Burnout and Medical Errors Among American Surgeons

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Objective: To evaluate the relationship between burnout and perceived major medical errors among American surgeons.

Background: Despite efforts to improve patient safety, medical errors by physicians remain a common cause of morbidity and mortality.

Methods: Members of the American College of Surgeons were sent an anonymous, cross-sectional survey in June 2008. The survey included self-assessment of major medical errors, a validated depression screening tool, and standardized assessments of burnout and quality of life (QOL).

Results: Of 7905 participating surgeons, 700 (8.9%) reported concern they had made a major medical error in the last 3 months. Over 70% of surgeons attributed the error to individual rather than system level factors. Reporting an error during the last 3 months had a large, statistically significant adverse relationship with mental QOL, all 3 domains of burnout (emotional exhaustion, depersonalization, and personal accomplishment) and symptoms of depression. Each one point increase in depersonalization (scale range, 0–33) was associated with an 11% increase in the likelihood of reporting an error while each one point increase in emotional exhaustion (scale range, 0–54) was associated with a 5% increase. Burnout and depression remained independent predictors of reporting a recent major medical error on multivariate analysis that controlled for other personal and professional factors. The frequency of overnight call, practice setting, method of compensation, and number of hours worked were not associated with errors on multivariate analysis.

Conclusions: Major medical errors reported by surgeons are strongly related to a surgeon's degree of burnout and their mental QOL. Studies are needed to determine how to reduce surgeon distress and how to support surgeons when medical errors occur.

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Patient safety became a major focus of US health care policy initiatives after the 1999 Institute of Medicine report suggested that up to 100,000 US patients die of medical errors or preventable adverse events each year.[1] Other recent studies suggest that medical errors effect up to 10% of hospitalized patients.[2–4] Medical errors comprise a wide range of events including medication errors (eg, wrong medication, wrong dose, failure to recognize an allergy), patient misidentification, and errors or delays in diagnosis.[5–7] In addition to these errors that may be made by all physicians, errors made by surgeons also include wrong site or wrong procedure surgeries[8,9] or errors in judgment that lead to either an unnecessary operation or delay of a necessary operation.[7] Such errors by surgeons can be substantial and lead to dramatic consequences for the patient, the surgeon, and the institution.[5–7,9–11]

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Although a variety of definitions of "medical error" exist,[12] a useful definition is: "a commission or omission with potentially negative consequences for the patient that would have been judged wrong by skilled and knowledgeable peers at the time it occurred, independent of whether there were any negative consequences."[13] In this respect, medical errors should be distinguished from complications (ie, unpreventable adverse events), which are an acknowledged risk of medical care and surgical procedures.[3,5,14–16] It is also important to recognize that many errors cause little or no direct harm to patients.[15,17,18] Nonetheless, an audit of 30-day postoperative mortality following >7000 operations at one academic medical center suggested that 12.6% of postoperative deaths were associated with medical errors.[14]

In addition to the effect on patients, studies suggest errors can have a significant emotional impact on physicians that can last for years after the error occurred.[19,20] Physicians have been referred to as the second victim of medical errors[13] and report a reluctance to disclose errors to patients[21–23] and colleagues.[19] The likelihood of disclosing errors to patients may also differ by specialty, with some studies suggesting surgeons are less likely to disclose errors than those in other disciplines.[21]

Although it is clear errors lead to physician distress,[19,20] it is also possible that physician burnout and depression may undermine the quality of care physicians provide and contribute to medical errors.[24,25] Prior surveys suggest that 50% of physicians and 70% of the public believe overwork, stress, and fatigue among health professionals are contributing factors to medical errors,[26] although few studies have directly measured this relationship in practicing physicians.[27] In the present study commissioned by the American College of Surgeons (ACS) Committee on Physician Competency and Health, we evaluated the frequency of recent, self-perceived medical errors among surgeons who were members of the ACS and measured the relationship between errors and surgeon burnout, quality of life (QOL), and symptoms of depression as assessed by standardized metrics.

METHODS

Participants

As previously reported,[28] we conducted a survey evaluating burnout and QOL among American surgeons in June 2008. 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 this study. Participation was elective and responses anonymous. The study was commissioned by the ACS Governor's Committee on Physician Competency and Health with Institutional Review Board oversight by the Mayo Clinic Institutional Review Board.

