Avoiding Burnout

The Personal Health Habits and Wellness Practices of US Surgeons

Tait D. Shanafelt, MD, Michael R. Oreskovich, MD,† Lotte N. Dyrbye, MD,* Daniel V. Satele,‡ John B. Hanks, MD,§ Jeff A. Sloan, PhD,‡ and Charles M. Balch, MD¶*

Objective: To evaluate the health habits, routine medical care practices, and personal wellness strategies of American surgeons and explore associations with burnout and quality of life (QOL).

Background: Burnout and low mental QOL are common among US surgeons and seem to adversely affect quality of care, job satisfaction, career longevity, and risk of suicide. The self-care strategies and personal wellness promotion practices used by surgeons to deal with the stress of practice are not well explored.

Methods: Members of the American College of Surgeons were sent an anonymous, cross-sectional survey in October 2010. The survey included self-assessment of health habits, routine medical care practices, and personal wellness strategies and standardized assessments of burnout and QOL.

Results: Of 7197 participating surgeons, 3911 (55.0%) participated in aerobic exercise and 2611 (36.3%) in muscle strengthening activities, in a pattern consistent with the Centers for Disease Control and Prevention recommendations. The overall and physical QOL scores were superior for surgeons' following the Centers for Disease Control and Prevention recommendations (all $P < 0.0001$). A total of 3311 (46.2%) participating surgeons had seen their primary care provider in the last 12 months. Surgeons who had seen their primary care provider in the last 12 months were more likely to be up to date with all age-appropriate health care screening and had superior overall and physical QOL scores (all $P < 0.0001$). Ratings of the importance of 16 personal wellness promotion strategies differed for surgeons without burnout (all $P < 0.0001$). On multivariate analysis, surgeons placing greater emphasis on finding meaning in work, focusing on what is important in life, maintaining a positive outlook, and embracing a philosophy that stresses work/life balance were less likely to be burned out (all $P < 0.0001$). Although many factors associated with lower risk of burnout were also associated with achieving a high overall QOL, notable differences were observed, indicating surgeons' need to employ a broader repertoire of wellness promotion practices if they desire to move beyond neutral and achieve high well-being.

Conclusions: This study identifies specific measures surgeons can take to decrease burnout and improve their personal and professional QOL.

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Maintaining a surgeon workforce adequate to meet societal needs requires that both an adequate number of surgeons be trained and premature exit from practice be prevented. Although evidence suggests that physicians have healthier lifestyles and lower mortality than the general public,[1,2] a 25-year single-institution cohort study suggested that 50% of US surgeons experience a major health issue by the age of 50 years and that the length of a surgeon's career may be influenced by personal health issues, exercise and preventive health patterns, and alcohol use/dependency.[3] Other data suggest that physicians' personal health habits (eg, alcohol use, tobacco use, exercise habits) and whether or not they are themselves up to date with recommended health screening may affect the medical care they provide to their own patients.[4–7] Despite these facts underscoring the importance of attention to surgeons' personal health practices, little is known about the health habits and routine medical care practices of US surgeons.

In addition to the importance of maintaining their physical health, surgeons face significant challenges due to practice-related stress. Studies suggest that burnout, depression, and a low mental quality of life (QOL) are common among US surgeons.[8–10] Further evidence indicates that surgeon burnout may affect quality of care,[11] job satisfaction,[8] intent-to-leave practice,[12] and increase the risk of suicidal ideation among surgeons.[13] Although some of the causes of burnout have been delineated,[8,14–16] the self-care strategies and personal wellness promotion practices used by surgeons to deal with the stress of practice are not well explored.

In this study, commissioned by the American College of Surgeons (ACS) Committee on Physician Competency and Health, we evaluated the personal health habits, routine medical care practices, and personal wellness strategies of US surgeons and explored associations with surgeon burnout and QOL.

METHODS

Participants

Study eligibility and survey administration process were identical to our 2008 ACS study.[8] All surgeons who were members of the ACS, had an e-mail address on file with the college, and permitted their e-mail to be used for correspondence with the college were eligible for participation in the 2010 study. Participation was elective and all responses were anonymous. The ACS Governor's Committee on Physician Competency and Health commissioned the study and institutional review board oversight for protection of human subjects was provided by the Mayo Clinic institutional review board.

Data Collection

Surgeons were surveyed electronically in October 2010. A cover letter stated that the purpose of the survey was to better understand the factors that contribute to satisfaction among surgeons. Participants were not informed of any specific hypothesis of the study. The survey included approximately 70 questions about a wide range of characteristics, including demographic information, practice characteristics, burnout, mental and physical QOL, symptoms of depression, and career satisfaction. Up to 3 follow-up e-mail messages reminded surgeons to complete the survey.

Exercise and Personal Health Habits

To evaluate surgeons' aerobic exercise activities and muscle strengthening activities relative to the Centers for Disease Control and

From the *Department of Medicine, Mayo Clinic, Rochester, MN; †Department of Psychiatry, University of Washington, Seattle, WA; ‡Department of Health Sciences Research, Mayo Clinic, Rochester, MN; §Department of Surgery, University of Virginia, Charlottesville, VA; and ¶Department of Surgery, University of Texas Southwestern Medical Center, Dallas, TX.

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Reprints: Tait Shanafelt, MD, Department of Medicine, Mayo Clinic, 200 First Street, Rochester, MN 55905. E-mail: shanafelt.tait@mayo.edu.

