dryad.2mg3t27). Burnout was measured using the 22-item Maslach Burnout Inventory–Human Services Survey (MBI-HSS).[21] The MBI-HSS has 3 subscales to evaluate each domain of burnout: emotional exhaustion, depersonalization, and personal accomplishment. Using the standard scoring criteria for health care workers, and in keeping with previous studies and convention,[6] we considered respondents with high scores on the emotional exhaustion (≥27) or depersonalization (≥10) subscales as meeting the criteria for burnout. Career satisfaction was assessed using 2 questions from previous physician surveys regarding career and specialty choice.[9,12,16,22,23] Questions from the Empowerment at Work[12,24] and Physician Job Satisfaction[25] scales explored meaning in work and professional satisfaction. Two questions were asked about the amount of time spent on clerical tasks directly and indirectly related to patient care.[26]

Statistical and qualitative analysis

The statistical methods were reported previously.[6] Differences between responders and nonresponders were tested using χ^2 tests for categorical variables and Wilcoxon tests for continuous variables. In this study, modeling for multivariable analyses was conducted using binary logistic regression with lasso model selection and validated using bootstrapping. Age, hours worked per week, nights on call per week, number of outpatients, and weekends per year with hospital rounds were entered as continuous variables. An age squared term was included in the model to account for a nonlinear relationship with burnout. Since a major goal of this study was to determine if there were differences by sex, all interactions with sex and the predictor variables were explored. These interactions were included in lasso modeling in accordance with lasso guidelines.[27] Significant interactions were included in the lasso and bootstrapping selection process. Because age and years in practice were highly multicollinear, we included only age in the logistic regression models because age was used in prior burnout research.[7,9,12] Plots of predicted risk levels were calculated using the final multivariable logistic model.

For a logistic regression, a minimum of 10 outcome events per predictor is recommended to have sufficient data to fit a model.[28] The binary logistic regression models in this study included 17 predictors requiring 170 events. For female participants, there were 361 events (560 female participants with a score for burnout times 64.6% considered to have burnout), and for male participants, there were 610 events (1,056 male participants with a score for burnout times 57.8% considered to have burnout).

The final portion of our survey invited respondents to enter a supplemental free text response: "Thank you for your time and responses. Is there anything else you would like to share with AAN regarding burnout and well-being?" (supplement e-1, doi.org/10.5061/dryad.2mg3t27) Answering this open-ended question was voluntary. For qualitative analysis, a panel of 5 neurologists and 2 non-neurologists coded free-text responses (n = 676; 250 women and 426 men) following the methods described by Miyasaki et al.[29] to understand the participants' understanding of the experience and drivers and mitigating factors of burnout, career satisfaction, and well-being in their own words. Inductive analysis was used to identify relevant themes by individual panelists. An initial codebook was used to code 40 of the 676 statements. Differences in coding were resolved through consensus and tighter definitions of themes. In our previous qualitative study of this survey population,[29] we did not consider differences by sex, but rather analyzed what all practicing neurologists who contributed free text comments identified as contributors to burnout and possible mitigators. Here, previously coded text units (i.e., thematically coherent excerpts from longer free-text responses) were analyzed by sex for the 4 themes that had the highest difference in proportion of comments by men and women and were also the top 4 themes commented upon by women. Of the team of 3 qualitative researchers who reanalyzed the previously coded text units for this article, all 3 reread the relevant text units and analyzed them for differences between men and women, the neurologist wrote the results, and the 2 non-neurologists reviewed and provided comments. We did not separate out qualitative statements by age and sex because there were too few respondents in each age section to reach saturation of themes.

Data availability

All supplementary data are available from the Dryad Digital Repository (doi.org/10.5061/dryad.2mg3t27). Further anonymized data can be made available to qualified investigators upon request to the corresponding author.

Results

Response rate and representativeness

Of the 4,127 neurologists surveyed, 1,671 responded, for a response rate of 40.5% (39.2% for men and 43.3% for women: $\chi^2 = 6.286$; $p = 0.012$). The representativeness of the respondents was previously reported[6] and showed that all demographic differences were no more than 3.7 percentage points (table e-1, doi.org/10.5061/dryad.2mg3t27).

Personal and practice characteristics

Compared to men, women were about 7 years younger (95% confidence interval [CI] 6–8) (figure e-1, doi.org/10.5061/dryad.2mg3t27), more likely to practice in the northeast (+6%) and less likely to practice in the south (−5%) ($p < 0.05$), and had 8 fewer years in practice (95% CI 7–9) (table 1). Women were less likely to be in a solo practice (−6%), more likely to be in an academic setting (+7%) (both $p < 0.05$), more likely to be employed at a hospital (+13%), and less likely to be an owner/partner (−12%) (both $p < 0.05$).

Subspecialty, method of compensation, and workload

Compared to men, women were less likely to identify themselves as a general neurologist (−13%) and more likely to identify themselves as a specialist in child neurology (+3%), movement disorders (+3%), or other (subspecialties with fewer than 30 respondents) (+4%) (all $p < 0.05$) (table e-2, doi.org/10.5061/dryad.2mg3t27). Compared to men, women were more likely to be compensated with a salary plus bonus (+6%), and less likely to report a pure production-based income (−9%) (both $p < 0.05$). Men reported working 2 more hours per week than women (95% CI 1–4) and saw 6 more outpatients per week (95% CI 3–10).

Burnout, career satisfaction, and well-being

Table 2 describes burnout, career satisfaction, and well-being among participants. Women had a higher burnout rate than men (+7%, $p = 0.007$), due to higher scores in the emotional exhaustion domain (+3%, $p < 0.001$). Personal accomplishment scores were 1 percentage point lower for women than for men ($p = 0.003$). Ten percent fewer women indicated they would choose to be a physician again ($p < 0.001$) and 6% fewer women were satisfied with their job compared to men ($p = 0.026$).

Women reported 0.28 lower quality of life (QOL) (95% CI 0.06–0.50), 0.41 higher level of fatigue (95% CI 0.17–0.66), and 10% lower work–life balance compared to men ($p < 0.001$). Women respondents were more likely (+15 percentage points) to indicate a lack of effective support staff compared to men ($p < 0.001$). No sex differences were found for depersonalization ($p = 0.326$), becoming a neurologist again ($p = 0.337$), doing motivating activities ($p = 0.580$), autonomy ($p = 0.076$), meaningful work ($p = 0.105$), or satisfaction with clerical tasks either directly ($p = 0.255$) or indirectly ($p = 0.253$) related to patient care.

