ORIGINAL RESEARCH

A survey of burnout and professional satisfaction among United States neurointerventionalists

Kyle M Fargen,[1] Adam S Arthur,[2] Thabele Leslie-Mazwi,[3] Rebecca M Garner,[1] Carol A Aschenbrenner,[4] Stacey Q Wolfe,[1] Sameer A Ansari,[5] Guilherme Dabus,[6] Alejandro Spiotta,[7] Maxim Mokin,[8] Italo Linfante,[9] J Mocco,[10] Joshua A Hirsch[11]

For numbered affiliations see end of article.

Correspondence to
Dr Kyle M Fargen, Neurosurgery, Wake Forest University, Winston-Salem, NC 27109, USA; kfargen@wakehealth.edu

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ABSTRACT

Background The toll of burnout on healthcare is significant and associated with physician depression and medical errors.

Objective To assess the prevalence and risk factors for burnout among neurointerventionalists.

Methods A 39-question online survey containing questions about neurointerventional practice and the Maslach Burnout Inventory-Human Services Survey for medical personnel was distributed to members of major US neurointerventional physician societies.

Results 320 responses were received. Median (interquartile range) composite scores for emotional exhaustion were 25 (16–35), depersonalization 7 (4–12), and personal accomplishment 39 (35–44). 164/293 respondents (56%) met established criteria for burnout. There was no significant relationship between training background, practice setting, call frequency, or presence of a senior partner on burnout prevalence. Multiple logistic regression analysis showed that feeling underappreciated by hospital leadership (OR=3.71; p<0.001) and covering more than one hospital on call (OR=1.96; p=0.01) were strongly associated with burnout. Receiving additional compensation for a call was independently protective against burnout (OR=0.70; p=0.005).

Conclusions This survey of United States neurointerventional physicians demonstrated a self-reported burnout prevalence of 56%, which is similar to the national average among physicians across other specialties. Additional compensation for a call was a significant protective factor against burnout. In addition, feeling underappreciated by departmental or hospital leadership and covering more than one hospital while on call were associated with greater odds of burnout.

INTRODUCTION

Burnout is defined as a triad of emotional exhaustion, depersonalization, and reduced personal accomplishment associated with work.[1] Across a wide spectrum of specialties, more than half of all physicians report professional burnout.[2] Physicians and medical students have significantly higher rates of burnout and depression than the general population.[3]

The toll of burnout on healthcare is significant. For the physician, burnout is associated with depression, substance abuse, and thoughts of suicide. Suicide, for example, is the leading cause of death in male and the second leading cause of death in female medical trainees.[4] For the patient, provider burnout is associated with poor patient care. Major medical errors are strongly correlated with burnout among surgeons[5] and are associated with malpractice lawsuits.[6] Together, these considerations make burnout a subject of great importance for patient safety and care. A number of personal and occupational factors have been correlated with burnout in physicians, but the study of burnout and its relationship to physician well-being is relatively new, with no longitudinal studies reporting, or comparing, burnout rates in prior decades.

Roughly 50% of neurosurgeons and neurologists and >60% of radiologists report burnout,[2] but the prevalence of burnout or risk factors has yet to be studied in neurointerventional (NI) physicians. The high-risk conditions treated, frequent call burden, overnight procedures, and regular interruption of family life suggest that NI physicians may be at high risk of burnout. These risk factors, coupled with the recent reported increase in consultations and procedures for stroke thrombectomy,[7 8] may further exacerbate professional dissatisfaction among NI physicians. Given the recent trends and future projections of higher thrombectomy volumes, the adverse effects of burnout on patient care are likely to increase. Hence, we sought to survey United States NI physicians to understand the prevalence of burnout and identify risk factors for burnout and professional dissatisfaction.

METHODS

Institutional review board approval was obtained before starting the study. An informal committee of six members, representing each of the surveyed societies, was assembled to write the survey. The writing group was tasked with composing a concise survey to explore burnout and profession satisfaction while examining pertinent practice and demographic factors. The survey was designed to have a completion time of approximately 5 min to optimize response rate. The writing group finalized a 39-question SurveyMonkey online survey comprising 17 demographic questions dealing with career and specific aspects of neurointerventional practice. This was followed by the 22-question Maslach Burnout Inventory-Human Services Survey (MBI-HSS) for medical personnel.[1] Rights to use, score, and interpret the MBI-HSS for this study were obtained through Mind Garden, Inc. Committee members of the Society of Neurointerventional

