The Relationship Between Self-Efficacy and Well-Being Among Surgical Residents

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OBJECTIVE: Residency is a challenging time in the lives of physicians. In this study, we examined the relationship between general self-efficacy, defined as the belief in one's own capabilities in a variety of situations, and burnout and psychological well-being in a sample of surgical residents.

DESIGN: In the context of a larger study, a cross-sectional survey was administered to residents. The survey included measures of general self-efficacy, the emotional exhaustion and personal accomplishment domains of burnout, and general psychological well-being. We examined correlations between self-efficacy and these well-being outcomes and used multivariable linear regression models that controlled for age, gender, postgraduate year, ethnicity, and the interaction between gender and self-efficacy.

SETTING: We surveyed residents at Stanford Health Care, a tertiary care center, between the fall of 2010 and the spring of 2013.

PARTICIPANTS: One hundred and seventy nine residents from 9 surgical subspecialties responded to the survey for a response rate of 76%.

RESULTS: Residents reported high levels of self-efficacy, and over a third reported high emotional exhaustion. Eighty-nine percent of residents had average or high personal accomplishment. In adjusted regression analyses, general self-efficacy was negatively predictive of emotional exhaustion ($B = -0.43$, $p = 0.0127$) and positively predictive of personal accomplishment ($B = 0.33$, $p = 0.0185$) and general psychological well-being ($B = 0.34$, $p = 0.0010$). There was no interaction between gender and general self-efficacy in regression analyses ($ps \geq 0.6776$).

CONCLUSIONS: Among other factors, self-efficacy appears to be significantly predictive of resident well-being. High self-efficacy suggests that residents feel prepared and capable. Interventions to improve residents' general self-efficacy should be explored as a possible mechanism to improve well-being. (J Surg Ed 76:321−328. © 2018 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: self-efficacy, burnout, well-being, residency, medical education

COMPETENCIES: Interpersonal and Communication Skills

INTRODUCTION

High levels of anxiety,[1] burnout,[2,3] and depression[4] have been found in physicians, particularly in residents. In addition to the inherent importance of physicians' well-being, their having good psychological and physical health is crucial because of the association between physicians' well-being and patient care outcomes. Research has demonstrated links between personal stressors to physicians and poorer patient care, such as medical mistakes and irritability with patients.[5,6] In particular, burnout and depression have both been associated with medical errors.[7-9] Thus, physician well-being must be a top priority in order to optimize patient care.

General self-efficacy is defined as "individuals' perception of their ability to perform across a variety of situations."[10] Self-efficacy has been shown to be correlated

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with many important qualities including self-esteem,[10] conscientiousness, goal setting, and goal commitment.[11] It has been suggested that self-efficacy most closely captures the idea of confidence,[12] which has been the subject of much discussion in surgical training particularly since the introduction of the 80-hour work week.[13-15] One common argument is that surgical residents have less confidence in their ability to practice independently since the work hour restrictions went into effect. Although confidence lacks a shared definition in the literature and is difficult to measure,[12] self-efficacy can be employed as an easily quantifiable proxy for the more subjective term confidence. Thus, measuring self-efficacy among surgical residents is an important contribution to this conversation.

There is reason to suspect that self-efficacy and well-being are related.[16] Intuitively, the more capable a person feels, the better that person feels about him- or herself. In this study, we examine the relationship between general self-efficacy, burnout, and psychological well-being in a sample of surgical residents. Our primary hypothesis is that self-efficacy will be associated with better well-being.

MATERIAL AND METHODS

Setting

In the context of a larger study, we surveyed residents from 9 surgical subspecialties at 1 academic medical center from fall 2010 to spring 2013. All instruments were administered during each data collection. Data collection occurred both in the spring and in the fall. If a resident responded more than once, only the resident's first set of responses was included in analyses. All postgraduate years as well as residents on research and/or professional development time were represented in the sample.

Measures

Residents responded to a validated general self-efficacy scale[17] consisting of 8 Likert-type items with answers ranging from "Strongly disagree" to "Strongly agree." Table 1 contains the text of all 8 items in the scale. The self-efficacy scale ranges from 1 to 5, with higher values indicating more self-efficacy.