Data Collection

A detailed description of the survey has been previously published.[28] Surgeons were surveyed electronically in June 2008 with up to 3 follow-up e-mail messages reminding surgeons to complete the survey. A cover letter stated the purpose of the survey was to better understand the factors that contribute to career satisfaction among surgeons. Participants were blinded to any specific hypothesis of the study.

The survey included 61 questions about a wide range of variables including demographic information, practice characteristics, and career satisfaction. Standardized survey tools were used to identify burnout,[29–32] mental and physical QOL,[33,34] and symptoms of depression.[35,36] Burnout was measured using the Maslach Burnout Inventory (MBI), a 22-item questionnaire considered a standard tool for measuring burnout.[29–32] The MBI has 3 subscales to evaluate the 3 domains of burnout: emotional exhaustion, depersonalization, and low personal accomplishment. Surgeons with a high score for medical professionals on either the depersonalization and/or emotional exhaustion subscales were considered to have at least one manifestation of professional burnout.[24,29,37–39] Symptoms of depression were identified using the 2-item Primary Care Evaluation of Mental Disorders (PRIME MD),[35] a standardized and validated assessment for depression screening which performs as well as longer instruments.[36] Mental and physical QOL were measured using the Medical Outcomes Study Short Form (SF-12)[33,34] with norm-based scoring methods used to calculate mental and physical QOL summary scores.[33] The average mental and physical QOL summary scores for the US population are 50 (scale, 0–100; standard deviation = 10).[33]

Recent, self-perceived medical errors were evaluated by asking surgeons, "Are you concerned you have made any major medical error in the last 3 months?" The question was based on similar measures from previous physician surveys,[24] and is intended to identify recent events internalized by a surgeon as a major medical error rather than to document actual events associated with patient outcome. For those who answered "yes" to this question, a follow-up question asked "Which of the following was the single greatest contributing factor in this particular error?" The response options for this follow-up question were: (*a*) system issue (eg, someone misinterpreted an order); (*b*) your degree of fatigue; (*c*) lapse in your concentration; (*d*) lapse in judgment; (*e*) lack of knowledge; (*f*) your degree of stress/burnout; (*g*) other (free text). All survey items were pilot-tested by 9 surgeons and subsequently modified on the basis of their feedback prior to use.

Statistical Analysis

Descriptive statistics were used to characterize sample demographics. A sample of 7905 observations as is reported here produces percentage estimates accurate to 1.1% with 95% confidence. Comparisons between surgeons reporting errors and surgeons reporting no errors were tested using Wilcoxon-Mann-Whitney tests and Fisher exact tests. Such comparisons with 7200 and 700 surgeons reporting in the 2 groups has 80% power to detect an average difference of 11% times the standard deviation, a small effect size.[40,41] Accordingly, the *P* values in this report are not as important as the observed effect size. Consistent with recent advances in the science of QOL assessment,[40] we a priori defined a ½ standard deviation in QOL scores as a clinically meaningful effect size.[40,41] Linear regression was used to evaluate the association of reporting a recent perceived medical error with each measure of distress. In addition, the odds ratio for reporting a major medical error associated with screening positive for depression or each one point difference in burnout or QOL score was calculated. The multivariate associations among demographic characteristics, professional characteristics, and distress with reporting a medical error 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. The independent variables used in these models included: age, gender, relationship status, having children, age of children, subspecialty, years in practice, hours worked per week, hours per week spent in the operating room, number of nights on call per week, practice setting (private practice, academic medical center, Veteran's hospital, active military practice, not in practice or retired, other), current academic rank, primary method of compensation (eg, salaried, incentive based pay, mix), percent of time dedicated to non-patient care activities (eg, administration, education, research), depression, and burnout. All analyses were done using SAS version 9 (SAS Institute Inc., Cary, NC).

RESULTS

A detailed description of the survey and analysis of the rates of burnout, QOL, and symptoms of depression among surgeons responding to the 2008 ACS survey has been previously reported.[28] Of the 24,922 ACS members surveyed, 7905 (32%) returned surveys. The personal and professional characteristics of responders are shown in Table 1.

