

Stress From Uncertainty and Resilience Among Depressed and Burned Out Residents: A Cross-Sectional Study



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The authors have no conflicts of interest to disclose.

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Received for publication November 7, 2017; accepted March 1, 2018.

ABSTRACT

BACKGROUND: Depression and burnout are highly prevalent among residents, but little is known about modifiable personal-ity variables, such as resilience and stress from uncertainty, that may predispose to these conditions. Residents are routinely faced with uncertainty when making medical decisions.

OBJECTIVE: To determine how stress from uncertainty is related to resilience among pediatric residents and whether these attributes are associated with depression and burnout.

METHODS: We surveyed 86 residents in pediatric residency programs from 4 urban freestanding children's hospitals in North America in 2015. Stress from uncertainty was measured with the use of the Physicians' Reaction to Uncertainty Scale, resilience with the use of the 14-item Resilience Scale, depression with the use of the Harvard National Depression Screening Scale; and burnout with the use of single-item measures of emotional exhaustion and depersonalization from the Maslach Burnout Inventory.

RESULTS: Fifty out of 86 residents responded to the survey (58.1%). Higher levels of stress from uncertainty correlated with lower resilience ($r = -0.60$; $P < .001$). Five residents (10%) met

depression criteria and 15 residents (31%) met burnout criteria. Depressed residents had higher mean levels of stress due to uncertainty (51.6 ± 9.1 vs 38.7 ± 6.7 ; $P < .001$) and lower mean levels of resilience (56.6 ± 10.7 vs 85.4 ± 8.0 ; $P < .001$) compared with residents who were not depressed. Burned out residents also had higher mean levels of stress due to uncertainty (44.0 ± 8.5 vs 38.3 ± 7.1 ; $P = .02$) and lower mean levels of resilience (76.7 ± 14.8 vs 85.0 ± 9.77 ; $P = .02$) compared with residents who were not burned out.

CONCLUSIONS: We found high levels of stress from uncertainty, and low levels of resilience were strongly correlated with depression and burnout. Efforts to enhance tolerance of uncertainty and resilience among residents may provide opportunities to mitigate resident depression and burnout.

KEYWORDS: burnout; depression; graduate medical education; resilience; uncertainty

ACADEMIC PEDIATRICS 2018;18:698-704

WHAT'S NEW

High levels of stress from uncertainty and low levels of resilience appear to be associated with depression and burnout. Tolerance of uncertainty and resilience may be protective against depression and burnout, potentially providing targets for curricular intervention in residency programs.

DEPRESSION AND BURNOUT are highly prevalent among physicians-in-training worldwide and across specialties.¹⁻³ Although future physicians begin medical school with mental health profiles better than those of college graduates pursuing other fields,⁴ research studies show rates of depression

and burnout among physicians-in-training that are consistently higher than those of the matched general population,^{5,6} with some research suggesting that the gap is widening.⁷ Physician burnout and depression have profound implications for physician well-being,^{8,9} patient satisfaction, patient safety,^{1,10} and quality of health care delivery.¹¹ Little is known about modifiable personality variables that may predispose physicians-in-training to burnout and depression.

Reaction to uncertainty and resilience are dynamic personality states that can be modified, reflecting a complex combination of inherited susceptibility and environmental influences.^{12,13} Interdisciplinary studies that involve biosciences as well as behavioral science now strongly support the contribution of genetics to resilience as well as interactions

in the environment, supporting the notion that it is an attribute that can be strengthened—a state and a trait.¹⁴ The practice of medicine involves inherent uncertainty. Doctors continually make decisions in the face of incomplete knowledge, diagnostic uncertainty, and unpredictable individual responses to therapies. Tolerance of uncertainty has been identified as an important competency for physicians, linked to effective communication,¹⁵ resource use,¹⁶ and rates of burnout¹⁷ in small studies. Among the 21 competencies defined by the Accreditation Council of Graduate Medical Education as important to foster, measure, and track in physicians over time is “the capacity to accept that ambiguity is part of clinical medicine and to recognize the need for, and to utilize appropriate resources in, dealing with uncertainty,” highlighting the importance of this attribute for pediatric trainees. Resilience is a multidimensional construct that is acknowledged to be associated with numerous desired outcomes, including physical and emotional health.¹⁸ There is, however, scant research about how resilience operates in physicians, and how this attribute is affected by reactions to uncertainty.