Burnout was measured using the Maslach Burnout Inventory.[18] The inventory includes 22 items, each of which has 7 answer choices: "Never," "A few times a year or less," "Once a month or less," "A few times a month," "Once a week," "A few times a week," or "Every day." There are 3 main subscales of the Maslach Burnout Inventory, and in this study, we examine 1 negative aspect of burnout, emotional exhaustion, and 1 positive aspect, personal accomplishment. Each subscale is represented as an average of the items rated from 1 to 7 that form the subscale. Higher values indicate more emotional exhaustion or personal accomplishment, respectively. Burnout is characterized by high levels of emotional exhaustion and low levels of personal accomplishment. Values of the subscales are classified into high, average, and low experienced burnout based on the tertiles of the normative distribution among medical workers, which includes physicians and nurses.[19] For the emotional exhaustion scale, scores of 4.00 out of 7 or higher indicate high burnout, scores of 2.78 or lower indicate low burnout, and scores between the cut-off points are classified as average burnout. Using the personal accomplishment subscale, scores of 5.71 or lower indicate high burnout, scores of 6.71 or higher indicate low burnout, and scores between the cut-off points are classified as average burnout.

We used the Dupuy Psychological General Well-Being Index to measure the general psychological well-being of each of the residents.[20] This measure consists of 22 items, each with 6 possible responses, and is scored such that higher values indicate better psychological well-being. Here, we present values of the Well-Being Index as the average of the 22 items.

Demographic information, including race and/or ethnicity, gender, and age were collected. In regression analyses, race was dichotomized into non-Hispanic white versus nonwhite. Additionally, each resident's current postgraduate year and surgical specialty were recorded.

Data Analysis

Descriptive statistics for demographic variables, with numbers and percentages, and for the scales and performance data, with means and standard deviations, were calculated. Bivariate associations were assessed using Spearman's correlations between self-efficacy and the continuous variables. We compared men and women using *t* tests. We compared levels of self-efficacy in different surgical specialties and different postgraduate years using analysis of variance. Next, multivariable regression analysis was used to determine the relationship between self-efficacy and several outcomes while controlling for gender, postgraduate year, age, and race. Interactions between self-efficacy and gender were also analyzed. All statistical analyses were done using SAS (Version 9.4, SAS Institute, Cary, NC). The research protocol was approved by the Institutional Review Board at Stanford University.

RESULTS

Preliminary Analyses

One hundred and seventy nine residents participated in this study (response rate 76%). Table 2 presents

demographic information for the sample. The majority of participants were male (63%), and slightly under a half (46%) were white. A third of the sample reported their race as Asian and/or Pacific Islander (33%). Half of the residents were junior residents (32% and 18% of the sample were PGY 1 and PGY 2, respectively), and 21 residents (12%) were engaged in a year dedicated to research or professional development. The residents were from 9 different specialties, the most common of which was general surgery (30%).

Table 3 shows descriptive statistics for self-efficacy and the outcomes of interest. The mean self-efficacy in the sample was 4.27 out of 5 with a standard deviation of 0.68. Compared to validity studies of the self-efficacy scale, where the mean general self-efficacy was 3.87 in undergraduates and 4.14 in a sample of managers,[17] the residents' self-efficacy was high. The mean emotional exhaustion among the residents was 3.56 out of 7 with a standard deviation of 1.19. Based on the emotional exhaustion subscale, 35% (63/179) of residents experienced high burnout, 38% (68/179) experienced average burnout, and 27% (48/179) experienced low burnout. The mean personal accomplishment was 5.74 out of 7 with a standard deviation of 0.91. Based on the personal accomplishment subscale, only 11% (20/179) of residents experienced high burnout, while 50% (89/179) experienced average burnout and 39% (70/179) experienced low burnout. While 45% of the residents reported high burnout as indicated by either high emotional exhaustion or low personal accomplishment, only 1% (2/179) experienced both high emotional exhaustion and low personal accomplishment.

The mean value for general psychological well-being was 4.64 (standard deviation 0.72), which is similar to a reference population (reference mean 4.68).[21] We found statistically significant differences between women and men in emotional exhaustion ($t = -2.19$, df = 177, p = 0.0299) and general psychological well-being ($t = 2.05$, df = 177, p = 0.0416) such that women had higher emotional exhaustion (3.82 vs 3.42) and lower general psychological well-being (4.50 vs 4.72) than men. There were no gender differences in either self-efficacy or personal accomplishment (ps $\geq$ 0.14). We found no differences in self-efficacy by specialty (F (8, 170) = 0.95, p = 0.48) or by postgraduate year (F(5, 173) = 0.73, p = 0.60).