A recent major medical error was reported by 700 (8.9%) of the 7905 participating surgeons. Perceived error rates did not vary by sex. The mean age of surgeons reporting errors was slightly lower than those not reporting errors (49 vs. 52 years; $P \leq 0.0001$). Surgeons reporting errors worked an average of 4.6 more hours a week (63.5 vs. 58.9 hours; $P < 0.0001$), spent an additional hour per week in the operating room (18.2 vs. 17.1 hours; $P = 0.0098$), and had slightly more nights on call per week (2.8 vs. 2.6 nights; $P = 0.0001$). Surgeons practicing obstetrics/gynecology (2%), plastic surgery (3%), and otolaryngology (6%) were less likely to report errors than general surgeons (10%; all $P < 0.04$). Consistent with a lower volume of patient care, physicians who spent <50% of their time on patient care were less than half as likely to report errors (4.4% vs. 9.3%, $P < 0.0001$).

A "lapse in judgment" was reported as the greatest contributing factor to the reported recent major medical error by 217/700 (31.8%) surgeons reporting errors with lessor numbers reporting a system issue, stress/burnout, lapse in concentration, or fatigue as the greatest contributing factor (Table 2). Only 31/700 (4.5%) surgeons felt the error was due to a lack of knowledge.

Reporting a perceived error during the last 3 months had a strong association with mental QOL, all 3 domains of burnout and the likelihood of screening positive for symptoms of depression (Table 3). For example, reporting a major medical error in the last 3 months was associated with a 7 point increase (59% of the standard deviation, eg, a large effect size) in emotional exhaustion on the MBI and roughly a doubling in the risk of screening positive for depression (54.9% vs. 27.5%; $P < 0.0001$). Reporting an error was also associated with a >½ standard deviation decline in mental QOL score, a difference reported to be clinically significant.[40,41] In contrast to these large adverse associations with mental and emotional health, reported errors had only a minimal relationship to physical QOL scores. Reported errors were also related to career satisfaction. Surgeons reporting recent errors were less likely to report they would become a physician (60% vs. 71.6%; $P < 0.0001$) or a surgeon (58.4% vs. 75.5%; $P < 0.0001$) again and were also less likely to recommend their children pursue a career as a physician or surgeon (40.8% vs. 51.4%; $P < 0.0001$).

Since surgeon distress could also increase the risk of medical errors,[24,27,37] we next evaluated the odds of reporting a medical error associated with each one point difference in burnout or QOL score. Higher levels of burnout were associated with an increased likelihood of reporting an error in the last 3 months (Table 4; Fig. 1). Each one point increase in depersonalization (scale range, 0–33) was associated with an 11% increase in the likelihood of reporting an error while each one point increase in emotional exhaustion (scale range, 0–54) was associated with a 5% increase. The personal accomplishment domain (scale range, 0–48) of burnout was inversely correlated with reporting errors where each one point increase in score (ie, an indicator of lower burnout) was associated with a 3.6% decrease in the likelihood of reporting an error. Similarly, mental QOL was inversely correlated with medical errors where each one point increase in mental QOL was associated with

TABLE 1. Personal Characteristics

	N (%) or Median (Q1, Q2) N = 7905
Age, Median	51 yr, (43, 59)
Gender	
Male	6815 (86.7)
Female	1043 (13.3)
Specialty	
Missing	44
Cardiothoracic	489 (6.2)
Colorectal	302 (3.8)
Dermatologic	2 (0)
General	3233 (41.1)
Otolaryngology	368 (4.7)
Obstetrics/gynecology	105 (1.3)
Oncologic	407 (5.2)
Pediatric	181 (2.3)
Plastic	458 (4)
Transplant	123 (1.6)
Trauma	345 (4.4)
Urologic	315 (4)
Vascular	463 (5.9)
Other	488 (6.2)
Hours worked per week	
Median	60 (50, 70)
<40 h	666 (8.5)
40–49 h	800 (10.3)
50–59 h	1410 (18.2)
60–69 h	2549 (32.6)
70–79 h	1048 (13.4)
≥80 h	1336 (17.1)
Hours per week in operating room	
Median	16 (10, 24)
No. nights on call per week	
Median	2 (1, 4)
Primary method determining compensation	
Missing	179
Salaried, no incentive pay	1674 (21.7)
Salaried, bonus pay based on billing	2372 (30.7)
Incentive pay based entirely on billing	2934 (38)
Other	746 (9.7)
% Time dedicated to nonpatient care activities	
Missing	57 (–)
0%	384 (4.9)
<10%	2273 (29)
10%–20%	2539 (32.4)
21%–30%	1204 (15.3)
31%–50%	805 (10.3)
>50%	643 (8.2)