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Surgery (SNIS), Society of Vascular and Interventional Neurology (SVIN), and the American Association of Neurological Surgeons/Congress of Neurological Surgeons combined cerebrovascular section distributed emails to their respective members soliciting survey completion. In addition, a copy of the email was posted on the SNIS Connect website for SNIS members. Communications contained the link to the survey that could be easily accessed with a single click. No compensation was offered to participants. No requests to complete the survey were placed on public social media platforms. All responses were anonymous. SurveyMonkey records the IP address, therefore limiting respondents to a single response. Reminder emails were sent periodically during the study period, which lasted for 4 weeks (November–December 2018).

Sample

The cerebrovascular section has a total of 557 adjunct, active, or senior/lifetime physician members, excluding international members. SNIS has a total of 898 physician members and SVIN has a total of 496 physician members practicing in the United States. A sizeable percentage of these physicians have dual membership in at least two of these societies. The authors, including acting presidents from all three organizations, estimate a potential sample size of approximately 1000 to 1200 NI physicians in the United States.

Maslach Burnout Inventory-Human Services Survey (MBI-HSS)

The MBI-HSS for medical personnel is scored depending on responses to 22 questions in three separate domains, including emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). Each domain accrues a composite score based on frequency of symptoms captured on a seven-point Likert scale (”never’ to ‘everyday’), ranging from 0 to 54 for EE, 0–30 for DP, and 0–48 for PA.

The EE scale ‘assesses feelings of being emotionally overextended and exhausted by one’s work.’[1] The DP scale ‘measures an unfeeling and impersonal response toward recipients of one’s service, care, treatment, or instruction.’[1] Higher scores on both the EE and DP scales correspond with greater degrees of experienced burnout. The PA scale ‘assesses feelings of competence and successful achievement in one’s work with people.’[1] Unlike EE and DP, lower PA scores correlate with greater degrees of experienced burnout. In the design of the MBI-HSS, burnout was defined not as a dichotomous variable (burnout vs no burnout) but instead as a continuous variable with scores ranging from high to low.

For this study, burnout was defined as being present in physician respondents based on the established convention of at least one of the following on the MBI-HSS: (1) a composite EE score of ≥27; and/or (2) a composite DP score of ≥10.[9–13] This convention is the predominant means of establishing burnout based on previously published studies. However, other less common criteria have also been used, most notably a composite EE score of ≥27, DP of ≥10, and/or a composite PA score of ≤32. Burnout was also calculated using these criteria to allow for comparison.

Statistical analysis

All analyses were conducted using R and RStudio. Descriptive statistics were calculated such that mean (SD) was used for normally distributed variables and median (range) for non-parametric data. For all analyses, two-tailed hypothesis testing was used with $p<0.05$ interpreted as statistical significance.

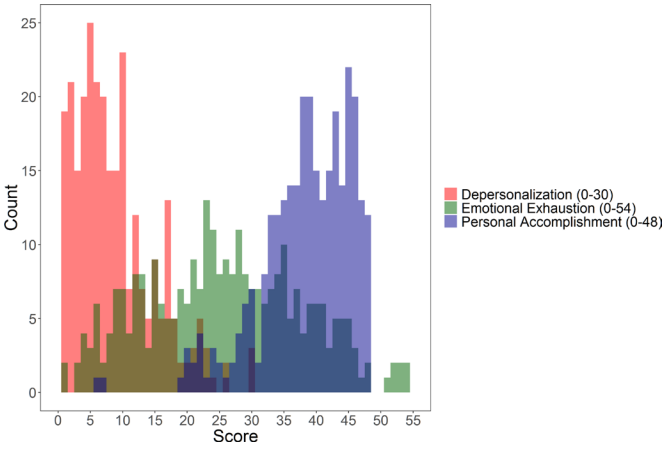

Figure 1 Histogram showing the number of respondents and composite scores for emotional exhaustion, depersonalization, and personal accomplishment.

Relationships between respondent characteristics and burnout classification were assessed via Pearson correlation, Kendall’s τ rank correlation, or X^2 test of homogeneity depending on the types of variables examined (nominal, ordinal, and/or dichotomous).

Multiple logistic regression analysis was performed to investigate predictors of burnout. Variable selection was performed using a stepwise procedure with model fit assessed by Akaike's Information Criteria. The residual series were examined to determine model fit and evidence of misestimating among predictor variables. Multicollinearity was examined among predictors through examination of bivariate correlations.