Relationship of age and sex with burnout, fatigue, and QOL

While burnout rates were 7 percentage points greater for women than men for all survey respondents ($p < 0.05$), sex differences in burnout rates were not significant within any

Table 1 Personal and practice characteristics in men and women neurologists

	Men (n = 1,091)	Women (n = 580)	*p* Value comparison M to W[a]
Personal characteristics			
Age, y			
Mean	54.3	46.9	<0.001
Median	55	46	
SD	12.1	10.1	
Missing, count	0	0	
Age % (and counts) in categories[c] <40	14.9 (163)	30.0[b] (174)	<0.001
40–49	20.7 (226)	34.1[b] (198)	
50–59	27.8 (303)	22.4[b] (130)	
60–69	25.2 (275)	11.7[b] (68)	
70+	11.4 (124)	1.7[b] (10)	
Geographic region,[d] %			0.048
Northeast	20.9	26.9[b]	
Midwest	24.3	23.6	
South	32.3	26.9[b]	
West	21.9	21.9	
AE, PR, VI	0.6	0.7	
Missing, count	0	0	
Years in practice[e]			<0.001
Mean	20.1	12.1	
Median	20	10	
SD	12.4	9.4	
Missing, count	52	24	
% In categories <10 y	24.5	48.0[b]	<0.001
10–19 y	22.9	26.4	
>20 y	52.6	25.5[b]	
How do you think your well-being compares to other physicians? %			<0.001
Poor (bottom 30% of physicians)	7.5	5.3	
Below average (31st–40th percentile)	18.8	25.7[b]	
Average (41st–60th percentile)	36.2	44.1[b]	
Above average (61st–70th percentile)	20.2	15.9[b]	
Excellent (top 30% of physicians)	17.3	9.0[b]	
Missing, count	3	0	
Practice characteristics			
Primary work setting, %			0.002
Solo practice	16.5	10.3[b]	
Neurology group	20.7	17.1	
Multispecialty group	14.0	12.8	

Continued

Table 1 Personal and practice characteristics in men and women neurologists *(continued)*

	Men (n = 1,091)	Women (n = 580)	*p* Value comparison M to W[a]
Academic-based	31.3	38.2[b]	
Hospital-based	12.6	15.6	
Government-based	3.1	3.3	
Other	1.9	2.8	
Missing, count	64	35	
Employment status, %			<0.001
Employed at a hospital	37.2	49.9[b]	
Employed at a practice	22.9	22.8	
Owner/partner	30.9	19.2[b]	
Other	9.0	8.1	
Missing, count	45	23	

[a] Comparisons tested using Kruskal-Wallis for continuous variables, χ^2 for nominal variables, and Mann-Whitney *U* for ordinal variables.
[b] This paired comparison (*z* test) was found to be significant at a $p < 0.05$ level.
[c] Ten-year age categories were used in an attempt to have roughly equal sized groups and still isolate the oldest and youngest neurologists.
[d] Regional designations: Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT; Midwest: IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI; South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; West: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY; Other: AE (Armed Forces Europe), AP (Armed Forces Pacific), GU (Guam), PR (Puerto Rico), VI (Virgin Islands).
[e] Since completion of residency and fellowship training.

age category (all $p > 0.05$) (table 3), when age and burnout were analyzed as continuous variables (figure 1), and in logistic modeling after adjusting for other covariates that were associated with burnout (see next section). Burnout did not have a linear relationship with age. The trajectories for emotional exhaustion, depersonalization, and personal achievement were similar for men and women. For women and men, emotional exhaustion initially increased with age, then began to decrease around age 60. Depersonalization began to decrease around age 50 for women and men.

Neurologist fatigue and overall QOL also had a nonlinear relationship with age. Both fatigue and QOL initially worsened with age, then started to improve as neurologists got older than about 50 (figure 2). The trajectories for fatigue and QOL were similar for men and women.

Workload, career satisfaction, and subspecialty in women and men by age

Data available from Dryad (table e-3, doi.org/10.5061/dryad.2mg3t27) show workload in men and women within each age category. There are several sex-associated differences (all $p < 0.05$) including hours worked per week (fewer in women <40 years old and 50–59 years old compared to men), outpatients per week (fewer in women 40–69 years old compared to men), weekends per year (fewer in women <40 years old compared to men), and hours volunteering per month (greater in women 60–69 years old compared to men).

Data available from Dryad (table e-4, doi.org/10.5061/dryad.2mg3t27) show career satisfaction in men and women within each age category. In the <40 years old age group, compared to men, women had less interest in becoming a physician again ($p < 0.05$), and less satisfaction with the amount of indirect clerical tasks ($p < 0.05$). In the 40–49 years old age group, compared to men, women had lower satisfaction with work–life balance ($p < 0.05$), and less satisfaction with the amount of direct clerical tasks ($p < 0.05$). In the <40, 40–49, and 50–59 years age groups, compared to men, women were more likely to indicate a lack of effective support staff.

Data available from Dryad (table e-5, doi.org/10.5061/dryad.2mg3t27) show there is a larger percentage of men in general neurology compared to women for those older than 40, but not for those younger than 40.

Factors associated with burnout

Multivariable analysis exploring factors associated with burnout in practicing neurologists found that sex was not a significant factor (table 4). Greater autonomy ($p < 0.001$), meaning in work ($p < 0.001$), reasonable amount of direct clerical tasks ($p < 0.001$), and having effective support staff ($p < 0.001$) were associated with lower burnout risk, while working more hours per week ($p < 0.001$), more nights on call ($p = 0.024$), more outpatients ($p = 0.005$), and having a higher percentage of time in clinical practice ($p = 0.006$) were associated with higher burnout risk. The interaction between sex and number of weekends with hospital rounds was also significantly related to burnout. Burnout rates increased faster for women than men as the number of weekends increased ($p = 0.019$) (figure e-2, doi.org/10.5061/dryad.2mg3t27). For every extra weekend, the risk of burnout increased by 3%

Table 2 Burnout and career satisfaction in men and women neurologists

	Men (n = 1,091)	Women (n = 580)	*p* Value comparison M to W[a]
Burnout indices[b]			
Emotional exhaustion[c]			
Median	27.0	30.0	<0.001
% Low score	29.2	23.6[d]	0.007
% Intermediate score	20.2	17.6	
% High score	50.6	58.8[d]	
Missing, count	51	29	
Depersonalization[c]			
Median	8.0	8.0	0.326
% Low score	37.5	34.7	0.516
% Intermediate score	21.9	22.3	
% High score	40.6	43.0	
Missing, count	44	24	
Personal accomplishment[c]			
Median	40.0	39.0	0.003
% High score	55.4	47.8[d]	0.007
% Intermediate score	23.7	30.3[d]	
% Low score[e]	20.9	21.9	
Missing, count	62	36	
% Burned out[f]	57.8	64.6	0.007
Missing, count	35	20	
Career satisfaction			
Would become physician again (career choice), % yes	64.8	54.8	<0.001
Missing, count	29	20	
Would become neurologist again (specialty choice), % yes	68.0	65.7	0.337
Missing, count	25	15	
Do you get to spend sufficient time doing those activities that motivated you to choose neurology? % mostly/very much so	45.0	43.5	0.580
Missing, count	51	38	
Overall, I am satisfied with my job, % agree	68.9	63.4	0.026
Missing, count	34	17	
Quality of life, fatigue, and work–life integration			
Overall quality of life[g]			
Mean (SD)	6.3 (2.2)	6.1 (2.1)	0.013
Median	7.0	6.0	
Missing, count	2	3	