TABLE 2. Perceived Medical Errors

	N (%) N = 7905
Made major medical error in last 3 mo	
Missing	6
Yes	700 (8.9)
No	7199 (91.1)
Greatest contributing factor in medical error	
Lapse in judgment	217 (31.8)
A system issue	103 (15.1)
Degree of stress or burnout	89 (13)
Lapse in concentration	89 (13)
Degree of fatigue	47 (6.9)
Lack of knowledge	31 (4.5)
Other	107 (15.7)

a 5.7% decrease in the likelihood of reporting an error. In contrast to the strong, dose response relationship between measures of mental/emotional distress and medical errors, physical QOL scores were unrelated to the likelihood of reporting errors.

Finally, we performed multivariate modeling to identify factors independently associated with perceived medical errors. Burnout and depression were strongly associated with perceived medical errors after controlling for other personal and professional characteristics (Table 5). Older surgeons were less likely to report errors (~15% decrease likelihood for each decade older) as were those who spent <50% of their time on clinical practice. Otolaryngologists, plastic surgeons, and gynecologic surgeons were the only specialty group less likely to report errors than general surgeons on multivariate analysis controlling for other factors. Notably, the number of nights on call per week, practice setting, method of compensation, and number of hours worked were not associated with reported errors after controlling for other factors.

DISCUSSION

In this large national survey, approximately 9% of participating surgeons reported they had made a major medical error in the last 3 months. Although surgeons do not appear more likely to make errors than physicians in other disciplines, errors made by surgeons may have more severe consequences for patients due to the interventional nature of surgical practice.[5,6,15] We observed a strong relationship between surgeon distress and perceived medical errors. Although our cross-sectional study is unable to determine a cause–effect relationship or the direction of this association, each one point increase in depersonalization, emotional exhaustion, and mental QOL score was associated with a 5% to 11% higher likelihood of reporting a recent major medical error. These represent large effects where a surgeon with a depersonalization score of 12 is more than twice as likely to report having made a major medical error in the last 3 months as a surgeon with a score of 2. Burnout and depression were among the strongest factors associated with reporting a recent major medical error on multivariate analysis adjusting for other factors. Since the present study is cross-sectional, we are unable to determine whether distress causes errors or errors cause distress. The findings are consistent with previous prospective studies in internal medicine[24] and pediatric[25] residents which demonstrate an increased risk of future medical errors among distressed physicians and imply that surgeon distress could be a contributing factor to medical errors as well as a consequence.

Most prior studies of errors among practicing physicians focus on system issues that contribute to errors rather than individual level factors.[42–46] Consistent with this focus, efforts to reduce errors have largely centered on improving coordination of care, team work, electronic order systems, and other system level changes.[42–48] While these approaches represent important quality safeguards, studies suggest that errors made by surgeons are most likely to be technical mistakes made during surgery or errors in judgment that

TABLE 3. Distress Among Surgeons Reporting Perceived Errors Versus not Reporting Errors

	Metric (Scale)*	No Reported Errors (N = 7199)	Reported Errors (n = 700)	Effect Size as % of Standard Deviation	*P*
Burnout					
Emotional exhaustion	MBI-EE (0–54), mean	20.3	27.5	59%	<0.0001
Depersonalization	MBI-DP (0–33), mean	6.3	10.3	71%	<0.0001
Personal accomplishment	MBI-PA (0–48), mean	40.8	39.1	27%	<0.0001
QOL					
Mental QOL	SF-12 (0–100), mean	49.5	42.5	71%	<0.0001
Physical QOL	SF-12 (0–100), mean	53.5	53.8	5%	0.0135
Depression	Screen positive for depression, %	27.5%	54.9%	—	<0.0001
Career Satisfactor					
Would become physician again (career choice)	% yes	71.6%	60.0%	—	<0.0001
Would become a surgeon again (specialty choice)	% yes	75.5%	58.4%	—	<0.0001
Would you recommend your children pursue a career as a physician/surgeon?	% yes	51.4%	40.8%	—	<0.0001

*MBI-EE indicates Maslach Burnout Inventory-Emotional Exhaustion; MBI-DP, Maslach Burnout Inventory-Depersonalization; MBI-PA, Maslach Burnout Inventory-Personal Accomplishment; SF-12, Medical Outcomes Study 12-item Short Form.

