

Does Surgery Attract Students Who Are More Resistant to Stress?

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This article examines perceptions of stress and career choice. One hundred sixty-nine junior students specified what they thought were the two most and two least stressful careers, as well as their own career preferences before and after a 12-week surgical clerkship. The class was divided for analysis into three groups: those who selected careers that they said were A) most stressful (42%), B) least stressful (10%), and C) neither most nor least stressful (48%). Surgery was cited as one of the two most stressful choices by 99% of the class before and 93% after the clerkship. The next most stressful career was internal medicine, cited by 43% before and 35% after the clerkship. The two least stressful careers were dermatology and radiology, cited by approximately 50% of the class before and after the clerkship. Those who chose careers that they said were most stressful had significantly higher self-esteem ($p < 0.05$), experienced less unfavorable stress themselves as measured by a 31-item stress scale before and after the clerkship ($p < 0.01$), and experienced more favorable (in their view) stress ($p < 0.05$) than did the other two groups. Reanalysis of data comparing those who selected surgery with those who did not confirmed findings similar to that of the matched high-stress career group. The study suggests that some students may be able to tolerate stress better and in fact, tend to thrive in an environment that they perceive as stressful, and that such students are more likely to go into a surgical career, which they foresee as one of the most stressful that they can enter.

STUDIES OF MEDICAL STUDENTS and their career preferences have not always found the choice of surgery associated with the most desirable kinds of personal qualities. Otis and Weiss¹ concluded that would-be surgeons were somewhat aggressive, stubborn, and authoritarian, that they were thick-skinned and able to handle difficult emotional situations without much distress, that their confidence in themselves was unshakable, and that they tended to be unsophisticated and sometimes crude, but easily pleased and free of jealousy. Eron² showed that students interested in surgery had less anxiety; however, they were more cynical than other students. Livingston and Zimet³ also found that students who liked surgery were more authoritarian than those

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who selected other specialties. Bruhn and Parsons⁴ studied student perceptions of the different specialties and found high agreement among students that surgeons were the most domineering and arrogant of the specialties. Becker and colleagues⁵ studied attitudes about seven specialties (prestige, money, intellectual breadth, patient relationships, length of residency) and found that prestige was highest for surgery and intellectual breadth was greatest for internists. Along these same lines, Zimet and Held⁶ showed that students rated surgery and medicine the highest and family practice and psychiatry the lowest in regard to status; however, family practice was highest and surgery lowest in social attractiveness. Furthermore, students (even those who preferred surgery) rated themselves as having traits similar to those they assigned to the family practitioners. Budner⁷ classified surgery and obstetrics/gynecology as highly structured careers, compared with other specialties, and confirmed that students who selected surgery had less tolerance for ambiguity than those who chose medium- or low-structured specialties. Paiva and Haley⁸ concluded that potential surgeons had significantly higher economic values and lower social values than students with all other preferences except internal medicine.

Some of our earlier work has shown that students who selected surgery had a different style of learning, in that they preferred active participation rather than conventional classroom methods,⁹ that they had more self-esteem and less tolerance for ambiguity than those who selected other specialties, and that those choosing specialty surgery were more cynical and authoritarian than those selecting general surgery.¹⁰

These findings describe potential surgeons as extremely self-confident, authoritarian, intolerant of ambiguity, and fitting into a career that they saw as supplying status and economic rewards. That surgery is a demanding career can hardly be denied. Those able to deal with the

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pressures inherent in surgical practice may need unique qualifications to equip them for their duties. Some of the stresses of medical practice begin in medical school, are accelerated in residency training, and permeate practice in varying degrees depending on the specialty. The third year of medical school has been described as the most stressful of the four,^{11,12} because the students shift from a classroom to an experiential model of learning, may first confront life-and-death issues, take responsibility for patients, and face concerns about career choices and their adequacy in meeting the demands of the profession. Stresses of residency training are better described than those in medical school, perhaps because these increase as clinical demand become greater. For the resident, role ambiguity, responsibility beyond one's ability, social isolation, and sleep deprivation have been described.¹³ Approximately one-third of residents are reported to have severe emotional distress or depression.¹⁴ Medical practice itself has a high degree of stress. McCue¹⁵ pointed out that those who are vulnerable may become unable to practice, although in other physicians, adaptations to unalterable stresses of medicine may actually improve quality of care. However, inability to cope with the stresses of medical practice is probably largely responsible for the rate of suicide being two to three times higher,¹⁶ alcoholism being at least as prevalent,¹⁷ and drug addiction 30 to 100 times higher¹⁸ than in the general population.