How to stem the rise of burnout in health professionals is an important unanswered question.⁷ In 2014, the American Academy of Pediatrics published a clinical report on physician health and wellness, acknowledging the high rate of burnout among pediatric practitioners and trainees and calling for pediatricians to lead a national movement to promote physician well-being.¹⁹ However, the literature on burnout among residents has primarily focused on internal medicine and surgery^{1,2,5}; there have been no studies to date that looked at the relationship between burnout and stress from uncertainty in pediatric trainees. Better understanding of the attributes needed to thrive in a challenging environment is essential as we seek to develop targeted interventions to mitigate burnout and depression, enhance patient safety, and improve health care delivery systems. To address this knowledge gap, we studied pediatric residents in 4 centers to determine how stress from uncertainty is related to resilience, and whether these attributes are associated with depression and burnout.

METHODS

STUDY DESIGN AND SETTING

We conducted a cross-sectional study of physicians-in-training in 4 pediatric residency training programs in the United States and Canada, after receiving approval from the Institutional Review Boards at all of the participating institutions. Data were collected from May 2015 through December 2015, concurrent with a larger data collection for the patient and family-centered I-PASS study, an ongoing study of communication in hospitals. The 4 sites included 2 free-standing children’s hospitals, 1 pediatric hospital within a larger system, and 1 pediatric unit within an adult hospital; they ranged in size from 35 to 84 residents, with sites located in the eastern and western regions of North America. The study units included inpatient general pediatrics, acute care, and complex care. All residents in pediatrics and medicine-pediatrics who were rotating through the study units

at the time of study were eligible to participate, except those on extended leave or those working in nonpediatric settings. We were unable to collect data on residents within each program that were not in the units during the study period. Residents who agreed to participate in the study provided written informed consent. Participants were aware that we were collecting data on their health during the study. Precautions were taken to secure confidentiality, including the assignment of coded identification numbers and secure storage of data. Participants were informed that the only instance in which confidentiality would be broken would be if they were an immediate danger to themselves or others, that is, if they demonstrated suicidal or homicidal ideation.

DATA COLLECTION

Participants completed a questionnaire, as part of their end-of-rotation survey, that consisted of several validated scales, including stress from uncertainty, resilience, depression, and burnout. Demographic characteristics also were collected, along with an item asking the residents about “your satisfaction with your job,” on a 5-item Likert-type scale ranging from poor to excellent.

To determine stress from uncertainty, we used the Physicians’ Reaction to Uncertainty Scale, developed by Gerrity et al,²⁰ which measures affective reactions to uncertainty in clinical situations. Three subscales were included: anxiety caused by uncertainty (Cronbach alpha, 0.85), concern about bad outcomes (Cronbach alpha, 0.74), and reluctance to disclose uncertainty to patients (Cronbach alpha, 0.76). The items are rated on a 6-point Likert-type scale. Its ability to measure relevant differences in reaction to uncertainty has been demonstrated in several studies,^{16,20} and it is distinguished by its well documented psychometric properties and its relevance to medical situations. The subscales are scored so that higher values indicate more stress from uncertainty.

The Resilience Scale 14 measures global resilience, reflecting 5 core characteristics: purpose/meaningfulness, perseverance, self-reliance, equanimity, and existential aloneness.¹⁸ The 14 items are scored on a 7-point Likert-type scale, which are summed to arrive at a global score, with a higher score reflecting increased resilience.