Burnout

In our analyses of correlations between self-efficacy and burnout, we found a significant inverse correlation between self-efficacy and emotional exhaustion (Table 4; $r_s = -0.28$, p = 0.0002) such that greater self-efficacy was associated with less emotional exhaustion. We found a significant moderate, positive correlation between self-efficacy and personal accomplishment ($r_s = 0.37$, p < 0.0001) such that greater self-efficacy was associated with a greater sense of personal accomplishment.

TABLE 1. Components of the Self-Efficacy Scale

Item	Question
1	"I will be able to achieve most of the goals that I have set for myself."
2	"When facing difficult tasks, I am certain that I will accomplish them."
3	"In general, I think that I can obtain outcomes that are important to me."
4	"I believe I can succeed at most any endeavor to which I set my mind."
5	"I will be able to successfully overcome many challenges."
6	"I am confident that I can perform effectively on many different tasks."
7	"Compared to other people, I can do most tasks very well."
8	"Even when things are tough, I can perform quite well."

Regression analyses were consistent with our correlational findings. In separate adjusted regression analyses controlling for gender, age, ethnicity, postgraduate year, and the interaction between self-efficacy and gender, self-efficacy was significantly negatively predictive of emotional exhaustion (Table 5; $B = -0.43$, p = 0.01). In a second model controlling for the same factors, there was a positive, statistically significant association between self-efficacy and personal accomplishment ($B = 0.33$, p = 0.02). We found no evidence of an interaction between gender and self-efficacy in regression analyses predicting burnout (ps $\geq$ 0.68). Nonwhite race was associated with a lower sense of personal accomplishment ($B = -0.28$, p = 0.05), but it was not predictive of emotional exhaustion. Additionally, gender, age, and postgraduate year were not significant covariates in either of the burnout models (ps $\geq$ 0.12).

Psychological Well-Being

We found a significant moderate, positive correlation between self-efficacy and general psychological well-being ($r_s = 0.35$, p < 0.0001) such that greater self-efficacy was associated with better psychological well-being.

In the adjusted regression analyses, there was a positive, statistically significant association between self-efficacy and general psychological well-being ($B = 0.34$, p = 0.001). As in the models for burnout, we found no evidence of an interaction between gender and self-

TABLE 2. Descriptive Statistics for Sample Demographics

Characteristic	n (%)
Gender	
Female	66 (36.87%)
Male	113 (63.13%)
Postgraduate year	
1	57 (31.84%)
2	32 (17.88%)
3	25 (13.97%)
4	21 (11.73%)
5	23 (12.85%)
Research and/or PD	21 (11.73%)
Specialty	
Cardiothoracic	7 (3.91%)
General surgery	55 (30.73%)
Neurosurgery	17 (9.50%)
ENT	19 (10.61%)
Ophthalmology	11 (6.15%)
Orthopedics	27 (15.08%)
Plastics	21 (11.73%)
Urology	19 (10.61%)
Vascular	3 (1.68%)
Race and/or ethnicity (N = 175)	
White	80 (45.71%)
Black or African-American	8 (4.57%)
Hispanic or Latino	11 (6.29%)
Asian and/or Pacific Islander	57 (32.57%)
Native American	0 (0.00%)
Middle Eastern	10 (5.71%)
Mixed race	9 (5.14%)
Marital status (N = 175)	
Single, never married	99 (56.57%)
Married	72 (41.14%)
Divorced	4 (2.29%)
Separated but married	0 (0.00%)
Widowed	0 (0.00%)

efficacy in the model predicting general psychological well-being (p = 0.81). Additionally, gender, age, and race were not significant covariates in the model predicting general psychological well-being ($ps \geq 0.17$). In regression analysis, it appears that postgraduate year was significantly predictive of general psychological well-being ($F(5, 158) = 2.88$, $p = 0.02$), and that second-, third-, fourth-year, and research residents had significantly different general psychological well-being compared to residents in postgraduate year 1 ($ps \leq 0.0483$). However, post hoc analyses adjusted for multiple comparisons indicate the only significant pairwise difference in general psychological well-being was between those in postgraduate year 1 and those in postgraduate year 3, with higher self-efficacy among first year residents (adjusted mean psychological well-being = 4.89 vs 4.37, p = 0.0214). No other pairwise comparisons of general psychological well-being between postgraduate years were statistically significant ($ps \geq 0.11$).