Not many studies have examined reactions to stresses in medical school. In one study,¹⁹ we had students rate amount of stress related to 31 different stressful events before and after their surgical clerkship, and whether the event was seen as a favorable or unfavorable type of stress. Only unfavorable stress was correlated with poorer performance as measured by grades given during the surgical clerkship. This article describes what junior medical students saw as the most and least stressful specialties and how these compared with their own career preferences, personality, and experiences with stress in the surgical clerkship.

Method

A total of 169 junior medical students were studied in the 1981–1982 academic year at the University of Miami School of Medicine. At the time they entered their 12-week surgical rotation, they rated the stress in Medical School (SIMS) Scale¹⁹ to describe the previous 3 months' experiences with stressful events in the medical school. The SIMS was rated again 3 months later when they left the clerkship to describe degree of stress experienced during the clerkship. The scale lists 31 events or situations from which stress can occur. Each event was rated on a 0 to 9 scale for degree of stress ranging from 0 = none to 9 = extreme. The students also indicated

whether or not each event or situation seemed to them a favorable or unfavorable type of stress. For example, some students might perceive the stress related to being on call as favorable and some as unfavorable. The 31 items cover areas of learning, interpersonal relationships, work, future concerns, pressure from school, outside pressures, and pressure that is self-induced. A total stress score was determined for each student by summing his or her scores on all 31 items of the SIMS Scale, and total unfavorable and favorable stress scores were computed based on how each stress was viewed by the student.

Students were also asked to specify what they thought were the two most and the two least stressful specialties before and after their clerkship experiences and to indicate why they thought the specialty was most or least stressful. In addition, students were asked to choose the specialty that they were most likely to go into. A list of 11 major specialties and "other" was provided. Career preferences were made both before and after the surgical clerkship. Students were followed up when they graduated from medical school in regard to their actual choice of residency program and practice.

Two personality dimensions, locus of control and self-esteem, were assessed when the students entered the clerkship. Locus of control (the extent to which an individual believes that environmental events are contingent on his behavior) has been shown to be related to stress. Individuals with an internal locus believe that they control themselves and their destiny, and those with an external locus believe that their fate or what happens to them is by luck or chance. Rotter's Locus of Control Scale²⁰ was used. Self-esteem was measured with Cutick's Self-Esteem Scale.²¹

Performance was assessed in cognitive areas by four examinations given at the end of the clerkship; the surgical section of the National Board Medical Examination (NBME), a computer-generated written examination,²² and two oral examinations (one dealing with cognitive knowledge and the other with management of patients assigned to them).²³ The students' attitudes and skills in relation to their daily clinical activities were assessed with a Ward Behavioral Rating Scale covering attitude and sensitivity to patients' needs, responsiveness to clinical responsibility, application of clinical knowledge, motivation toward self-learning, and overall evaluation of behavior. Behavioral ratings are provided by residents and faculty members for the general and specialty surgery wards. The final grade in surgery was a composite of these scores.

For data analysis, the class was divided into three groups: those who selected careers that they said were (A) most stressful, (B) least stressful, and (C) neither matched most or least stressful. These three groups were

TABLE 1. *Per Cent of Class Who Selected Most and Least Stressful Careers (Two Choices of Each)*