RESULTS

Burnout

A total of 320 individual survey responses were obtained for a response rate of 27–32% based on estimates of NI physician sample size. Of these, 293 (92%) had no missing responses to the MBI-HSS questions and EE and DP composite scores could therefore be tabulated to identify individuals meeting criteria for burnout. Median (IQR) composite scores for EE, DP, and PA were 25 (16–35), 7 (4–12), and 39 (35– 44), respectively (figures 1 and 2).

High scores in EE (≥27) were calculated for 137 of 293 respondents (47%). High scores in DP (≥10) were present in 107 of 297 respondents (36%). Low scores in PA (≤32) were present in 48 of 296 respondents (16%). At least one abnormal score, including a high score in EE, a high score in DP, or a low score in PA, was present in 174 respondents (60%).

One hundred and sixty-four respondents (56%) met criteria for burnout in this study by having a composite EE score of ≥27 and/or a composite DP score of ≥10. Of these, 80 respondents met the criteria for burnout based on both composite EE and DP scores, 57 respondents met the criteria based on EE alone, and 27 respondents met based on DP alone.

Respondent personal and practice characteristics

Respondents' characteristics based on survey questions and prevalence of burnout are shown in table 1. Nearly two-thirds of respondents (211/318; 66.4%) reported having a senior partner who could assist with difficult medical decision-making. Very few respondents (23/318; 7.2%) indicated using locum tenens physicians to help cover NI call. There was no significant

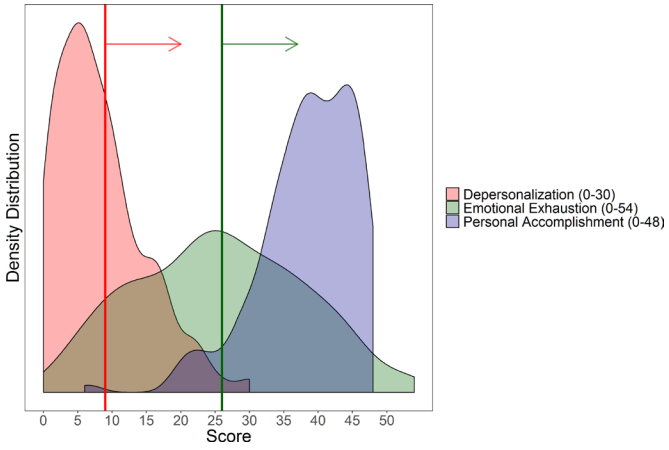

Figure 2 Density distribution of composite scores for emotional exhaustion, depersonalization, and personal accomplishment among respondents. The red and green bars represent the lower threshold for classification of burnout for depersonalization and emotional exhaustion, respectively, with the arrows indicating scores meeting criteria for burnout.

relationship between training background (p=0.80), career stage (p=0.91), NI call frequency (p=0.45), or presence of a senior partner (p=0.99) on burnout prevalence. Practice setting and number of hospitals covered did not achieve significance but did show marginal associations (p=0.11 and p=0.12, respectively).

Table 1 Personal and practice characteristics of respondents

Variable (number of respondents)	Number of respondents (% of total)	Percent reporting burnout*
Training background (n=321)		
Radiology	145 (45.2)	57
Neurology	60 (18.7)	52
Neurosurgery	115 (36.1)	57
Practice setting (n=319)		
Academic with residents/fellows	157 (49.2)	50
Academic without residents/fellows	53 (16.6)	67
Private	109 (34.2)	58
Years of independent practice (n=320)		
Less than 5 years	81 (25.3)	55
5–9 years	75 (23.4)	54
10–19 years	100 (31.3)	59
More than 20 years	64 (20.0)	56
NI call frequency (n=317)		
Every day	38 (12.0)	51
Every other day	120 (37.9)	54
Every third day	86 (27.1)	61
Every fourth day	46 (14.5)	61
Every fifth day or less	27 (8.5)	50
Number of hospitals covered on call (n=319)		
One	183 (57.4)	50
Two	57 (17.9)	67
Three	32 (10.0)	66
Four or more	47 (14.7)	59

*Based on 293 responses with complete Maslach Burnout Inventory-Human Services Survey data.