Continued

Table 2 Burnout and career satisfaction in men and women neurologists *(continued)*

	Men (n = 1,091)	Women (n = 580)	*p* Value comparison M to W[a]
Level of fatigue[g]			
Mean (SD)	5.4 (2.4)	5.0 (2.3)	0.001
Median	5.0	5.0	
Missing, count	8	1	
Work schedule leaves enough time for personal/ family life, % agree	35.7	25.8	<0.001
Missing, count	30	21	
Autonomy and meaning in work			
I have significant autonomy in determining how I do my job, % agree	61.5	56.9	0.076
Missing, count	30	16	
The work I do is meaningful to me, % agree	86.6	89.4	0.105
Missing, count	32	15	
Clerical tasks and support staff			
The amount of time I spend on clerical tasks directly[h] related to patient care is reasonable, % agree	23.8	21.3	0.255
Missing, count	42	22	
The amount of time I spend on clerical tasks indirectly[i] related to patient care is reasonable, % agree	16.7	14.5	0.253
Missing, count	46	20	
How much effective support staff do you have to assist you in your work? % too little	51.1	66.1	<0.001
Missing, count	51	22	

[a] Comparisons tested using Kruskal-Wallis for continuous variables and χ^2 for categorical variables.
[b] As assessed using the full Maslach Burnout Inventory.
[c] Per the standard scoring of the Maslach Burnout Inventory for health care workers, physicians with scores on the Emotional Exhaustion subscale ≥27, the Depersonalization subscale ≥10, or scores ≤33 on the Personal Accomplishment subscale are considered to have a high degree of burnout in that dimension.
[d] This paired comparison (*z* test) was found to be significant at a $p < 0.05$ level.
[e] Low scores on the Personal Accomplishment subscale are less favorable.
[f] High score on Emotional Exhaustion or Depersonalization subscales of the Maslach Burnout Inventory (see Methods).
[g] Scale of 0 = As bad as it can be to 10 = As good as it can be.
[h] e.g., Order entry, dictation, laboratory results review, communicating with patients via a patient portal.
[i] e.g., Correspondence, completion of forms, answering phone calls.

in women but did not increase for men. No additional factors associated with burnout in either sex were found when the final multivariable model was fit separately to men and women (table e-6, doi.org/10.5061/dryad.2mg3t27).

We plotted predicted probabilities of burnout by age based on the composite multivariable logistic model (figure 3). Burnout probability increases slightly at first but starts to decrease as neurologists get older. Figure 3 illustrates predicted probabilities by age for 6 cohorts of neurologists: men and women having high, average, and low risk of burnout. The overall trajectory of burnout by age was the same for all cohorts, but burnout risk increased or decreased based on values assigned to the other variables in the multivariable model, including reasonable amount of clerical tasks, outpatients per week, autonomy, nights on call per week, meaningful work, effective support staff, hours worked per week, and number of weekends rounding. Predicted burnout risk of men and women in the high-, average-, and low-risk groups was almost identical, consistent with the finding that sex was not independently associated with burnout in the multivariable analysis.

Qualitative analysis

Analysis of the free text responses from women and men to our open-ended final question, "Is there anything else you would like to share with AAN regarding burnout and well-being?" showed greatest differences for workload, leadership, work–life balance, and professionalism (table e-7, supplement e-2, doi.org/10.5061/dryad.2mg3t27). With regard to workload, women mentioned more unpaid work (e.g., teaching,

Table 3 % Burnout in men and women within each age category

% Burnout of the count in each cell (with 95% exact binomial confidence intervals)	Men (n = 1,056)	Women (n = 560)
<40	58.5 (50.4–66.2) (n = 159)	67.3 (59.7–74.2) (n = 171)
40–49	64.5 (57.8–70.9) (n = 220)	68.1 (61.0–74.6) (n = 191)
50–59	64.1 (58.3–69.7) (n = 290)	60.5 (51.3–69.1) (n = 124)
60–69	57.0 (50.9–63.0) (n = 270)	60.9 (47.9–72.9) (n = 64)
70+	29.9 (21.8–39.1) (n = 117)	30.0 (6.7–65.3) (n = 10)
Total	57.8 (54.7–60.8) (n = 1,056)	64.6 (60.5–68.6)[a] (n = 560)

[a] Sex significant at $p < 0.05$ for total men vs women using χ^2. Sex differences were not significant (all $p > 0.05$) for any of the age categories using a paired comparison (z test).

administration) than expected by their job description. Both men and women mentioned taking leaves of absence, changing to part time work, switching to hospitalist work without call, removing themselves from call, early retirement, or leaving medicine altogether. Men mentioned hobbies and lacking sufficient time to pursue them, while women did not mention hobbies at all.

Leadership-related comments revealed sex differences. Women mentioned lack of pay equity ("I work at —, where one of the division chiefs said at a dinner that it was okay for women physicians to be paid only 70% of what male physicians are paid because we work less"). Only women mentioned erosion of the academic mission due to pursuit of relative value units even in academia. Men focused on loss of autonomy in their practice by hospital and practice administration not meeting their needs, and insurance and government mandates eroding their ability to practice. Men also mentioned that subspecialization of neurology reduced the respect for general neurology and the ability for general neurologists to practice.

In terms of work–life balance, women were more likely to mention suicidal ideation, leaves, closing practice, and mental health effects ("drowning," "demoralized," "emotional exhaustion"). Women also mentioned childcare/family responsibilities as additional work. Men mentioned suicide of colleagues, but not suicidal ideation, and described family time as enjoyment and wanting more time to engage in it, as well as sacrificing family time for work.

Threats to medical professionalism, which can be defined as having the expertise, trust, autonomy, and authority to place the medical interests of their patients first,[30] emerged as a major theme in our original qualitative study.[29] Women made more negative comments about professionalism than men. Both women and men mentioned linking physician payment to patient satisfaction surveys has made them fearful of "speaking the truth" or to give diagnoses that patients do not want to hear. "Although there are elements of service in what we do, we are not a service industry. We have to tell people what they don't want to hear, we have to ask them to make changes that they may not be ready for, and we have to have relationships with people based on respect and tough love, not creature comforts." Fear of litigation and doctor rating websites further eroded their professional identity.