Careers	Pre (%)	Post (%)
Most stressful careers (two choices)		
Surgery	99	93
Internal medicine	43	39
Anesthesiology	11	13
Ob/Gyn	15	14
Psychiatry	8	7
Pediatrics	3	4
Neurology	2	3
Family practice	0.6	0.6
Pathology	0.6	0.6
Other	18	25
Least stressful careers (two choices)		
Dermatology	55	56
Radiology	59	59
Pathology	25	26
Psychiatry	18	13
Neurology	4	6
Family practice	5	5
Anesthesiology	9	8
Pediatrics	3	2
Internal medicine	2	2
Ob/Gyn	2	3
Surgery	1	0
Other	17	20

compared by multivariate analysis of variance on interests, personality, stress experiences in the clerkship, and clerkship performance. In addition, those students who selected surgery were further compared with those who did not on the same variables both in regard to selection of surgery at the end of the clerkship and on entry into a surgical residency. The hypothesis was that students who chose what they believed was the most stressful careers would differ significantly from the others in regard to personality and the ways they experienced stress in the clerkship.

Results

Only two students failed to complete all the tests. Data, therefore, were complete for 99% of the junior

TABLE 2. *Composition of Most-stressful Match, Least-stressful Match, and No-match Groups by Career Preferences*

Career Choices		
Matched Most Stressful (N = 69)	Matched Least Stressful (N = 16)	Did Not Match (N = 83)
71% Surgery	42% Radiology	29% Medicine
19% Medicine	27% Dermatology	16% Family medicine
6% Ob/Gyn	8% Anesthesiology	15% Pediatrics
2% Psychiatry	8% Medicine	8% Neurology
2% Anesthesiology	8% Pathology	7% Ob/Gyn
2% Other	7% Other	6% Psychiatry
		4% Anesthesiology
		4% Surgery
		2% Radiology
		4% Other

class. Table 1 shows what the students perceived as the most and least stressful specialties before and after the surgical clerkship. The choices were remarkably similar at the two points in time, with perhaps the selection of internal medicine being seen as slightly less stressful after the clerkship than before. Since students had two choices, the per cents total 200%. Surgery was selected as the most stressful careers in one of the two choices by 99% of the class before the clerkship and by 93% of the class after. Internal medicine was the second most stressful specialty choice, with over one-third of the class selecting this specialty as one of the two most stressful over one-third of the time. There was considerable agreement regarding the least stressful specialties, with over one-half of the class citing dermatology and radiology as one of the two least stressful, and one-fourth of the class choosing pathology.

Over 35 different reasons were provided by students as to why surgery was stressful (long hours, life/death decisions, consequences of judgment/skills, and amount of work and time involved cited most frequently). Only 15 reasons were provided for why internal medicine was stressful (amount to be learned, long hours, and heavy patient load being the most frequent ones).

Table 2 shows the composition of the three groups of students studied. Forty-one per cent of the class said they wanted to go into a specialty that they had rated as one of the two most stressful; 10% of the class had a career preference that matched what they thought was the least stressful career; and 48% of the sample chose a career that did not match either their most or least stressful career choice. Almost three-fourths (71%) of the group that matched their most stressful career choice were potential surgeons, with internal medicine career choices making up the next largest per cent of that group. Most of the group that matched their least stressful choice said they planned to go into radiology, dermatology, pathology, or internal medicine. The no-match group was largely internal medicine, family medicine, pediatrics, and neurology. Another way of looking at the choices is that of those who selected surgery as their career preference at the end of the clerkship (N = 46), 93% were ones who had said surgery was the most stressful career. On follow-up at graduation, 33 students went into a surgical residency program. Thus, 13 students changed their minds about surgery between the end of the clerkship and residency practice. All 13 students, however, went into internal medicine, which had been one of their two choices of a most stressful career. Therefore, these students were still in one of the careers that they had cited as most stressful at the time they graduated from medical school.

Table 3 shows how the three groups of students differed in regard to interests, personality, stress variables,

TABLE 3. Comparison of Students Who Chose What They Considered the Most Stressful, Least Stressful, or Neither Career Preference