DISCUSSION

In this study, we examined the association between self-efficacy and 3 indicators of well-being: emotional exhaustion, personal accomplishment, and general psychological well-being. We found an inverse association between self-efficacy and emotional exhaustion such that higher self-efficacy was associated with lower emotional exhaustion. Positive associations existed between self-efficacy and personal accomplishment and general psychological well-being. The associations between self-efficacy and the well-being outcomes persisted after controlling for gender, age, race, and year of residency. Finally, we found no evidence of an interaction between gender and self-efficacy, meaning that the relationship between self-efficacy and the well-being outcomes does not seem to differ by gender.

Almost half of the residents in our sample experienced either high emotional exhaustion or low personal accomplishment, but this was driven primarily by residents reporting high emotional exhaustion. Additionally, only 1% of the sample showed both high emotional exhaustion and low personal accomplishment. Thus, it is noteworthy that residents found their work fulfilling. This finding was contrary to that described in a previous study of medical students who showed matching levels of high emotional exhaustion along with low personal

TABLE 3. Descriptive Statistics for Self-Efficacy and Well-Being Scales

Measure	Mean (SD) Overall	Women	Men	p Value*
Self-efficacy†	4.27 (0.68)	4.17 (0.77)	4.33 (0.63)	0.1350
Emotional exhaustion‡	3.56 (1.19)	3.82 (1.06)	3.42 (1.25)	0.0299
Personal accomplishment‡	5.74 (0.91)	5.77 (0.88)	5.72 (0.93)	0.7475
WBI§	4.64 (0.72)	4.50 (0.74)	4.72 (0.70)	0.0416

*Test for difference between women and men.
†Scaled 1 = lowest to 5 = highest.
‡Scaled 1 = lowest to 7 = highest.
§Scaled 1 = lowest to 6 = highest.

accomplishment.[22] Interestingly, the authors of that study noted that personal accomplishment increased over the years in medical school, which would be consistent with our findings of higher personal accomplishment in residency. Our findings indicate that the surgical residents have a similar level of emotional exhaustion, but they also have a stronger sense of personal accomplishment compared to medical students.

There is some literature measuring burnout among surgical residents specifically. A survey of orthopedic surgery residents found high emotional exhaustion,[23] and a longitudinal study of general surgery residents reported that 50% of surgery residents had high emotional exhaustion.[24] A cross-sectional study from 2016 of general surgery residents found that 69% of residents met the criteria for burnout on at least one of the burnout subscales.[25] A review of burnout in residents reported high levels of emotional exhaustion among residents in a variety of surgical and nonsurgical programs.[2] A study of internal medicine residents found that 76% met the criteria for burnout, and those residents who were experiencing burnout were more likely to report providing suboptimal patient care.[26] Moderate rates of emotional exhaustion and low to moderate rates of lack of personal accomplishment have also been documented in family practice residents.[27] Our work adds to this body of literature and demonstrates consistent findings in a group of residents from several surgical specialties.

In the context of high burnout rates and poor psychological well-being, it is important to explore factors that can improve mental health. Here, we have shown that self-efficacy is positively associated with well-being. This is meaningful because self-efficacy is malleable and can thus be improved. Researchers have implemented interventions to improve self-efficacy in a variety of populations,[28,29] but studies specifically targeting increasing self-efficacy in surgical residents are limited. One study focused on improving self-efficacy for surgeons training in minimally invasive techniques proposed several practical suggestions that can be applied in a surgical setting.[30] These included both physical changes such as eliminating distractions in the surgical environment and psychological changes such as learning strategies for coping with complex tasks and reducing anxiety. They also suggested using different methods to enhance self-efficacy depending on an individual's perceived and actual capabilities. A review found strong evidence of an association between self-efficacy and work performance and suggested that interventions to improve self-efficacy may be particularly effective in improving performance.[31] However, the study found that task complexity moderated the relationship between self-efficacy and performance such that the association was weaker for high complexity tasks. Finally, an interventional study examined change in self-efficacy and performance in a group of surgical trainees and recent fellows using