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Prevention (CDC) guidelines,[17] surgeons were asked to indicate (i) the number of minutes per week they engaged in moderate-intensity exercise (eg, brisk walking, riding bike on level ground, pushing lawn mower, water aerobics), (ii) the number of minutes per week they engaged in vigorous-intensity exercise (eg, jogging or running, riding bike on hills, swimming laps, playing basketball), and (iii) the number of times they engaged in muscle-strength training that worked all major muscle groups (legs, hips, back, abdomen, chest, shoulders, arms). The CDC recommends that adults participate in at least 150 minutes per week of moderate-intensity exercise, at least 75 minutes per week vigorous-intensity exercise, or an equivalent mix of moderate- and vigorous-intensity exercise (each minute of vigorous intense exercise equivalent to approximately 2 minutes of moderately intense exercise).[17] In addition, the CDC recommends that adults engage in muscle strengthening activities that work all major muscle groups at least 2 times per week.[17]

Routine Medical Care and Health Screening Practices

Assessment of age-appropriate health screening (ie, cholesterol assessment, colon cancer screening, prostate cancer screening [men], Papanicolaou test screening [women], and mammography [women]) were based on the US Preventative Services Task Force (USPSTF) recommendations[18] and were similar to the approaches used in previously published studies of physicians.[2–4,19] Physicians were also asked whether they currently had a primary care provider, when they had last seen a primary care provider, and when they had last seen a dentist, using an approach similar to previous surveys.[20]

Personal Wellness Promotion Strategies

In addition to evaluating exercise and medical care/health screening habits, we also assessed surgeons' use of personal wellness strategies to deal with stress of medical practice. Surgeons were asked to rate the importance of 16 specific wellness strategies reported in previous studies of physicians.[21–26] The strategies in these questions explored aspects of self-care, relationships, work attitudes, religious/spiritual practice, personal philosophies, mindfulness (eg, contemplative practices, reflecting writing), and approaches to promote work-life balance integration. Surgeons were asked to rate the personal importance of each strategy with response options of "not important to me," "minimally important," "moderately important," or "essential." In addition to evaluating responses on this ordinal scale, answers were also transformed to a numeric score (*not important to me* = 0, *minimally important* = 1, *moderately important* = 2, *essential* = 3) to allow a mean/median ratings and rank across all responders.

Burnout and QOL

Standardized survey tools were used to assess burnout,[27] physical QOL and overall QOL.[28–30] Although the 22-item Maslach Burnout Inventory (MBI) is the gold standard for the assessment of burnout,[27] its length (22 items) limits feasibility for use in long surveys addressing multiple content areas. Because many burnout studies have focused on the presence of high levels of either emotional exhaustion or depersonalization as the foundation of burnout among physicians,[31–33] symptoms of burnout in this study were assessed using 2 single-item measures adapted from the full MBI. Emotional exhaustion was assessed by asking responders to rate how often they felt burned out from their work. Depersonalization was assessed by asking responders to rate how often they felt they had become more callous toward people since they took their current job. Each question was answered on a 7-point Likert scale, with response options ranging from "never" to "daily." Symptoms of high emotional exhaustion were defined by a frequency of feeling burned out from work of at least once a week and symptoms of high depersonalization were defined by a frequency of feeling more callous toward people of at least once a week. These single items have been shown to correlate strongly with the emotional exhaustion and depersonalization domains of burnout as measured by the full MBI in a sample of more than 10,000 medical students, residents, and practicing physicians.[34] The area under the receiver operating characteristic curve for the emotional exhaustion and depersonalization single items relative to that of their respective full MBI domain score in previous studies were 0.94 and 0.93 and the positive predictive values of the single-item thresholds for high levels of emotional exhaustion and depersonalization were 88.2% and 89.6%, respectively.[34]

QOL in a variety of domains was measured using single-item linear analog self-assessment items. Linear analog self-assessment instruments are widely used in QOL research[21,35–37] and have been extensively validated. Each QOL domain was assessed on a 0 to 10 scale, with response anchors ranging from "As bad as it can be" (0) to "As good as it can be" (10). Population-based normative data suggest that mean scores on QOL instruments for healthy individuals are generally above 70 when scaled to a 0 to 100 range (eg, $\geq$7 on 0–10 scale).[38,39] Consistent with this approach,[40] we also explored the characteristics of individuals with QOL scores of 8 or higher to explore features associated with achieving a high overall QOL.

Statistical Analysis

Descriptive statistics were used to characterize sample demographics. Comparisons between surgeons' health habits and wellness strategies were tested using Wilcoxon-Mann-Whitney tests and Fisher exact tests. Such comparisons with approximately 5232 and 1925 surgeons reporting in the 2 groups have 95% power to detect an average difference of less than 5% of the standard deviation, a very small effect size.[41,42] Accordingly, the *P* values in this report are not as important as the observed effect sizes. Consistent with the science of QOL assessment,[41] we a priori defined a 0.5 SD in QOL scores as a clinically meaningful effect size.[41,42] The multivariable associations among demographic characteristics, professional characteristics, health habits, and wellness strategies with burnout and career satisfaction were assessed using logistic regression. Both forward and backward elimination methods were used to select significant variables for the models where the directionality of the modeling did not impact the results. All analyses were done using SAS version 9 (SAS Institute Inc, Cary, NC) or R (R Foundation for Statistical Computing, Vienna, Austria; http://www.r-project.org.).