Variables	Career Choice Matched			F Ratios
	Most Stressful (N = 69)	Least Stressful (N = 16)	No Match (N = 83)	
Interests (1–100 scale)				
Research	55.0	50.1	48.4	0.50
Teaching	71.8	56.5	65.1	1.67
Surgery	80.0	45.0	53.3	13.57*
Personality (higher = more)				
Externally controlled	8.4	7.1	8.7	1.44
Self-esteem	81.3	78.0	77.0	3.22†
Perceived stress (0–9 scales)				
Degree favorable stress	51.4	39.2	43.5	1.61
Degree unfavorable stress	55.1	92.5	64.6	9.70*
Performance				
National Board Medical Examination	513.7	492.5	529.2	0.35
Computer-generated written examination	92.3	94.1	92.8	0.74
Oral exams	87.3	86.9	88.2	0.55
Ward behavior (general surgery)	92.9	92.1	91.9	0.33
Ward behavior (specialty surgery)	93.4	90.8	91.8	0.08
Final surgical grade	89.9	88.8	89.3	0.47

* $p < 0.001$. † $p < 0.05$.

and performance. As might be expected, students who selected careers they thought were most stressful had more interest in surgery than other students ($p < 0.001$). They also had more interest in research and teaching; however, the differences among groups did not reach statistical significance. The most-stressful choice group also differed from the other two groups by having more self-esteem ($p < 0.05$). When the stress scores were examined, those who had selected their most stressful career choices reported they had experienced less stress of what they considered an unfavorable nature ($p < 0.001$). Conversely, the group picking the most stressful careers had more of what they considered favorable type stress, even though this did not discriminate significantly among the groups. When the students were asked about each of the 31 stresses as to whether the stress was a positive or negative type of stress, the group who picked the least stressful careers identified 23 of the 31 as unfavorable events and those who selected the most stressful careers said only 17 of the 31 were unfavorable types of stress. Performance during the clerkship and final grade in surgery did not discriminate among the three career-matched groups at a statistically significant level.

Although 71% of the high-stress selection group contained would-be surgeons and even though 93% of all those selecting surgery were in that group, we compared students who chose surgery either at the end of the clerkship or at the time of residency practice with those who did not to confirm whether findings in Table 3 for the matched high-stress career group were typical of potential surgeons. Table 4 shows these comparisons. As might be expected, interest in surgery was significantly

different between surgery and other career selections both at the end of the clerkship for those who thought they wanted to go into surgery and for those who actually went into surgery after graduation ($p < 0.001$). More self-esteem was found for those students who were both interested in ($p < 0.01$) and those who went into ($p < 0.05$) surgery compared with other students, similar to the group who chose the most stressful careers. However, differing from the earlier comparison of the three groups, locus of control differed significantly for those interested in surgery at the clerkship ($p < 0.01$) and at graduation ($p < 0.05$) compared to other students, with more internally controlled students selecting surgery. Degree of favorable stress was significantly greater for those who wanted to go into surgery than other students at the end of the clerkship ($p < 0.05$) but did not discriminate among groups later at time of residency selection. The amount of unfavorable stress experienced during the clerkship separated the potential surgeons both at the end of the clerkship and later at their residency from other students at the 0.01 level statistically, with the surgical group having experienced less unfavorable stress during the clerkship.

Performance had not discriminated among the three matched career groups. Table 4 also indicates that it did not discriminate between those who selected surgery compared with other students at the end of the clerkship. Specialty ward behavior showed a trend toward those who wanted to go into surgery doing better than other students, but it was not statistically significant. However, when performance was compared between those who actually went into a surgical residency and those who did not, two areas of performance differed significantly.

TABLE 4. Comparison of Students Who Chose Surgery at the End of the Clerkship or After Graduation From Medical School with Students Who Did Not

Variables	Clerkship Choice			Residency Choice		
	Yes (N = 46)	No (N = 121)	F Ratio	Yes (N = 33)	No (N = 134)	F Ratio
Interests (1-100 scale)						
Research	54.6	49.7	0.52	52.4	51.0	0.03
Teaching	72.8	64.6	2.36	62.9	68.4	0.82
Surgery	92.5	50.5	70.11*	90.1	56.7	26.73*
Personality (higher = more)						
Externally controlled	8.1	8.9	5.98†	8.2	8.7	3.98‡
Self-esteem	82.6	76.8	9.41†	81.8	77.8	3.59‡
Stress (0-9 scales)						
Degree favorable	52.9	43.5	3.47‡	53.1	44.6	2.13
Degree unfavorable	54.3	66.7	6.07†	52.3	65.7	6.47†
Performance						
National Board Medical Examination	508.5	525.0	1.05	538.8	514.4	3.75‡
Computer-generated written examination	92.6	92.9	0.01	93.2	92.5	0.21
Oral	87.4	87.8	0.20	89.1	87.3	2.69
Ward behavior (general surgery)	92.5	92.2	0.26	93.2	92.1	2.62
Ward behavior (specialty surgery)	93.3	92.1	2.69	93.6	92.2	2.42
Final surgery grade	89.8	89.4	0.39	90.7	89.2	4.23‡