Table 2 Additional payment for neurointerventionalist call

Additional compensation per 24-hour period	Number of respondents (% of total)	Percent reporting burnout*
No compensation	172 (54.1)	60
Compensated	146 (45.9)	51
<$1000	71 (22.3)	64
$1000–1999	48 (15.1)	40
$2000–2999	23 (7.2)	43
$3000–3999	2 (0.6)	0
$4000 or more	2 (0.6)	0

*Based on 293 responses with complete Maslach Burnout Inventory-Human Services Survey data.

Professional satisfaction

On a scale of 1–10 (very unhappy to very happy), respondents rated the median (IQR) of overall general life happiness as 8 (7–9), with respondents classified in the burnout category having a median of 7 (6–8) and non-burnout category 9 (8–9). On a similar scale, respondents rated happiness in career choice as a median (IQR) of 8 (7–10), with respondents classified in the burnout group having 8 (6–9) and non-burnout category 9 (8–10). On a scale of 1 (not affected) to 10 (highly affected), respondents indicated the degree to which work duties affect personal/family lives as median (IQR) of 7 (5–9), with respondents classified in the burnout category having 8 (7–9) and non-burnout category 6 (4–8). Nearly two-thirds of respondents (208/319; 65.2%) reported feeling underappreciated by hospital or departmental leadership. Finally, 119 of 293 respondents (40.6%) indicated that they had strongly considered quitting their NI career in the past 5 years. There were significant relationships between general life happiness, happiness in career choice, degree in which work duties affect person/family life, feeling underappreciated, and consideration of quitting on burnout prevalence (p<0.001 for all).

Compensation

Nearly two-thirds of respondents (208/319; 65.2%) reported that they believed they were inadequately compensated for the work they perform. Nearly half of respondents (146/318; 45.9%) reported receiving additional financial payment for each 24 hours NI call performed (table 2). Any additional compensation for call was reported by 36.4% and 43.3% of academic physicians (with resident/fellow assistance and without, respectively), and 60.6% of private physicians (figure 3). There was an inverse correlation between burnout and additional call payment (p=0.04).

Influence of workload on burnout

Respondents were asked to report separately their expected number of mechanical thrombectomy (MT), ruptured and unruptured aneurysm treatment procedures during the next year based on the number of each performed during the past 6 months (stratified as ≤5, 6–15, 16–29, 30–49, or ≥50). The most frequent responses were ≥50 or more MT procedures (104/319; 32.6%), 16–29 unruptured aneurysm treatments (102/318; 32.1%), and 6–15 ruptured aneurysm treatments (121/316; 38.3%). There was no association between burnout

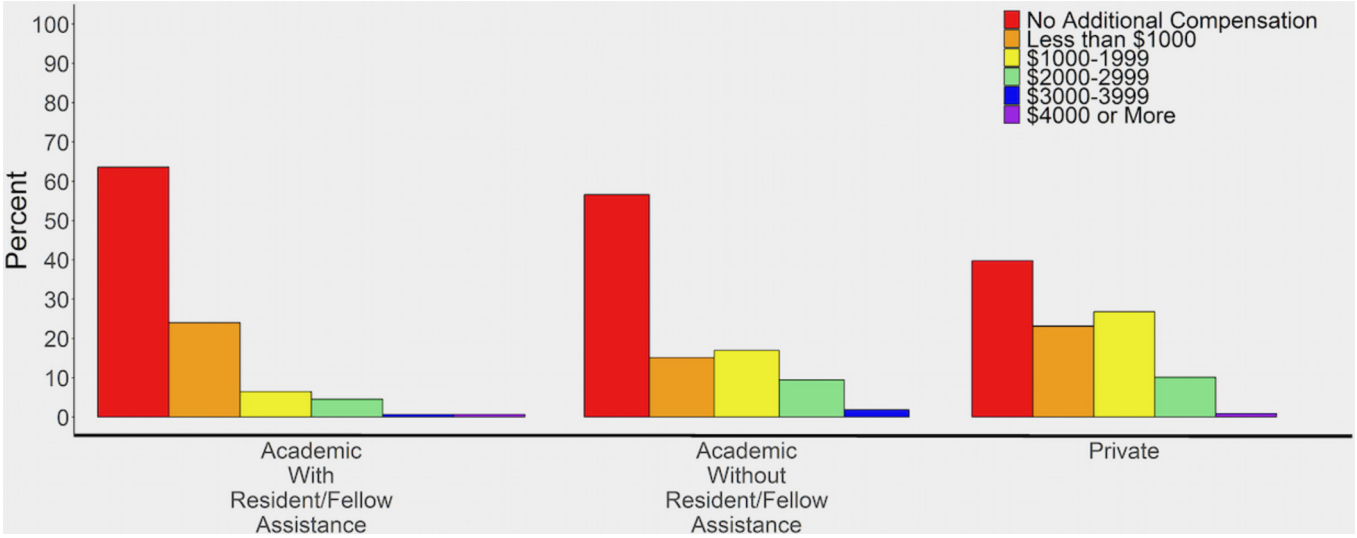

Figure 3 Percentage of respondents receiving additional compensation for call based on practice setting.