Discussion

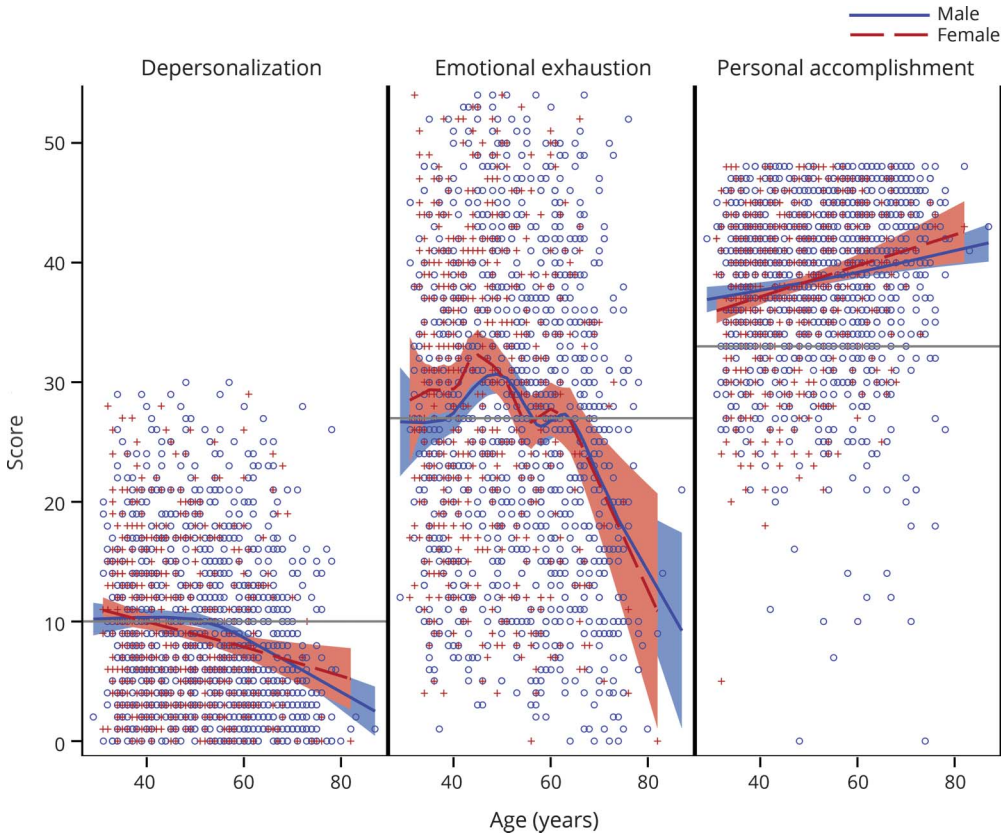
We identified differences in burnout, career satisfaction, and well-being by age and between men and women US neurologists using quantitative and qualitative methods. We previously found higher rates of burnout and lower rates of career satisfaction in women than in men.[6] However, sex was not an independent predictive factor of burnout on multivariate analysis.[6]

This finding can be explained by the relationship of burnout with age combined with the demographics of our respondents. In our survey population, burnout varied by age for both women and men neurologists. Age-matched rates of depersonalization and emotional exhaustion were the same for women and men, but the age distributions of men and women differed, with women neurologists tending to be younger than men. This finding is concordant with a recent study showing that fewer women than men pursue neurology careers, with the gap increasing by seniority.[31] Previous studies showed age is a more dominant factor in predicting physician burnout than sex, which is also true in the general US working population.[9] Women and men now enter medical school in near-even numbers.[32] If women and men enter neurology residencies in equal numbers and then all remain in the specialty, their burnout rates may equalize in the future.

Previous studies showed that age has a complex relationship with burnout and well-being.[7–12] In some studies, burnout rates are higher in midcareer physicians.[10] In most studies, burnout decreases after middle age or with increasing age.[7] These trajectories may reflect different challenges associated with different career stages, including professional responsibilities and compensation; and home life phases, including the family life cycle, family structure and responsibilities, and the physician's health. The decrease in burnout with age may also reflect negative selective pressure on the workforce, with older physicians decreasing their workload or leaving clinical practice, perhaps earlier than initially planned.[7]

Although overall burnout rates were the same for women and men neurologists when adjusted for age, the characteristics

Figure 1 Depersonalization, emotional exhaustion, and personal accomplishment by age and sex



Burnout measures by age. Lowess curves, with 95% confidence intervals for the mean, were fit separately for men (blue) and women (red) to show trajectories by age. The black reference lines show the burnout cutoffs for each scale (≥10 for depersonalization, ≥27 for emotional exhaustion, and ≤33 for personal accomplishment). The overlap of the curves indicates that burnout trajectories by age are similar for male and female participants.

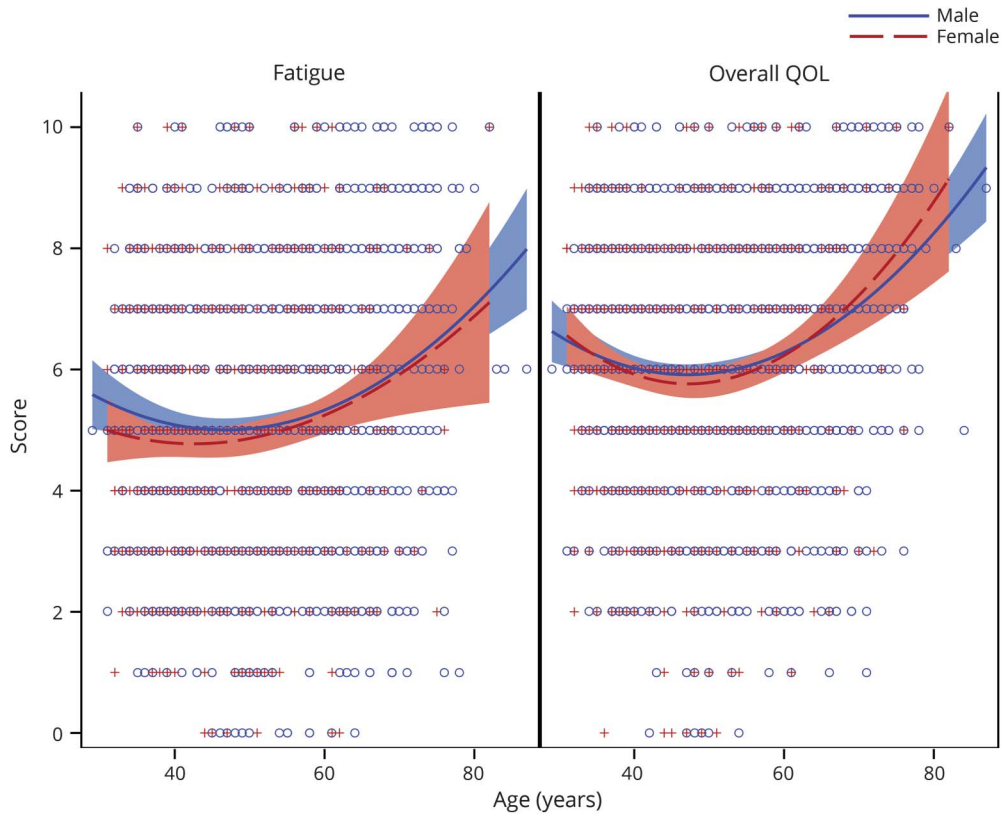
and experience of the workplace and burnout differed between women and men. Our survey did not include sex-specific questions, such as asking about childcare and domestic responsibilities or experiences of sex discrimination. However, quantitative analysis of differences in survey responses between women and men, multivariable analysis exploring factors associated with burnout, and qualitative analysis of the free-text comments enabled us to explore sex-specific themes related to burnout, career satisfaction, and well-being.