TABLE 4. Correlations Between Self-Efficacy and Well-Being

Measure	N	r_s	p Value
Emotional exhaustion	179	−0.28	0.0001
Personal accomplishment	179	0.37	<0.0001
WBI	179	0.35	<0.0001

TABLE 5. Linear Regression Analyses Predicting Well-Being Scales (N = 164 for all models)

	Outcome					
	Emotional Exhaustion		Personal Accomplishment		WBI	
	B	p Value	*B*	p Value	*B*	p Value
Self-efficacy	−0.42	0.0127*	0.33	0.0185*	0.34	0.0010†
Female gender‡	0.54	0.6405	−0.29	0.7592	−0.40	0.5705
Self-efficacy × female gender	−0.03	0.9171	0.09	0.6776	0.04	0.8072
Nonwhite race§	0.12	0.4756	−0.28	0.0488*	−0.14	0.1714
Age	−0.01	0.9100	0.01	0.1175	−0.00	0.6307
PG year‖						
2	0.05	0.8488	−0.12	0.5847	−0.31	0.0483*
3	0.75	0.0077†	−0.30	0.2217	−0.53	0.0018†
4	0.32	0.2709	−0.12	0.6297	−0.36	0.0414*
5	0.03	0.9153	0.28	0.2252	−0.32	0.0572
Research and/or PD	0.17	0.5558	−0.42	0.0811	−0.45	0.0106*

*$p < 0.05$.
†$p < 0.01$.
‡Male is the reference group.
§White is the reference group.
‖PGY 1 is the reference group.

simulation sessions challenging nontechnical skills.[32] They also examined the effects of the intervention on those with particularly high- or low-reported self-efficacy because having perceived ability greater than or less than actual ability is potentially problematic. While they found no significant difference in self-efficacy overall, the intervention had positive effects in terms of modifying inflated or depressed self-efficacy.

This research also contributes to the existing literature on confidence among surgical residents. Despite the perception that residents who train in the new era of work hour restrictions have less confidence than those who preceded them, there are little precise data. A review of 15 studies on confidence in general surgery residents found that a third of studies on the topic had positive or neutral conclusions, and the remaining studies reported low confidence or readiness to practice.[12] However, the author notes that while many of the articles expressed a sense of a deterioration of confidence over time, particularly since the implementation of the duty hour restrictions, there is no directly comparable historical data. Using the more precise measure of self-efficacy, our data indicate that residents may feel prepared and capable. In addition, it may be that the messages residents hear about their lack of preparedness for independent practice lowers self-efficacy and is harmful.[12] Research has found that residents expressed worry that those teaching them, who trained before the restrictions, have doubts about their ability to succeed.[33] It is reasonable that hearing these messages about the inferiority of current training would lead residents to be less confident.

It is important to note that the measure of self-efficacy used in this study captures general self-efficacy rather than surgery-specific self-efficacy. In this population, it is not unreasonable to believe that there could be differences between general self-efficacy and surgical self-efficacy. The scores using the general self-efficacy scale indicate the residents believe themselves to be generally competent in their performance, and indeed all the residents have successfully progressed through medical school into a competitive residency program. But it is possible that while they have a strong perception of their ability to perform generally in life, they could have different levels of self-efficacy in the surgical domain. Because there is currently not a method to assess surgery-specific self-efficacy, development of such a tool is a direction for future research. An additional future direction would be a longitudinal study of changes in residents' self-efficacy over the course of their residencies. As the study sample includes residents of all postgraduate years and multiple surgical subspecialties, the heterogeneity may be viewed as both a strength and a weakness. Other limitations of this study include a single site and modest sample size.

CONCLUSIONS

We found an inverse relationship between self-efficacy and emotional exhaustion among a sample of surgical residents. We also found positive associations between self-efficacy and psychological well-being and feelings of personal accomplishment. While the correlations do not imply causality, our research suggests that interventions to improve self-efficacy may be effective tools to address physicians' well-being.

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