RESULTS

At the time of the survey, there were approximately 65,844 fellows and associate fellows in the ACS of whom 27,457 had an e-mail address on record with the college and permitted use of their e-mail address for correspondence. Of these 27,457, a correct e-mail address could be confirmed on the initial mailing for approximately 91.3% (n = 25,073), and 7197 (28.7%) eventually returned surveys.

Participants

The demographic and practice characteristics of the study participants have been previously reported. Briefly, the median age of responders was 53 years and 6116 (85.4%) were men. Overall, 6527 (90.7%) were married and 6384 (88.9%) had children. Participating surgeons had been in practice a median of 20 years, worked a median of 60 hours per week, and were on call a median of 2 nights per week. General surgery (n = 2737; 38.2%) was the most common subspecialty area, but all surgical specialties were represented. A majority of responders were in private practice (n = 3723), with

lesser numbers working in academic practice (n = 2108), at a veterans' hospital (n = 161), in active military practice (n = 94), or in an "other" practice setting (n = 724). An additional 195 responders (2.8%) were retired or no longer in practice. With respect to burnout, symptoms of emotional exhaustion were reported at least weekly by 1640 (22.9%) surgeons, whereas 1053 (14.9%) reported symptoms of depersonalization at least weekly. On the 0 to 10 Likert scale, the mean overall QOL score was 7.3 (SD: 1.74), whereas the mean physical QOL score was 6.9 (SD: 2.02) (population-based normative data suggest that mean scores for healthy individuals are ≥7).[38,39]

Tobacco Use, Caffeine Use, and Exercise Habits

The caffeine, tobacco, and exercise habits of participating surgeons are shown in Table 1. Only 1127 (15.8%) surgeons reported any tobacco use in the last year, with 202 (2.8%) reporting daily use. In contrast, 6739 (94.1%) surgeons reported using caffeine in the last year, with 5367 (74.9%) reporting daily use.

Surgeons reported a median of 61 to 120 minutes of moderate-intensity exercise (eg, brisk walking, riding bike on level ground, pushing lawn mower, water aerobics) per week and a median of 31 to 45 minutes of vigorous-intensity exercise per week (eg, jogging or running, riding bike on hills, swimming laps, playing basketball). Overall, the aerobic exercise activity of 3911 (55.0%) surgeons was consistent with the CDC recommendations. Surgeons engaged in muscle strengthening activities working all major muscle groups a median of 1 time per week, and 2611 (36.3%) surgeons engaged in muscle strengthening activity consistent with the CDC recommendations (eg, ≥2 times per week).

The mean overall (7.6 vs 7.1; $P < 0.0001$) and physical (7.5 vs 6.1; $P < 0.0001$) QOL scores were superior for surgeons whose aerobic exercise activity was consistent with the CDC recommendations compared with those who exercised less than recommended. Similarly, the mean overall (7.6 vs 7.2; $P < 0.0001$) and physical (7.6 vs 6.5; $P < 0.0001$) QOL scores of surgeons who engaged in muscle strengthening activities consistent with the CDC recommendations were superior to those who did not follow the CDC recommendations. Rates of burnout were also lower among surgeons whose exercise habits were consistent with the CDC aerobic exercise (24.7% [963/3898] vs 29.5% [944/3197]; $P < 0.0001$) and muscle strength training (24.6% [637/2593] vs 28.2% [1280/4542]; $P = 0.0009$) recommendations.

Routine Medical Care and Health Screening Practices

The routine medical care and health screening practices of participating surgeons are shown in Table 2. Approximately two-thirds of surgeons (n = 4978; 69.8%) reported currently having a primary care provider, and 3311 (46.2%) had seen their primary care provider in the last 12 months. Surgeons were approximately twice as likely to have seen a dentist in the last 12 months as a primary care provider (77.7% vs 46.2%). The mean physical (7.06 vs 6.75; $P < 0.0001$) and overall (7.58 vs 7.23; $P < 0.0001$) QOL scores of surgeons who had seen a primary care provider in the last 12 months were superior to those who had not. Rates of burnout were also lower among surgeons who had seen a primary care provider in the last 12 months (23.7% [780/3295] vs 29.7% [1142/3845]; $P < 0.0001$).

With respect to those surgeons eligible for health screening studies recommended by the USPSTF, 6160 (88.7%) had undergone cholesterol evaluation in the last 5 years and 3768 (78.6%) had completed age-appropriate screening for colon cancer. Among female surgeons, 847 (84.5%) had undergone cervical cancer screening (eg, Papanicolaou test) in the last 3 years and 675 of the 789 (85.6%) eligible for breast cancer screening had undergone mammography