Personal and external determinants likely contribute to the sex-associated differences we identified. Women and men had different work characteristics, issues related to career satisfaction and subspecialty choices. Greater numbers of weekends spent doing hospital rounds was associated with higher burnout risk in women but not men.

The qualitative analysis results were especially revealing. Women indicated they experienced the workplace in a different manner than men, with comments reflecting pay inequity, higher expectation for nonremunerative work, and less administrative support. A previous study revealed that women are less likely to negotiate job offers and, when they do, are more likely to be viewed negatively.[33] Women and men neurologists who contributed free-text responses mentioned different values associated with their work. Only women commented that emphasis on productivity measures eroded the academic mission, while men focused on autonomy. This is consistent with a previous study that found alignment of individual and institutional values is of greater importance to women than men physicians.[34]

Women described their family commitments as adding to the burden of work and, at times, being unable to be emotionally available for their family. This may explain our finding that burnout risk increased with more weekends rounding in the hospital for women but not for men, since weekend rounding might interfere with women's family and home responsibilities. Emotional exhaustion has been linked with persistent work–home interface stress.[35] In women, such stress was the most important predictor of emotional exhaustion. In contrast, in men, emotional exhaustion was associated with the lack of reduction in working hours, while more support from colleagues mitigated work–home interface stress. A study of US dual physician couples from 2010 to

Figure 2 Fatigue and overall quality of life (QOL) by age and sex



Level of fatigue on average and overall QOL by age. Higher values indicate less fatigue and better quality of life. Lowess curves, with 95% confidence intervals for the mean, were fit separately for men (blue) and women (red) to show trajectories by age. Both values initially decrease with age but eventually start increasing with age. The overlap of the curves indicates that fatigue and quality of life trajectories by age are similar for male and female participants.

2015 found that women physicians with young children worked fewer hours on average than their male peers, potentially reflecting persistent societal expectations for women to care for children.[36] Despite difficulties in meeting demands for dual roles, having children has been associated with stronger career satisfaction for women physicians.[16] Burnout rates in women physicians are lower in the Netherlands, which has better maternity leave policies and greater physician control over work schedules, than the United States.[37]

In our study, women commented more frequently than men on mental health issues, specifically depression and suicidal ideation. However, it is unknown if this reflects sex differences in prevalence of mental health issues or a higher likelihood of disclosure by women neurologists. Depression, substance abuse, and addiction have been associated with physician burnout,[38] but were not captured in our survey.

Neurologists may be especially prone to experience burnout due to the demands for a detailed history and examination coupled with personality factors of conscientiousness, making it difficult to operate under imperatives to increase patient encounters.[39] In addition, unintended consequences of the current approach to patient satisfaction may play a role. Both women and men commented that linkage of physician reimbursement with patient satisfaction scores disincentivized them from having forthright conversations with their patients regarding unfavorable diagnoses or prognoses.

The difficulties inherent in successful neurologic practice may be intensified in women physicians, who, on average, spend more time with their patients than men physicians and may display a more compassionate attitude, potentially increasing the risk for emotional exhaustion and compassion fatigue.[40] Compounding matters, patient expectations differ for women and men physicians. Female patients, compared to male patients, seek longer and more empathic encounters, especially if their physician is a woman. Women physicians have more women patients and more psychosocially complex patients compared to men physicians. However, physician schedules are not adjusted either for the sex of the physician or the patient's characteristics.[41] Women in our study also practiced more often in lower earning subspecialties, which may contribute to lower feelings of accomplishment or recognition.[42]

Our study has several important limitations. The collected data were self-reported, which could introduce response bias.

Table 4 Factors associated with burnout using multivariable analyses

Predictor	OR	95% CI		*p* Value
		Lower	Upper	
Female (compared to male)	0.820	0.569	1.180	0.2841
Autonomy in job (Q9a) (0 = disagree/neutral, 1 = agree)	0.311	0.237	0.407	<0.0001
Meaningful work (Q9b) (0 = disagree/neutral, 1 = agree)	0.280	0.164	0.478	<0.0001
Reasonable amount of direct clerical tasks (Q10a) (0 = disagree/neutral, 1 = agree)	0.476	0.355	0.638	<0.0001
Effective support staff (Q11) (0 = too little, 1 = about right)	0.651	0.504	0.840	0.0009
Hours worked per week (Q12)	1.015	1.006	1.024	0.0009
Percentage time in clinical practice (Q13_1)	1.008	1.002	1.014	0.0057
Nights on call per week (Q14)	1.071	1.009	1.137	0.0240
No. of outpatients (Q15)	1.007	1.002	1.011	0.0050
Age (Q19)	1.125	1.025	1.233	0.0128
Age squared (Q19)	0.999	0.998	0.999	0.0020
Weekends per year with hospital rounds (Q17)	0.991	0.977	1.006	0.2512
Interaction between sex and weekends with hospital rounds (Q17 by gender interaction)	1.032	1.005	1.061	0.0193

Abbreviations: CI = confidence interval; OR = odds ratio.
A logistic multivariable analysis was conducted to explore personal and professional factors associated with burnout (0 = not burned out, 1 = burned out). Variables were selected for this model using a lasso method and verified using bootstrapped logistic modeling. All possible sex interaction terms were included in the variable selection process. Personal characteristics considered for the model: age (continuous), region, sex. Professional characteristics considered for the model: autonomy, meaningful work, direct clerical tasks, indirect clerical tasks, effective support staff, hours per week (continuous), % clinical time (continuous), nights on call (continuous), number of outpatients (continuous), number of inpatients (continuous), number of weekends have hospital rounding (continuous), academic vs clinical work setting, subspecialty, employment status, compensation method. Results shown when variable was significant using lasso model selection methods. The final model was verified using bootstrapped logistic models with 1,000 repetitions. Sex was forced into the model.