and the number of expected procedures for MT (p=0.96), ruptured (p=0.72), or unruptured aneurysms (p=0.26).

Predictors of burnout

A multiple logistic regression analysis was performed to investigate predictors of burnout (table 3). The final model included responses to the following questions as predictors: number of hospitals covered (dichotomized into 1 vs >1), current practice setting, feeling underappreciated by hospital or departmental leadership, and additional payment for call.

DISCUSSION

This survey of United States NI physicians received 320 responses, representing one-third of those actively practicing. The self-reported burnout prevalence of 56% using the MBI-HSS is similar to the national average among all physicians across specialties and is consistent with previous studies of neurologists, neurosurgeons, and radiologists (50–60% burnout).[2] Just over 40% of respondents indicated that they had strongly considered quitting the NI specialty within the past 5 years. Career stage, training background, call frequency, and procedural volumes had little influence on self-reported burnout. Additional compensation for a call was a protective factor; with each increasing amount of compensation for NI call, burnout decreased by an odds of 0.70. However, feeling underappreciated by departmental or hospital leadership and covering more than one hospital while on call were associated with greater odds of burnout.

Burnout has been extensively studied in many specialties. Published studies have shown an association between years practicing and decreased levels of burnout in the fields of otolaryngology, interventional gastroenterology, general surgery, surgical oncology, pediatric oncology, and obstetrics and gynecology.[14–20] Dyrbye *et al* found that middle-career physicians were more likely to be burned out than early- or late-career physicians.[21] Multiple studies have found an association between increasing calls and higher levels of burnout in various specialties,[14 15 22–25] although not consistently.[17 26] We did not identify any published studies evaluating the association between burnout and compensation for call or number of hospitals covered. Importantly, burnout has been linked to medical errors and lawsuits. One study of surgeons revealed that each one-point increase in DP and EE scores was associated with an 11% and 5% increase in reporting a medical error, respectively.[5] A second study demonstrated a highly statistically significant 1.4 times greater odds of self-reported burnout in surgeons involved in a malpractice lawsuit during the past 2 years compared with those physicians who were not.[6]

Burnout in NI physicians appears to be correlated with personal well-being and home-related factors. As expected, decreasing happiness with life and career choice correlated strongly with burnout. Previous studies of physicians in other specialties have suggested that work–home conflicts are associated with a greater than double risk of burnout.[27] Physicians with children younger than 21 years and those with non-physician healthcare professionals as a spouse are at higher risk.[27] In this study, work–home conflicts significantly correlated with burnout, with increases in burnout as the degree to which work duties affected personal/family lives increased.

Stroke thrombectomy consultation and procedural volumes have been increasing.[7 8] Emergent stroke call has been identified as a significant factor in physician burnout among stroke neurologists.[28] Nearly half of NI respondents (49.9%) reported being on call either every day or every other day. Despite the expected effect of this call frequency on sleep, elective case schedules, work–home conflicts, and personal emotional and physical exhaustion, this study shows no association between frequency of stroke call or number of expected procedures on burnout prevalence.

Nearly half (43%) of respondents cover two or more hospitals while on call. In contrast to call frequency, covering more than one hospital while on call was associated with nearly double

Table 3 Independent predictors of burnout

Multiple logistic regression outcome: burnout classification	Regression coefficient	P value	OR (95% CI)
Feel underappreciated	1.31	<0.001	3.71 (2.21 to 6.34)
Additional payment for call	–0.36	0.005	0.70 (0.54 to 0.90)
Hospitals covered (reference of 1 vs >1)	0.67	0.01	1.96 (1.17 to 3.32)
Current practice setting	0.53–0.66	>0.05	NS*

*Not significant.

the odds of burnout in this study; this relationship has not been examined in studies of other specialties. Logically, covering more than one hospital during a given call period may increase the stress and depersonalization associated with call. The reasons for this may include the potential for concomitant emergencies in different facilities, longer commute times while upholding treatment time metrics, balancing varying logistics and expectations of multiple call teams and/or staff, accessing different electronic medical records/imaging software, and suboptimal follow-up and feedback due to distribution of resources.