TABLE 1. Tobacco Use, Caffeine Use, and Exercise Habits of US Surgeons

	N (%)
Tobacco use	
Missing, n	42
Never	6028 (84.3)
Few times a year or less	528 (7.4)
Once a month or less	108 (1.5)
Few times a month	111 (1.6)
Once a week	53 (0.7)
Few times a week	125 (1.8)
Daily	202 (2.8)
Caffeine use	
Missing, n	34
Never	424 (5.9)
Few times a year or less	239 (3.3)
Once a month or less	134 (1.9)
Few times a month	220 (3.1)
Once a week	100 (1.4)
Few times a week	679 (9.5)
Daily	5367 (74.9)
Exercise habits	
Minutes of moderately intense aerobic exercise per week*†	
Missing, n	44
≤30 min	1773 (24.8)
31–60 min	1660 (23.2)
61–120 min	1702 (23.8)
121–150 min	746 (10.4)
>150 min	1272 (17.8)
Minutes of vigorous aerobic exercise per week†‡	
Missing, n	80
<30 min	3387 (47.6)
31–45 min	567 (8)
46–60 min	594 (8.3)
61–75 min	463 (6.5)
76–90 min	378 (5.3)
>90 min	1728 (24.3)
Surgeons compliant with CDC aerobic exercise recommendations§	3911 (55.0)
Episodes of muscle-strength training per week†	
Missing, n	33
None	3267 (45.6)
1	1286 (18)
2	1265 (17.7)
3	900 (12.6)
≥4	446 (6.2)
Surgeons compliant with CDC muscle-strength training recommendations¶	2611 (36.5)

*The CDC recommends 150 minutes per week. Moderately intense exercise: brisk walking, riding bike on level ground, pushing lawn mower, water aerobics, etc.

†CDC recommendations.[17]

‡CDC recommends ≥75 minutes per week. Vigorous intense exercise: jogging or running, riding bike on hills, swimming laps, playing basketball, etc.

§At the time of the survey, the CDC recommended that adults participate in ≥150 minutes per week of moderately intense exercise, ≥75 minutes per week vigorous intense exercise, or an equivalent mix of moderately intense and vigorous intense exercise (each minute of vigorous intense exercise equivalent to approximately 2 minutes of moderately intense exercise).

¶CDC recommendations are at least 2 times per week. Guidelines (and the question asked of surgeons) specified muscle strength training work all major muscle groups: legs, hips, back, abdomen, chest, shoulders, arms.

TABLE 2. Routine Medical Care and Health Screen Practice of US Surgeons

	n (%)
Routine medical care	
Have a primary care provider	4978 (69.8)
Missing, n	68
Last time saw primary care provider	
Missing, n	26
<1 yr	3311 (46.2)
1–2 yrs	1653 (23.1)
3–4 yrs	730 (10.2)
5 yrs or more	907 (12.6)
Never	570 (7.9)
Last time saw a dentist	
Missing, n	35
<1 yr	5563 (77.7)
1–2 yrs	925 (12.9)
3–4 yrs	329 (4.6)
5 yrs or more	333 (4.6)
Never	12 (0.2)
Health screening	
Last cholesterol check	
Missing, n	62
≤5 yrs	6160 (88.7)
>5 yrs	783 (11.3)
Not indicated, n*	192
Age-appropriate colon cancer screening†	
Missing, n	55
Completed	3768 (78.6)
Indicated but have not had	1027 (21.5)
Not indicated‡	2347
Papanicolaou test (women)	
≤3 yrs	847 (84.5)
>3 yrs	155 (15.5)
Not indicated, n§	46
Mammogram (women)	
Within the last year	504 (63.9)
>1 yr ago but < 2 yrs ago	171 (21.7)
>2 yrs ago	114 (14.4)
Not indicated, n¶	252
Prostate examination (men)‖	
Within the last year	2267 (41.1)
>1 yr ago but <3 yrs ago	1252 (22.7)
>3 yrs ago	915 (16.6)
Never	1085 (19.7)
Prostate-specific antigen (men)‖	
Within the last year	2701 (48.8)
>1 yr ago but <3 yrs ago	974 (17.6)
>3 yrs ago	359 (6.5)
Never	1502 (27.1)

*Men age <35 years; women age <45 years.

†Colonoscopy within the last 10 years or other colon examination (eg, flexible sigmoidoscopy, colon x-ray) within the last 5 years.

‡Age <50 years.

§Prior hysterectomy.

¶Age <40 years; prior bilateral mastectomy.

‖Only assessed for men age ≥40 years; the USPSTF deems that there is "insufficient evidence to assess the balance of benefits and harms of screening for prostate cancer" and that patients should understand this uncertainty before being screening.

in the last 2 years. Among men older than 40 years, 2267 (41.1%) had undergone digital rectal examination in the last year, and 3519 (63.8%) had undergone digital rectal examination within the last 3 years. Similarly, 2701 (48.8%) had undergone prostate-specific antigen screening in the last year, and 3675 (66.4%) had prostate-specific antigen screening within the last 3 years. It should be noted that the USPSTF deems that there is "insufficient evidence to assess the balance of benefits and harms of screening for prostate cancer" and that patients should understand this uncertainty before screening. Accordingly, some (~15.0%) of surgeons older than 40 years who had never undergone either digital rectal examination or prostate-specific antigen screening may have chosen to forgo screening out of a conscious decision rather than due to complacency.