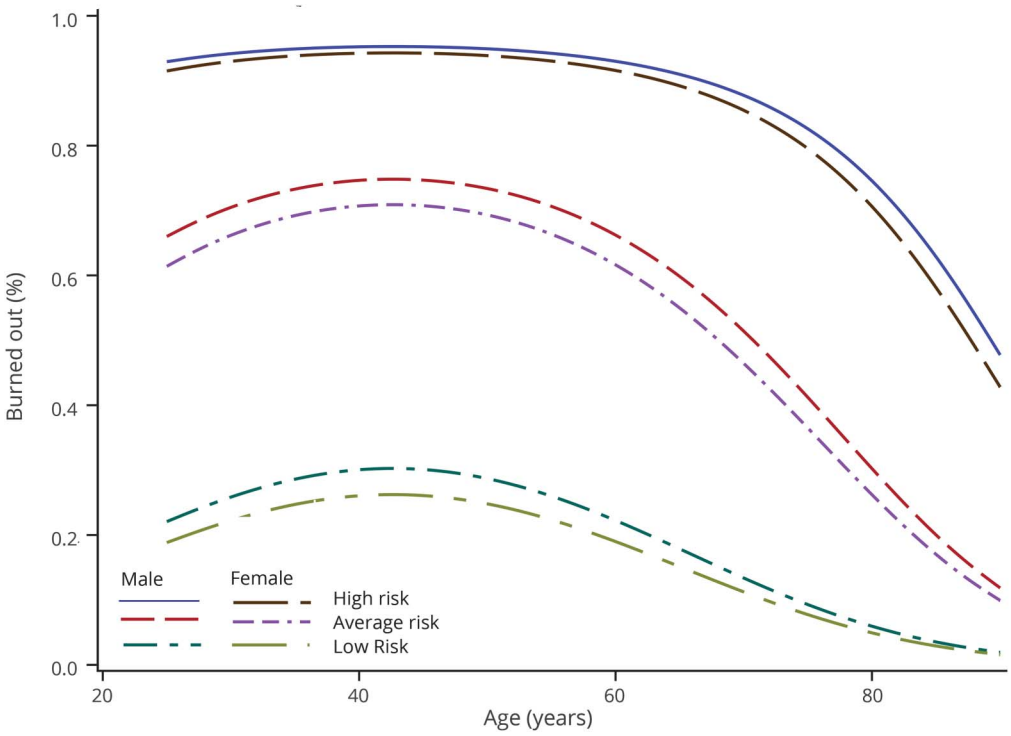
Any response rate less than 100% can reduce the ability to generalize findings to the population of interest. Only 34% of our respondents were women, with only 78 women older than 59 years. Although our respondents were representative of the demographics of the study population of AAN member US neurologists, analysis of a larger respondent base, or equal-sized groups of men and women, may have found additional differences between sexes, especially when categorized by age. Our study also did not specifically account for physicians who leave practice. The decrease in burnout over age 60 could be explained if the most burned out neurologists retire earlier than their peers. Variations in burnout rate by sex even when adjusted for age might not be identified if dropout rates due to burnout differ between men and women neurologists. This is a potential subject for future research. Our survey did not include questions about sex-specific topics such as number of pregnancies, family and caregiving responsibilities, perceived discrimination, pay differences, intent to work full-time or part-time, and sexual harassment. Fewer comments were analyzed in this study than in our qualitative analysis of burnout that included all practicing neurologists.[29] In this study, our analytic focus was on differences in how men and women commented about the 4 top categories of concerns including those related to workload. Due to the exploratory nature of the analysis and the small number of comments, we did not quantify men's and women's responses for comparison.

Our study has important strengths. Our mixed-methods survey had a relatively high participation rate and neurologists in the sample were drawn from the AAN member database that includes most US neurologists. Qualitative analysis of the comments generated sex-specific hypotheses about neurologist burnout, career satisfaction, and well-being that were not captured by our quantitative survey responses.

The topics identified in our qualitative analysis as potentially sex-specific factors contributing to burnout will need to be further studied to determine if they are generalizable. Future qualitative research could ask neurologists specific questions to more clearly elicit differences in women's and men's experiences, for example: (1) What has driven or mitigated burnout for you personally? (2) In your opinion, are these drivers and mitigators the same or different for men and for women?

Solutions to prevent burnout and promote career satisfaction and well-being in women and men should include initiatives at the individual level and systemic and cultural changes. Promotion of mental health, mindfulness, regular exercise, and other measures aimed at increasing physician resilience have small but significant benefits.[7,43] Fostering communication and support within peer groups is a promising, well-accepted, and low-cost intervention to mitigate burnout for medical

Figure 3 Predicted risk of burnout by age based on the composite multivariable logistic model



Predicted risk of burnout by age based on the composite multivariable logistic model. All 6 plots are for neurologists with 85% of their time in clinical practice. Separate plots were created for male and female participants at each of 3 risk levels; high, average, and low risk. The high-risk group did not have significant autonomy, did not think their work was meaningful, did not have a reasonable amount of clerical tasks, did not have an effective support staff, worked 55 hours per week, saw 40 outpatients per week, had hospital rounds 8 weekends per year, and had 1 night on call per week. The average-risk group had significant autonomy, did not think their work was meaningful, had a reasonable amount of clerical tasks, did not have an effective support staff, worked 55 hours per week, saw 40 outpatients per week, had hospital rounds 8 weekends per year, and had 1 night on call per week. The low-risk group had significant autonomy, thought their work was meaningful, had a reasonable amount of clerical tasks, had an effective support staff, worked 40 hours per week, saw 40 outpatients per week, had hospital rounds 0 weekends per year, and had 0 nights on call per week.

professionals.[44] Departmental and institutional changes require a larger commitment from leadership and are associated with higher costs of implementation, but can be cost-effective.[45] Changes may include more assistance with administrative and clerical duties that is equitably assigned, and giving physicians more control over their work schedules. Successful programs need to be tailored towards the individual practice or institution and should involve input by physicians and administrators prior to implementation.[46] Organizational loyalty can be increased and burnout decreased by granting physicians more autonomy, promoting positive relationships with colleagues, and ensuring their work is meaningful.[47] Unilateral top-down decision-making will likely erode neurologists' professional satisfaction, as will the unintended consequences of evaluating physician performance based on current patient satisfaction measures. Furthermore, leaders should recognize that men and women spoke equally of a desire to spend more time with their families and in favor of work–life balance.