Two-thirds of NI physicians report feeling financially inadequately compensated. Despite the association of burnout with feeling underappreciated, most NI respondents scored highly in the PA components of the MBI-HSS. Whether this sense of personal accomplishment may play a protective role in burnout is uncertain. Poor compensation or compensation determined entirely based on billing has previously been linked to higher rates of professional dissatisfaction and burnout.[29 30] Additional compensation for a call was reported by nearly half of respondents (46%) and was identified as a strong protective factor against burnout. Burnout prevalence was <40% in the nearly one-quarter of respondents (24%) who reported receiving at least $1000 additional payment for each 24-hour call period. With each increase in call pay stratification, a 0.36 odds reduction in burnout risk was seen.

These data provide insights into burnout for NI physicians and may indicate opportunities to reduce it. The powerful protective effect of compensation suggests that additional compensation for NI call, or changes in reimbursement (eg, increased reimbursement values for emergent thrombectomy for stroke) may be one highly effective method of reducing burnout. Models that involve covering multiple hospitals, despite the advantages these may offer, should be entered into with caution by NI practitioners and possibly even discouraged by our professional societies, given the effect this has on burnout rates. Finally, there is an increasing awareness of the importance of wellness and mindfulness in practice, and the balance of work and the demands of personal and family life. Topics are included now in professional society meetings, opportunities are being offered by practices and institutions (yoga classes, didactic lectures, etc), and studies, such as this one, are being performed and published. Although this trend is encouraging it remains very much in its infancy and requires support and growth. Our data suggest that providing NI physicians with better tools to maintain a healthy work–life balance would be a further method of reducing burnout in NI physicians. Greater understanding of the phenomenon of burnout in our specialty will help to refine and expand these options further.

This study has several important limitations. As a survey study, it is subject to the inherent limitations of survey methodology, including recall and selection bias. There is a potential for both survivorship bias (those most burned out having already left the specialty) and selection bias (those most burned out more likely to complete the survey owing to its relevance). Importantly, physician burnout has been established as a binary entity (burnt out vs no burnout) and defined by scores in two of the three domains on the validated MBI-HSS by convention in the medical literature. Clearly, however, professional dissatisfaction and feelings of burnout lie on a wide spectrum. Therefore the simple classification by which burnout is defined is subject to error and misinterpretation, and does not take into account personal accomplishment and resilience. Finally, the scope for demographic questions was limited owing to the length of the MBI-HSS and the need to keep the survey completion time brief. A number of potentially important demographic or practice-specific questions, such as gender or region, were not included in order to keep the time short. The demographic questions used were not previously validated and were designed specifically for the NI physician population, which may limit their generalizability to other specialties and may make comparison with data from other surveys less valid.

CONCLUSIONS

This survey of United States neurointerventional physicians demonstrated a self-reported burnout prevalence of 56%, which is similar to the national average among physicians across other specialties. Additional compensation for call was a significant protective factor against burnout. In addition, covering more than one hospital while on call was associated with a greater odds of burnout. Taking these findings into into account in future NI professional considerations may help to reduce burnout in neurointerventionalists, with benefit for both physicians and patients.

Author affiliations
[1]Neurosurgery, Wake Forest School of Medicine, Winston Salem, North Carolina, USA
[2]UT Department of Neurosurgery/Semmes-Murphey Clinic, Memphis, Tennessee, USA
[3]Neurosurgery, Massachusetts General Hospital, Boston, Massachusetts, USA
[4]Biostatistics, Wake Forest University School of Medicine, Winston-Salem, North Carolina, USA
[5]Radiology, Neurology, and Neurological Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA
[6]Interventional Neuroradiology and Neuroendovascular Surgery, Miami Cardiac & Vascular Institute and Baptist Neuroscience Center, Miami, Florida, USA
[7]Neurosciences, Medical University of South Carolina, Charleston, South Carolina, USA
[8]Neurosurgery, University of South Florida, Tampa, Florida, USA
[9]Baptist Cardiac and Vascular Institute, Miami, Florida, USA
[10]The Mount Sinai Health System, New York, New York, USA
[11]Interventional Neuroradiology, Massachusetts General Hospital, Boston, Massachusetts, USA

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