* $p < 0.001$. † $p < 0.01$. ‡ $p < 0.05$.

Those who went into a surgical residency had performed better on the NBME taken in the junior year ($p < 0.05$) and the final grade in surgery had been higher ($p < 0.05$) than for other students.

When degree of unfavorable and favorable perceived stress was correlated with performance, amount of favorable stress was unrelated to performance, but amount of unfavorable perceived stress during the clerkship was significantly and inversely correlated with performance on oral examination ($p < 0.05$), ward behavior for general surgery ($p < 0.01$), and final surgical grade ($p < 0.01$). Therefore, unfavorably perceived stress was associated with poorer performance.

Discussion

Almost all of the students saw surgery as one of the most stressful medical specialties. Those who chose to go into surgery did so with the knowledge that it would be stress-producing career. Students who selected what they thought was a stressful career had some unique qualities that could help them cope with the pressures likely to be encountered later in practice. They had higher self-esteem than other students; they tended to experience less stress in their lives as students; and they viewed many of the stresses as more favorable types of stress than students who chose what they thought was least stressful or those whose selection did not match their most or least stressful careers.

Only the amount of unfavorable perceived stress distinguished among the three matched career groups of students. The small group that selected what they had

identified as the least stressful career specialties experienced what they believed was more unfavorable stress during the clerkship and had less self-esteem to deal with these pressures. Since unfavorable stress was associated with poorer performance, this group of students was particularly vulnerable. Furthermore, others²⁴ have observed that stress has its most devastating impact on persons when their self-esteem is low.

In regard to the students who specifically selected surgery, they appeared to be typical of the entire group of students who selected what they had identified as one of the most stressful careers. This might be expected because three-fourths of that group had been made up of potential surgeons. However, one new finding was highlighted by this comparison. Surgical interest students had more internal locus of control than other students, indicating that they believed that events were the result of their own behavior rather than that of fate or luck. Both perception of stress and coping with stress have been found to be associated with locus of control. Persons who are more internal tend to perceive less stress and to cope more effectively.²⁵

When students who actually entered a surgical residency were compared with other students, findings for the group of 46 at the end of the clerkship held up for the 33 who went into a surgical residency. One interesting additional finding, however, was that performance during the clerkship became significant statistically in differentiating between surgical and nonsurgical residency groups. What this seems to indicate is that students who changed their minds or perhaps were not selected for surgical residencies had performed more poorly on the surgical

section of the NBME given in the junior year and had received a lower surgical grade than those students who ultimately went into a surgical residency.

The fact that potential surgeons chose what they know is a stressful career, perceive more stress as favorable or facilitating, and feel less unfavorable amounts of stress suggest that they may thrive or be challenged by a stressful environment, and in fact are better equipped to cope with the demands of practice by having more self-esteem and feeling more in control of events that occur in their lives. Some individuals are more stress reactive than others and some are more resistant to stress than others. Stress-reactive students might find the demands of a surgical career overwhelming. One of the functions of the surgical clerkship viewed in light of these findings then is to help students foresee some of the realities of surgical practice so that they can make a more informed decision about their career preference. To our knowledge this function has not previously been cited as an argument in favor of continuing to include surgery as a compulsory clerkship in the medical school curriculum against those who feel that the surgical clerkship should be a totally elective curricular component. Since the clerkship comes at a time when students are integrating clinical and classroom learning and since unfavorable stresses in the clerkship were associated with poorer performance, attention may need to be given to helping some students learn to cope with stress more effectively.

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