Next, we assessed what proportion of surgeons was up to date with all age- and sex-appropriate health care screening guidelines (eg, for women: cholesterol assessment, Papanicolaou test, age-appropriate mammography, age-appropriate colon cancer screening; for men: cholesterol assessment and age-appropriate colon cancer screening). Digital rectal examination and prostate-specific antigen screening were not included in this analysis. Collectively, 749 (71.7%) female surgeons and 4667 (76.8%) male surgeons were up to date with all the age- and sex-appropriate health care screening guidelines assessed. Surgeons who reported having seen their primary care provider in the last 12 months were more likely to be up to date with all age- and sex-appropriate health care screening guidelines (2890/3273 [88.3%] vs 2515/3832 [65.6%]; $P < 0.0001$). The mean overall (7.5 vs 7.1; $P < 0.0001$) and physical (7.0 vs 6.6; $P < 0.0001$) QOL scores of surgeons who were up to date with all age- and sex-appropriate health care screening guidelines were superior to those who were not up to date. Rates of burnout were lower among surgeons who were up to date with all age- and sex-appropriate health care screening guidelines (25.4% [1369/5396] vs 31.4% [534/1700]; $P < 0.0001$).

Personal Wellness Promotion Strategies

The importance of various personal wellness promotion strategies as rated by responding surgeons is shown in Table 3. On the basis of mean score, the highest rated coping strategies were (i) finding meaning in work; (ii) protecting time away form work with spouse, family, and friends; and (iii) focusing on what is most important in life. The lowest rated coping strategies were regular meetings with a psychologist/psychiatrist, reflective writing/journaling, and engaging in contemplative or mindfulness practices (eg, meditation, narrative medicine, appreciative inquiry). The mean ratings of each of the coping strategies were similar for male and female surgeons where no difference in mean rating larger than 0.2 was observed by sex. Associations between personal wellness promotion strategies and burnout are shown in Table 4. All personal wellness promotion strategies were rated more highly among surgeons without burnout, with the exception of regular meetings with a psychologist/psychiatrist to discuss stress and the delayed gratification strategy of "looking forward to retirement," which were rated more highly by burned out surgeons (all $P < 0.0001$).

Multivariate Associations of Self-Care Activities With Burnout

We next explored associations between burnout and high overall QOL and surgeons' self-care activities, including their exercise habits (eg, compliance with CDC aerobic exercise and muscle strength training recommendations), routine medical care practices (saw primary care provider in last year, up to date all age-appropriate health care screening), and personal wellness promotion strategies (dichotomized as those rating each as "essential" vs those rating less than "essential"). Basic demographic characteristics (age, sex, relationship status, children) and professional factors (subspecialty, years in practice, hours worked per week, number of nights on call per week) previously found to be associated with surgeon burnout in our 2008 study were included in the model.[8]

Factors independently associated with burnout on multivariate analysis are shown in Table 5. Sex was the only demographic characteristic associated with burnout (lower risk for men). Professional

TABLE 3. Personal Importance of Wellness Promotion Strategies as Rated by Surgeons

	Not Important to Me (0), n (%)	Minimally Important (1), n (%)	Moderately Important (2), n (%)	Essential (3), n (%)	Mean Score*	Rank
I find meaning in my work	46 (0.7)	347 (4.9)	2196 (30.9)	4521 (63.6)	2.6	1
I protect time away from work with my spouse, family, and friends	108 (1.5)	564 (7.9)	2416 (34.0)	4011 (56.5)	2.5	2
I focus on what is most important to me in life	46 (0.7)	509 (7.2)	3076 (43.4)	3463 (48.8)	2.4	3
I try to take a positive outlook on things	114 (1.6)	771 (10.8)	3113 (43.7)	3128 (43.9)	2.3	4
I take vacations	222 (3.1)	1168 (16.4)	2327 (32.7)	3397 (47.8)	2.3	5 (tie)
I participate in recreation/ hobbies/exercise	167 (2.4)	1076 (15.1)	2637 (37.1)	3233 (45.5)	2.3	5 (tie)
I talk with family, significant other, or friends about how I am feeling	324 (4.6)	1002 (14.1)	2569 (36.1)	3227 (45.3)	2.2	7
I have developed an approach/ philosophy to dealing with patients' suffering and death	298 (4.2)	1019 (14.4)	3306 (46.8)	2448 (34.6)	2.1	8
I incorporate a life philosophy stressing balance in my personal and professional life	468 (6.6)	1488 (21.0)	2904 (41.1)	2214 (31.3)	2.0	9
I look forward to retirement	1130 (16.0)	1877 (26.6)	2065 (29.3)	1986 (28.1)	1.7	10
I discuss stressful aspects of work with colleagues	898 (12.7)	2079 (29.3)	2824 (39.8)	1289 (18.2)	1.6	11
I nurture the religious/spiritual aspects of myself	1495 (20.9)	1936 (27.1)	1900 (26.6)	1817 (25.4)	1.6	12
I am involved in nonpatient care activities (eg, research, education, administration)	1527 (21.4)	1989 (27.9)	2319 (32.6)	1288 (18.1)	1.5	13
I engage in contemplative practices or other mindfulness activities such as meditation, narrative medicine, or appreciative inquire, etc.	4500 (63.5)	1495 (21.1)	742 (10.5)	352 (5.0)	0.6	14
I engage in reflective writing or other journaling technique	4832 (68.6)	1400 (19.88)	546 (7.75)	264 (3.75)	0.5	15
I have regular meetings with a psychologist/psychiatrist to discuss stress	6164 (86.6)	593 (8.33)	222 (3.12)	137 (1.93)	0.2	16

*Scoring: not important to me = 0, minimally important = 1, moderately important = 2, essential = 3.