TABLE 4. Relationship Between Burnout, QOL, and Symptoms of Depression With Perceived Medical Error

Independent Variable	Metric (Scale)*	Odds Ratio (95% CI)†	*P*
Burnout			
Emotional exhaustion‡	MBI-EE (0–54)	1.048 (1.042–1.055)	<0.0001
Depersonalization‡	MBI-DP (0–33)	1.109 (1.096–1.122)	<0.0001
Personal accomplishment§	MBI-PA (0–48)	0.965 (0.955–0.975)	<0.0001
QOL			
Mental QOL	SF-12 (0–100)	0.943 (0.936–0.949)	<0.0001
Physical QOL	SF-12 (0–100)	1.008 (0.996–1.021)	0.178
Depression	Screen positive for depression, %	3.212 (2.742–3.761)	<0.0001

Table indicates how a 1 unit difference in each distress metric relates to likelihood of reporting a major medical error in the previous 3 month (ie, evaluates how being distressed may relate to the odds of reporting an error). For depression, results indicate how screening positive for symptoms of depression relates to the likelihood of reporting a major medical error in the previous 3 months as compared to those who screen negative.

*MBI-EE indicates Maslach Burnout Inventory-Emotional Exhaustion; MBI-DP, Maslach Burnout Inventory-Depersonalization; MBI-PA, Maslach Burnout Inventory-Personal Accomplishment; SF-12, Medical Outcomes Study 12-item Short Form.

†Odds ratio of self-reported error in the following 3 months associated with a 1 unit increase in each distress metric.

‡Higher score indicates greater degree of burnout.

§Higher score indicates lower degree of burnout.

lead to an inappropriate operation or delayed diagnosis.[7,11,17] Accordingly, it has been postulated that many explanatory factors for medical errors "remain to be uncovered."[49] Consistent with this premise, only 15% of the surgeons reporting a recent major medical error in our study attributed the error to a system issue while over 70% attributed the error to an individual level factor (eg, lapse in judgment, stress/burnout, lapse in concentration, fatigue). Efforts to reduce errors resulting from such individual level factors need to incorporate a variety of strategies including efforts to reduce physician's degree of emotional distress and burnout.[24,25] It is also important to note that even when system issues are not the cause of errors, system strategies may nonetheless be a critical part of the solution. The intent of a well-designed system is to neutralize or reduce the impact of errors made by individuals.

The limited studies that have explored the relationship between surgeon specific factors and medical errors have primarily focused on fatigue and sleep deprivation rather than burnout or emotional distress. Those studies build from the well documented increase risk of medical errors among interns working extended duty shifts (>24 hours) compared with interns working shorter shifts.[50–52] Although simulator-based studies also suggest fatigued surgeons make more errors and operate more slowly than nonfatigued surgeons,[53,54] the available studies among resident and practicing surgeons have not found a clear relationship between surgeon fatigue and complication rates or patient outcome.[55–58] Consistent with these studies, we found no relationship between hours worked per week, the number of nights on call per week, practice setting, or the method by which surgeons were compensated and medical errors on multivariate analysis controlling for measures of distress. These findings suggest that, although it has the appearance of improving safety, simply regulating work hours or the frequency of overnight call among practicing surgeons may do little to reduce errors.

Once errors do occur, physicians often experience significant distress and feel inadequately supported by their health care organizations as they attempt to cope with their mistakes.[20] Although evidence suggests that disclosing the error to the effected patient reduces physi-