Age- and sex-specific interventions to reduce burnout include attitudinal change in leadership to provide pay equity, mentorship, and equitable opportunities for academic advancement.[31,48,49] Physician schedules could be adjusted to reflect professional responsibilities at different career stages and the characteristics and expectations of the physicians' patients.[41] Administrative support (office space, support staff access, start-up funds for researchers) should be ample, unbiased, and transparent. Disparities in how work is divided at home need to shift to support women in the neurology workforce. Women with work–life balance concerns stemming from the care of dependents (children and the elderly) would benefit from egalitarian behavior in sharing these domestic tasks.[35] Organizational initiatives that offer career life counseling and time banking may also help.[50]

The differences in burnout, career satisfaction, and well-being by age and between men and women neurologists we found and those from studies of other physicians suggest that efforts to prevent or mitigate burnout and promote professional fulfillment will be most effective if they are personalized to reflect the physician's age, career stage, home life, and sex. These challenges need to be addressed at the individual, work unit, organization, and national levels to increase the attractiveness of neurology as a career choice, to ensure the well-being of our current and future neurologist workforce, and, most importantly, to optimize care for patients with neurologic disorders.

Author contributions

Kathrin LaFaver: interpretation of the data, drafting and revising the manuscript for intellectual content. Janis M. Miyasaki: analysis and interpretation of the data, drafting and revising the manuscript for intellectual content. Christopher M. Keran: design of the study, analysis and interpretation of the data, drafting and revising the manuscript for intellectual content. Carol Rheaume: analysis and interpretation of the data, revising the manuscript for intellectual content. Lisa Gulya: analysis and interpretation of the data, revising the manuscript for intellectual content. Kerry H. Levin: commenting on manuscript for intellectual content. Elaine C. Jones: commenting on manuscript for intellectual content. Heidi B. Schwarz: commenting on manuscript for intellectual content. Jennifer R. Molano: commenting on manuscript for intellectual content. Amy Hessler: commenting on manuscript for intellectual content. Divya Singhal: commenting on manuscript for intellectual content. Tait D. Shanafelt: analysis and interpretation of the data, commenting on manuscript for intellectual content. Jeff A. Sloan: analysis and interpretation of the data, commenting on manuscript for intellectual content. Paul J. Novotny: analysis and interpretation of the data, commenting on manuscript for intellectual content. Terrence L. Cascino: conceptualization of the study, commenting on manuscript for intellectual content. Neil A. Busis: design of the study, interpretation of the data, drafting and revising the manuscript for intellectual content.

Acknowledgment

The authors thank the AAN Burnout Task Force and the AAN Gender Disparity Task Force for discussing the study results and implications.

Study funding

Study funded by the American Academy of Neurology.

Disclosure

K. LaFaver receives honoraria from the American Academy of Neurology, consulting fees from Tufts Medical Center and Pfizer, and speaker's bureau fees from TEVA. J. Miyasaki receives grants through PCORI and Parkinson Alberta and is a member of the American Academy of Neurology Board of Directors. C. Keran is an employee of the American Academy of Neurology. C. Rheaume is an employee of the American Academy of Neurology. L. Gulya is an employee of the American Academy of Neurology. K. Levin receives honoraria from the American Academy of Neurology and American Board of Psychiatry and Neurology and royalties from UpToDate and Elsevier. E. Jones is reimbursed for travel expenses for nonindustry, educational lectures for Medical Education Resources, and is a member of the American Academy of Neurology Board of Directors. H. Schwarz is a member of the American Academy of Neurology Board of Directors. J. Molano serves on the *Neurology Now* and *NEJM Journal Watch Neurology* Editorial Advisory Boards. A. Hessler, D. Singhal, T. Shanafelt, J. Sloan, and P. Novotny report no disclosures relevant to the manuscript. T. Cascino is a former President of the American Academy of Neurology. N. Busis receives honoraria for speaking at American Academy of Neurology courses and for serving as Alternate CPT Advisor for American Academy of Neurology and is a former member of the American Academy of Neurology Board of Directors. Go to Neurology.org/N for full disclosures.

Received September 6, 2017. Accepted in final form August 5, 2018.