characteristics associated with a higher risk of burnout included area of specialization (higher risk among urologists and ophthalmologists; lower risk among pediatric surgeons), hours worked per week, and number of nights on call per week. Higher ratings for several personal wellness promotion strategies were associated with a lower risk of burnout after adjusting for other factors including finding meaning in work, taking a positive outlook, incorporating a philosophy of balance between personal and professional life, focusing on what is most important in life, and taking vacations. Higher ratings for several other personal wellness promotion strategies were associated with a higher risk of burnout after adjusting for other factors including engaging in reflective writing/journaling, regular meetings with a psychologist/psychiatrist, nurturing religious/spiritual aspects of self, and discussing stressful aspects of work with colleagues. Surgeons who had seen a primary care provider in the last 12 months were also at lower risk for burnout after adjusting for personal and professional characteristics as well as wellness promotion strategies.

Factors independently associated with achieving a high overall QOL on multivariate analysis are shown in Table 6. Although many of the factors associated with high overall QOL were similar to the factors that seemed to protect against burnout, there were also notable differences. Shared factors included hours worked per week, nights on call per week, and several personal wellness promotion strategies, including finding meaning in work, taking a positive outlook, incorporating a philosophy of balance between personal and professional life, focusing on what is most important in life, and taking vacations. Factors unique to achieving high overall QOL included compliance with CDC aerobic exercise guidelines and higher ratings for several personal wellness promotion strategies including talking with family, significant other, or friends about feelings; protecting time away from work with spouse/family/friends; and participating in recreation/hobbies/exercise. Looking forward to retirement as an essential wellness strategy (a strategy of delayed gratification[43]) was associated with a lower likelihood of achieving high overall QOL.

DISCUSSION

Although recent studies have provided substantial insights into surgeon distress, little is known about the personal health habits, routine medical care practices, or personal wellness strategies that may promote surgeon well-being. We are the first to simultaneously evaluate the exercise habits, medical care/health screening practices, and personal wellness strategies of a large sample of US surgeons. Although many previous studies have explored whether physicians' behaviors and health screening practices are consistent with

TABLE 4. Burnout and Wellness Promotion Strategies

	Burned Out* N = 1925	No Burnout* N = 5232	*P*
I find meaning in my work.	2.3	2.7	<0.0001
I protect time away from work with my spouse, family, and friends.	2.4	2.5	<0.0001
I focus on what is most important to me in life.	2.2	2.5	<0.0001
I try to take a positive outlook on things.	2.0	2.4	<0.0001
I take vacations.	2.1	2.3	<0.0001
I participate in recreation/hobbies/exercise.	2.1	2.3	<0.0001
I talk with family, significant other, or friends about how I am feeling.	2.1	2.3	<0.0001
I have developed an approach/philosophy to dealing with patients' suffering and death.	2.0	2.2	<0.0001
I incorporate a life philosophy stressing balance in my personal and professional life.	1.7	2.1	<0.0001
I look forward to retirement.	2.1	1.5	<0.0001
I discuss stressful aspects of work with colleagues.	1.5	1.7	<0.0001
I nurture the religious/spiritual aspects of myself.	1.4	1.6	<0.0001
I am involved in nonpatient care activities (eg, research, education, administration).	1.2	1.6	<0.0001
I engage in contemplative practices or other mindfulness activities such as meditation, narrative medicine, or appreciative inquire, etc.	0.5	0.6	0.0063
I engage in reflective writing or other journaling technique.	0.4	0.5	0.0006
I have regular meetings with a psychologist/psychiatrist to discuss stress.	0.3	0.2	<0.0001

*Mean rating.

TABLE 5. Factors Independently Associated With Burnout

Independent Factor*	Odds Ratio (95% CI)†	*P*
Male	0.707 (0.588–0.849)	0.0002
Hours worked per week (for each additional hour)	1.018 (1.014–1.023)	<0.0001
Nights on call per week (for each additional night)	1.087 (1.055–1.121)	<0.0001
Specialty‡		
Pediatric surgery	0.607 (0.400–0.921)	0.0190
Urology	1.752 (1.293–2.374)	0.0003
Ophthalmology	1.726 (1.104–2.700)	0.0168
Has seen primary care provider in last 12 months	0.827 (0.726–0.942)	0.0043
Wellness strategies§		
Find meaning in my work	0.445 (0.387–0.512)	<0.0001
Take a positive outlook	0.596 (0.515–0.691)	<0.0001
Incorporate a philosophy of stressing work-life balance	0.633 (0.536–0.748)	<0.0001
Focus on what is most important in life	0.806 (0.697–0.932)	0.0031
Take vacations	0.857 (0.749–0.982)	0.0259
Nurture religious/spiritual aspects of self	1.189 (1.017–1.390)	0.0294
Discuss stressful aspects of work with colleagues	1.319 (1.104–1.575)	0.0023
Regular meetings with psychiatrist	2.244 (1.460–3.449)	0.0002
Engage in reflective writing/journaling	3.865 (3.375–4.425)	<0.0001

*Factors in model: age, sex, relationship status, children, subspecialty, years in practice, hours worked per week, number of nights on call per week, compliant with CDC aerobic exercise recommendations, compliant with CDC muscle strength training recommendations, saw primary care provider in last year, up to date all age-appropriate health care screening, rated importance of each wellness promotion strategy.