We used 2 standardized screening tools—the Harvard National Depression Screening Day Scale,²¹ and single-item measures of emotional exhaustion and depersonalization from the Maslach Burnout Inventory (MBI)^{22,23}—to assess the prevalence of depressive symptoms and burnout. Both scales were chosen for their brevity, ease of administration, sensitivity, and specificity.

The Harvard National Depression Screening Day Scale is a 10-item, validated screening tool for depression. A score in the upper third (≥ 9) has been found to be 94% specific and 95% sensitive for a major depressive episode, similarly to both the Beck Depression Inventory and the Zung Self-Rating Depression Scale, which are twice the length.²¹ We defined participants as being depressed if they scored ≥ 9 .

Although the 22-item MBI is the criterion standard in medical research literature for the assessment of burnout,²²

Table. Characteristics of Participants (n = 50)

Variable	n (%)
Study site	
1	6 (12)
2	9 (18)
3	15 (30)
4	20 (40)
Year of residency*	
Postgraduate year 1	27 (54)
Postgraduate year 2	8 (16)
Postgraduate year 3	10 (20)
Postgraduate year 4	1 (2)
Gender*	
Female	31 (62)
Male	15 (30)
Age <30 y*	32 (64)

*Information missing for 4 participants.

its length limits feasibility for use in surveys addressing multiple content areas within space constraints. Burnout was therefore measured using 2 single-item measures adapted from the MBI. Emotional exhaustion was assessed by the statement “I feel burned out from my work,” and depersonalization by the statement “I’ve become more callous toward people since I took this job.” Each question was answered on a 7-point Likert-type scale with response options ranging from never to daily. These 2 items have been shown to stratify risk of burnout in physicians and medical students.^{23,24} Consistent with previous literature,^{2,22,23} participants indicating that they experienced symptoms in either domain at least weekly were considered to meet the criteria for high burnout.

STATISTICAL ANALYSIS

Standard descriptive statistics were used to characterize the sample. To evaluate associations between resilience, stress

from uncertainty, depression, and burnout, we conducted a series of bivariate analyses assessing for confounders with the dependent variable by means of *t* tests or 1-way analysis of variance for continuous variables (for example age), and Pearson chi-square tests for categorical variables (for example sex). We used Fisher exact tests for categorical comparisons when distributional assumptions of chi-square were not met. All tests were 2 sided, with a type I error level of .05. Receiver operating characteristic (ROC) curves were used to assess possible cutoffs for stress from uncertainty scores to predict depression and burnout in pediatric residents. All analyses were performed with the use of commercially available statistical software (Stata version 14.1; Statacorp).

RESULTS

Fifty of 86 eligible residents (58% response rate) participated from 4 sites in North America. No significant differences were found between age, gender, or postgraduate year for participants and nonparticipants. There were missing data for resilience, burnout, and depression for 1 resident, who was excluded from our analysis. The Table presents the demographic data for participants.

PHYSICIANS’ STRESS FROM UNCERTAINTY AND RESILIENCE

Across the study cohort, mean resilience was 82.5 ± 12.0 (range, 39–98). According to established cutoff points,²⁵ 28 residents (57.1%) had high resilience scores (range, 82–98) and 8 residents (16.3%) had low resilience scores (range, 14–73). Resilience was not related to age, gender, site, or year of residency. Stress from uncertainty was not related to age, gender, or year of residency. Overall, there was a strong negative correlation between stress from uncertainty and resilience ($r = -.60$; $P < .001$; Fig. 1).