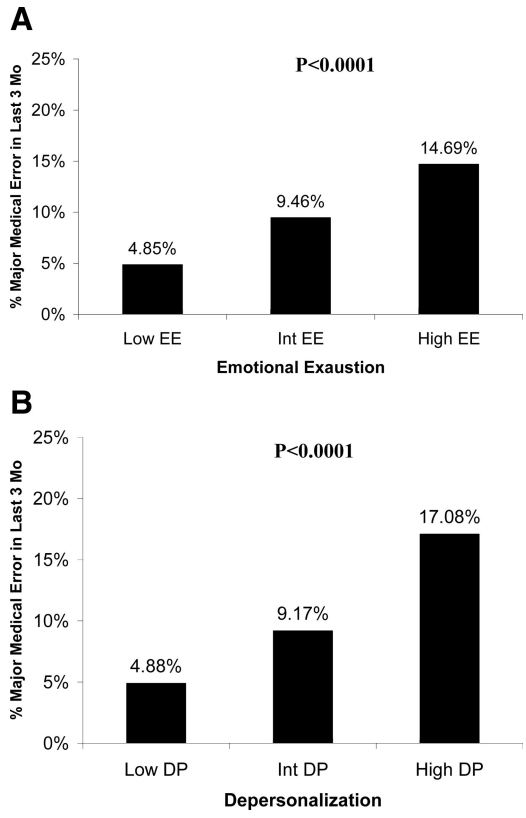

FIGURE 1. Report of making a recent medical error by degree of burnout. A, Report of making a recent medical error by degree of emotional exhaustion. According to standardized scoring system for health care professionals, surgeons with Emotional Exhaustion scores ≤18, 19 to 26, and ≥27 are considered to have low, intermediate (Int), and high degrees of burnout, respectively. B, Report of making a recent medical error by degree of depersonalization. According to standardized scoring system for health care professionals, surgeons with depersonalization scores ≤5, 6 to 9, and ≥10 are considered to have low, intermediate (Int), and high degrees of burnout, respectively.

cian distress,[20] physicians are often reluctant to do so.[21–23] Thus, in addition to efforts to reduce the frequency of medical errors, programs training physicians how to disclose errors and supporting physicians after errors occur are also needed. Surgeons may also have a tendency to blame themselves for errors that affect their patients even when they are only part of the process leading to error rather than its sole cause. In this regard, surgeons may benefit from education that errors are often caused by a series of events rather than being the fault of one individual which may help them be more proactive in error prevention and reduce inappropriate self-blame when errors occur.

Our study is subject to a number of limitations. First, the definition and reporting of errors in our study were based on self-perception. Although numerous studies have used this approach,[8,9,18,19,24,39,59,60] a variety of other methods including audit of medical records[3,5,6,14,15,25] and review of databases[10,61] or malpractice claims[7,10,11,61,62] have also been used. In this regard, self-reported errors have been shown to have a high correlation with events documented in the medical record.[63] Although we are unable to determine whether the perceived errors reported actually affected patient outcomes, up to 53% of self-perceived errors have been found to impact patients in some studies.[18]

TABLE 5. Factors Independently Associated With Perceived Medical Errors on Multivariate Analysis

Characteristic and Associated Factors	Odds Ratio*	*P*
Positive depression screen	2.217	<0.0001
Burnout	2.016	<0.0001
Age†	0.985	0.001
Otolaryngologist	0.614	0.041
>50% time dedicated to nonpatient care (research, administration)	0.597	0.012
Retired	0.296	0.0400
Plastic surgeon	0.263	<0.0001
Gynecologic surgeon	0.243	0.050

*OR >1 indicates increased risk of perceived medical error; OR<1 indicate lower risk of perceived medical error.

†Each 1 year change.

‡Nonsignificant factors: hours worked per week, number of hours in operating room per week, number of nights on call per week, primary method of compensation (eg, salaried, incentive based pay, mix), years in practice, practice setting, academic rank, relationship status, having children, age of children, gender.

Second, we are unable to determine whether the associations between errors and distress are causally related or the potential direction of the effects. Retrospective error reporting could be influenced by feelings of distress although it is unknown whether distress would increase (e.g. self blame) or decrease (e.g. denial) error reporting. Prior studies demonstrate both that medical errors lead to significant physician distress[19,20] and that distress may contribute to future errors.[24,25] It is also unknown how distress and/or errors influenced the likelihood of participating in the survey and whether the prevalence of recent errors among participating surgeons is representative of all American surgeons.

Third, unmeasured confounding variables could explain some of the associations observed. For example, fatigued physicians may be both more likely to make errors and experience personal distress. Although we found no significant relationship between hours worked and the number of nights on call with medical errors on multivariate analysis, our study did not measure fatigue directly. Other confounders such as personality traits (narcissism, arrogance, cynicism, or being self-critical) could influence an individual's perception of errors as well as their vulnerability to distress.

In conclusion, recent self-perceived major medical errors were reported by 9% of American surgeons. These errors are strongly related to surgeon's degree of burnout and mental QOL. A majority of surgeons attributed their errors to individual rather than system level factors. Additional studies exploring how to reduce individual level factors that contribute to medical errors are needed in conjunction with implementation of system level safeguards. Studies are also needed to determine how to reduce surgeon distress and how to support surgeons when medical errors occur.

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