References

1. Sigsbee B, Bernat JL. Physician burnout: a neurologic crisis. Neurology 2014;83:2302–2306.
2. Center C, Davis M, Detre T, et al. Confronting depression and suicide in physicians: a consensus statement. JAMA 2003;289:3161–3166.
3. Shanafelt TD, Balch CM, Bechamps G, et al. Burnout and medical errors among American surgeons. Ann Surg 2010;251:995–1000.
4. Busis NA. To revitalize neurology we need to address physician burnout. Neurology 2014;83:2202–2203.
5. Shanafelt TD, Mungo M, Schmitgen J, et al. Longitudinal study evaluating the association between physician burnout and changes in professional work effort. Mayo Clin Proc 2016;91:422–431.
6. Busis NA, Shanafelt TD, Keran CM, et al. Burnout, career satisfaction, and well-being among US neurologists in 2016. Neurology 2017;88:797–808.
7. West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences and solutions. J Intern Med 2018;283:516–529.
8. Shanafelt TD, Balch CM, Bechamps GJ, et al. Burnout and career satisfaction among American surgeons. Ann Surg 2009;250:463–471.
9. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. Arch Intern Med 2012;172:1377–1385.
10. Dyrbye LN, Varkey P, Boone SL, Satele DV, Sloan JA, Shanafelt TD. Physician satisfaction and burnout at different career stages. Mayo Clin Proc 2013;88:1358–1367.
11. Amoafo E, Hanbali N, Patel A, Singh P. What are the significant factors associated with burnout in doctors? Occup Med 2015;65:117–121.
12. Shanafelt TD, Hasan O, Dyrbye LN, et al. Changes in burnout and satisfaction with work-life balance in physicians and the general US working population between 2011 and 2014. Mayo Clin Proc 2015;90:1600–1613.
13. Adesoye T, Mangurian C, Choo EK, et al. Perceived discrimination experienced by physician mothers and desired workplace changes: a cross-sectional survey. JAMA Intern Med 2017;177:1033–1036.
14. Frank E, Brogan D, Schiffman M. Prevalence and correlates of harassment among US women physicians. Arch Intern Med 1998;158:352–358.
15. Dyrbye LN, Sotile W, Boone S, et al. A survey of U.S. physicians and their partners regarding the impact of work-home conflict. J Gen Intern Med 2014;29:155–161.
16. Frank E, McMurray JE, Linzer M, Elon L. Career satisfaction of US women physicians: results from the Women Physicians' Health Study: Society of General Internal Medicine Career Satisfaction Study Group. Arch Intern Med 1999;159:1417–1426.
17. Jolly S, Griffith KA, DeCastro R, Stewart A, Ubel P, Jagsi R. Gender differences in time spent on parenting and domestic responsibilities by high-achieving young physician-researchers. Ann Intern Med 2014;160:344–353.
18. Jena AB, Khullar D, Ho O, Olenski AR, Blumenthal DM. Sex differences in academic rank in US medical schools in 2014. JAMA 2015;314:1149–1158.
19. Desai T, Ali S, Fang X, Thompson W, Jawa P, Vachharajani T. Equal work for unequal pay: the gender reimbursement gap for healthcare providers in the United States. Postgrad Med J 2016;92:571–575.
20. Jena AB, Olenski AR, Blumenthal DM. Sex differences in physician salary in US public medical schools. JAMA Intern Med 2016;176:1294–1304.
21. Maslach C, Jackson S, Leiter M. Maslach Burnout Inventory Manual. 3rd ed. Palo Alto: Consulting Psychologists Press; 1996.
22. Lemkau J, Rafferty J, Gordon R Jr. Burnout and career-choice regret among family practice physicians in early practice. Fam Pract Res J 1994;14:213–222.
23. Shanafelt TD, Gradishar WJ, Kosty M, et al. Burnout and career satisfaction among US oncologists. J Clin Oncol 2014;32:678–686.
24. Spreitzer GM. Psychological empowerment in the workplace: dimensions, measurement, and validation. Acad Manage J 1995;38:1442–1465.
25. Williams ES, Konrad TR, Linzer M, et al. SGIM Career Satisfaction Study Group. Refining the measurement of physician job satisfaction: results from the physician worklife survey. Med Care 1999;37:1140–1154.
26. Shanafelt TD, Dyrbye LN, Sinsky C, et al. Relationship between clerical burden and characteristics of the electronic environment with physician burnout and professional satisfaction. Mayo Clin Proc 2016;91:836–848.
27. Signorino CS, Kirchner A. Using LASSO to Model Interactions and Nonlinearities in Survey Data: Survey Practice [Serial Online]. 2018;11. Available at: surveypractice.scholasticahq.com/article/2716-using-lasso-to-model-interactions-and-non-linearities-in-survey-data. Accessed July 17, 2018.

28. Hosmer D, Lemeshow S, Sturdivant R. Applied Logistic Regression. 3rd ed. Hoboken: John Wiley & Sons; 2013.
29. Miyasaki JM, Rheaume C, Gulya L, et al. Qualitative study of burnout, career satisfaction, and well-being among US neurologists in 2016. Neurology 2017;89:1730–1738.
30. Bernat JL. Challenges to ethics and professionalism facing the contemporary neurologist. Neurology 2014;83:1285–1293.
31. McDermott M, Gelb DJ, Wilson K, et al. Sex differences in academic rank and publication rate at top-ranked US neurology programs. JAMA Neurol Epub 2018 Apr 2.
32. More women than men enrolled in U.S. medical schools in 2017. In: Association of American Medical Colleges [online]. Available at: news.aamc.org/press-releases/article/applicant-enrollment-2017/. Accessed July 17, 2018.
33. Bowles HR, Babcock L, Lai L. Social incentives for gender differences in the propensity to initiate negotiations: sometimes it does hurt to ask. Organ Behav Hum Decis Process 2007;103:84–103.
34. Leiter MP, Frank E, Matheson TJ. Demands, values, and burnout: relevance for physicians. Can Fam Physician 2009;55:1224–1225.
35. Hertzberg TK, Rø KI, Vaglum PJ, et al. Work-home interface stress: an important predictor of emotional exhaustion 15 years into a medical career. Ind Health 2016;54:139–148.
36. Ly DP, Seabury SA, Jena AB. Hours worked among US dual physician couples with children, 2000 to 2015. JAMA Intern Med 2017;177:1524–1525.
37. Linzer M, McMurray JE, Visser MR, Oort FJ, Smets E, de Haes HC. Sex differences in physician burnout in the United States and The Netherlands. J Am Med Womens Assoc 2002;57:191–193.
38. Oreskovich MR, Shanafelt T, Dyrbye LN, et al. The prevalence of substance use disorders in American physicians. Am J Addict 2015;24:30–38.
39. Bernat JL. How can neurologists avoid burnout? Neurology 2017;88:726–727.
40. Gleichgerrcht E, Decety J. Empathy in clinical practice: how individual dispositions, gender, and experience moderate empathic concern, burnout, and emotional distress in physicians. PLoS One 2013;8:e61526.
41. Linzer M, Harwood E. Gendered expectations: do they contribute to high burnout among female physicians? J Gen Intern Med 2018;33:963–965.
42. Neurology compensation and productivity report: 2017 report based on 2016 data. In: American Academy of Neurology [online]. Available at: aan.com/tools-and-resources/practicing-neurologists-administrators/benchmarking-data/neurology-compensation-productivity/. Accessed July 17, 2018.
43. Panagioti M, Panagopoulou E, Bower P, et al. Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. JAMA Intern Med 2017;177:195–205.
44. Siedsma M, Emlet L. Physician burnout: can we make a difference together? Crit Care 2015;19:273.
45. Dyrbye LN, Trockel M, Frank E, et al. Development of a research agenda to identify evidence-based strategies to improve physician wellness and reduce burnout. Ann Intern Med 2017;166:743–744.
46. Shanafelt TD, Dyrbye LN, West CP. Addressing physician burnout: the way forward. JAMA 2017;317:901–902.
47. Swensen S, Kabcenell A, Shanafelt T. Physician-organization collaboration reduces physician burnout and promotes engagement: the Mayo Clinic experience. J Healthc Manag 2016;61:105–127.
48. Smith KA, Arlotta P, Watt FM, Initiative on Women in Science and Engineering Working Group, Solomon SL. Seven actionable strategies for advancing women in science, engineering, and medicine. Cell Stem Cell 2015;16:221–224.
49. American Academy of Neurology.Gender disparity task force report. Available at: aan.com/conferences-community/member-engagement/Learn-About-AAN-Committees/committee-and-task-force-documents/gender-disparity-task-force-report/. Accessed July 17, 2018.
50. Fassiotto M, Simard C, Sandborg C, Valantine H, Raymond J. An integrated career coaching and time banking system promoting flexibility, wellness, and success: a pilot program at Stanford University School of Medicine. Acad Med 2018;93:881–887.