†OR > 1 indicate a higher risk of burnout; OR <1 indicate a lower risk of burnout.

‡Compared to general surgery.

§Rate this strategy "essential" as compared to less than essential.

published guidelines and/or relate to how physicians' counsel their patients, to our knowledge, none have explored how these practices relate to physicians' QOL or degree of burnout. The aerobic exercise habits of approximately 50% of US surgeons were consistent with the CDC guidelines; however, only approximately one-third participated in muscle strength training consistent with CDC guidelines. The physical QOL scores of surgeons whose exercise and/or strength training habits were consistent with the CDC recommendations were more than 0.5 SD higher than those who did not follow the guidelines (a clinically significant difference).[41,42] Although approximately 70% of surgeons reported having a primary care provider, less than half had seen their provider in the last 12 months and more than 20% had

TABLE 6. Model of Independent Factors Related to High Overall QOL*

Independent Factors†	Odds Ratio (95% CI)‡	*P*
Married (vs single)	1.736 (1.409–2.139)	<0.0001
Hours worked per week (each additional hour)	0.983 (0.979–0.986)	<0.0001
Nights on call per week (each additional night)	0.924 (0.899–0.950)	<0.0001
Years in practice (each additional year)	1.020 (1.014–1.026)	<0.0001
CDC compliant with aerobic exercise guidelines (vs not)	1.250 (1.104–1.414)	0.0004
Wellness strategies§		
Take a positive outlook on things	1.772 (1.560–2.014)	<0.0001
Incorporate a life philosophy stressing balance	1.578 (1.365–1.823)	<0.0001
Find meaning in work	1.523 (1.339–1.732)	<0.0001
Focus on what is most important in life	1.442 (1.266–1.642)	<0.0001
Take vacations	1.368 (1.201–1.558)	<0.0001
Participate in recreation/hobbies/exercise	1.246 (1.088–1.428)	0.0015
Talk with family/spouse/friends about feelings	1.244 (1.101–1.405)	0.0004
Protect time away from work with spouse/family/friends	1.198 (1.051–1.365)	0.0068
Regular meetings with psychiatrist to discuss stress	0.460 (0.298–0.710)	0.0004
Looking forward to retirement	0.376 (0.329–0.429)	<0.0001

*Overall QOL score ≥8 out of 10 (see methods).

†Factors in model: age, sex, relationship status, children, sub-specialty, years in practice, hours worked per week, # nights on call per week, compliant with CDC aerobic exercise recommendations, compliant with CDC muscle strength training recommendations, saw primary care provider in last year, up to date all age-appropriate health care screening, rated importance of each wellness promotion strategy.

‡OR > 1 indicated a higher likelihood of having high overall QOL; OR < 1 indicate a likelihood of having high overall QOL.

§Rate this strategy "essential" as compared to less than essential.

not seen a primary care provider in the last 4 years. Surgeons who had seen their primary care provider in the last 12 months were more likely to be up to date with all age- and sex-appropriate health screening guidelines and again had higher overall and physical QOL scores. These observations suggest that following the CDC guidelines for aerobic exercise and muscle strength training, seeing a primary care provider regularly, and keeping up to date receiving routine preventive care may be tangible and concrete ways for surgeons to promote both physical and overall QOL. Because 45% to 65% of surgeons either did not follow the CDC guidelines or did not see a primary care provider in the last 12 months, they also identify potentially underutilized strategies for US surgeons explore as part of efforts to improve their QOL.

Another unique aspect of our study is exploration of surgeons' personal wellness promotion strategies. Consistent with previous qualitative studies,[23,24,26] meaning in work, protecting time away from work for relationships, and focusing on what is most important in life were the strategies rated essential by the largest proportion of surgeons. The hierarchical rating of wellness strategies in this large sample of US surgeons was strikingly similar to a similar study of US oncologists[21]; however, oncologists rated "developing an approach/philosophy to dealing with patients' suffering and death" more highly than surgeons (tied with meaning in work as the number one wellness strategy for oncologist as compared with being the eighth rated strategy by surgeons). This observation suggests that although many critical wellness strategies may be shared across specialties, others may have greater importance for physicians in certain disciplines with unique challenges (eg, frequent exposure to death and suffering associated with medical oncology).

It also should be noted that the personal strategies beneficial to one person may not be helpful to another. For example, while one surgeon may find mindfulness-based activities particularly helpful,[25] other surgeons may find greater value in other strategies. The results shown in Table 4 should be viewed as a description of which strategies are viewed as most helpful for a large population of surgeons rather than as a recipe that all surgeons must follow. This description may provide ideas for individual surgeons regarding new strategies of wellness promotion that their colleagues find useful but which they may have personally neglected. In addition, the multivariate analysis exploring which wellness promotion strategies were associated with lower rates of burnout identifies specific strategies that, although not necessarily widely used, may be particularly effective. For example "incorporating a philosophy stressing work-life balance" was reported as an essential wellness promotion strategy by only one third of surgeons but those who used this strategy were approximately 40% less likely to be burned out on multivariate analysis. Five specific wellness promotion strategies were associated with a lower risk of burnout on multivariate analysis. The fact that only 31% to 64% of responding surgeons rated each of these strategies "essential" suggests broader use of these strategies among other surgeons may prove helpful for reducing burnout. Although rating some wellness promotion strategies as "essential" was associated with a higher risk of burnout, caution must be used in interpreting these associations. Because the results are cross sectional, it is plausible that some of these strategies are not necessarily dysfunctional approaches that contribute to burnout but rather are approaches more likely to be employed after distress develops (eg, regular meetings with a psychologist/psychiatrist). It is possible, however, that over reliance on other strategies, such as "discuss stressful aspect of work with colleagues" (ie, which could result in excessive complaining/focusing on negative aspects of work), could be detrimental. It should also be noted that seeing a primary care provider within the last 12 months was associated with a lower risk of burnout after controlling for other factors in multivariate modeling.

Although many of the factors that seemed to protect against burnout were also factors associated with achieving a high overall QOL, notable differences were observed. For example, although not associated with a lower risk of burnout, compliance with the CDC guidelines for aerobic exercise, greater emphasis on recreation/hobbies/exercise, and wellness strategies that emphasized personal relationships (eg, talking with family, significant other, or friends about feelings and protecting time away from work with spouse/family/friends) exhibited large and strong associations with high overall QOL. These observations emphasize that the absence of

distress (eg, not being burned out) is not the same thing as achieving high QOL/satisfaction and suggest physicians need to employ a broader repertoire of wellness promotion practices if they desire to move beyond neutral and achieve high well-being.[44]

Although this study is the first, to our knowledge, to explore implications for QOL and burnout, the routine medical care and health screening practices of the surgeons in our sample are similar to those found in previous studies of physicians. In 2000, Gross and colleagues,[20] reported on the routine health care practices of more than 900 alumni of the Johns Hopkins' School of Medicine who had graduated between 1948 and 1964. Roughly one-third of these physicians had no regular source of medical care, with surgeons among those less likely to have a regular source of care.[20] These results are relatively similar to our 2010 findings, which indicate that approximately 30% of US surgeons do not have a primary care provider. The proportion of US surgeons who had actually seen a primary care provider in the last 1 (46.2%) or 2 years (69.3%) in our study is also nearly identical to the frequencies observed in a national sample of Canadian physicians conducted in 2007–2008.[19] The proportion of surgeons up to date with cholesterol, colon cancer, cervical cancer, and breast cancer screening in our study is remarkably similar to those reported approximately 10 to 20 years ago.[2,20] Similar to the findings of Gross and colleagues,[20] surgeons who had a primary care provider were more likely to be up to date with age- and sex-appropriate health care screening.

Given the declining ratio of general surgeons to the population and the projected decrease of surgeons in the workforce over the next 10 to 20 years,[45,46] continued attention to surgeon burnout and its association with intent-to-leave practice[12] is critical. Although this study is focused on the personal health and wellness practices of individual surgeons, organizational efforts to promote surgeon health are also needed. Ideally, the process of surgeon training should help equip future surgeons with the habits and skills necessary to sustain them through the course of their career that prepare them for the personal and professional challenges they will face.[3] Because of associations between personal health habits and the care physicians provide their patients[4–7], as well as the potential for poor health to result in premature exit from practice,[3] hospitals, health maintenance organizations, academic medical centers, physician societies, and officials responsible for promoting public health, should also consider how they can help surgeons maintain health and resilience. Additional studies are needed to evaluate the ability of programs supported by these groups to promote surgeon health, where the findings of this study provide information regarding some of the components such programs should contain (eg, exercise, routine medical care, efforts to promote meaning in work).

Our study is subject to a number of limitations. First, exercise habits and medical care/health screening practices were assessed by self-report. Although consistent with the approach used in numerous prior studies of physicians,[2,4–7,19,20] how accurately this approach assesses actual behaviors is unknown. Second, we are unable to determine whether the associations between exercise habits, medical care/health screening practices, and personal wellness strategies and burnout/QOL are causally related or the potential direction of the effects in this cross-sectional study. Third, although similar to other national survey studies of physicians,[9–11,47] our response rate of 28.7% is lower than that of physician surveys in general.[48] Although this increases the possibility of response bias, several studies failed to identify significant differences between responding and nonresponding physicians in cross-sectional studies.[49] The fact that rates of compliance with recommended health screening and use of routine medical care among the participating surgeons were nearly identical to those observed in other samples of physicians[2,3,19,20] suggests that the participating surgeons are likely representative.

In conclusion, this study identifies specific measures associated with lower rates of burnout and improved QOL among US surgeons. These measures include (1) increasing weekly aerobic exercise and weight training to recommended levels, (2) annual visits to their primary care provider, and (3) age-appropriate preventative testing. It is unknown whether these measures are simply characteristics of surgeons who place a greater emphasis on self-care (and hence indirectly related) or if they represent direct ways to reduce burnout and improve QOL. Regardless, they represent the types of tangible behaviors that indicate that a surgeon values his or her personal needs and health, and such a distinction may be considered circular. In addition to exercise habits and routine medical care practices, incorporating wellness strategies that include finding meaning in work, focusing on what is important in life, maintaining a positive outlook and attitude toward professional life, and embracing a philosophy that stresses work-life balance may decrease the risk for burnout and improve professional and personal QOL. These personal strategies, along with attention to the previously identified characteristics of work load (eg, hours worked, nights on call),[8,14] specialty choice,[8] method of compensation,[8] medical errors,[11] medical malpractice suits,[50] and work–home conflicts,[16] provide strategies for surgeons to reduce burnout and promote QOL.

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