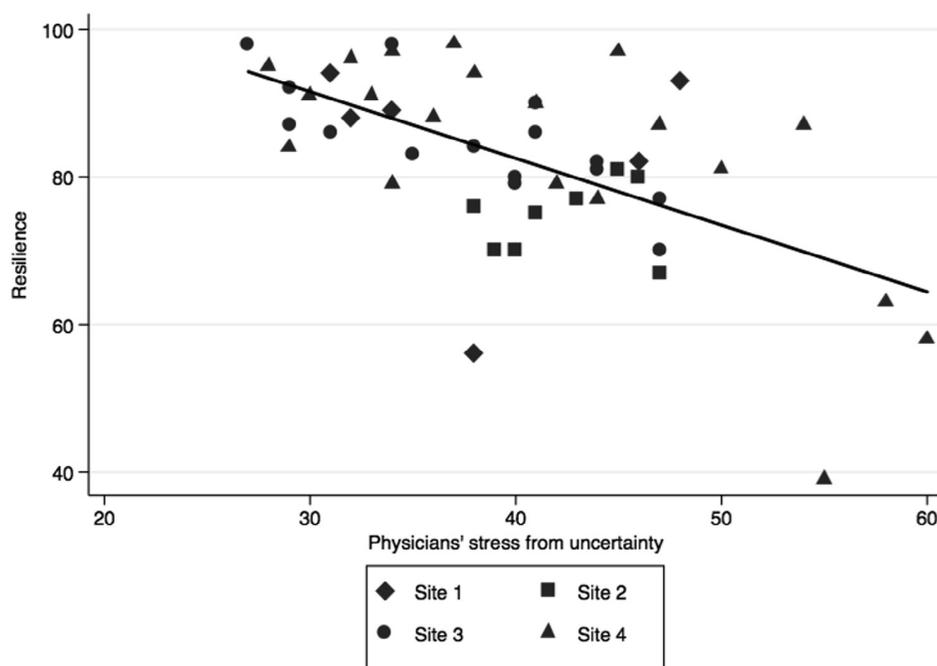


Figure 1. Correlation between physicians' stress from uncertainty and resilience.

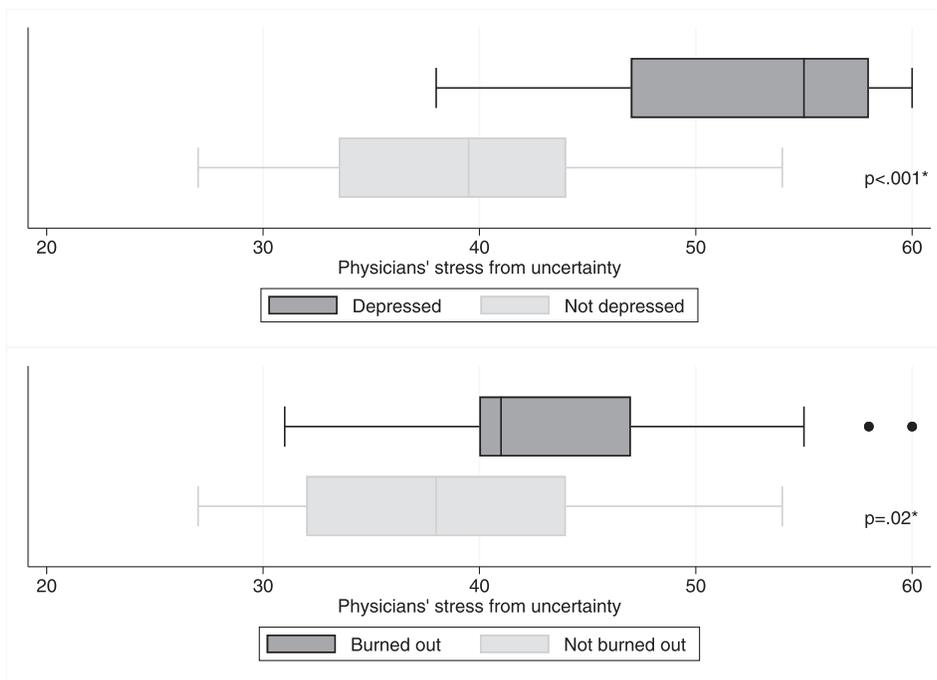


Figure 2. Physicians' stress from uncertainty scores for depressed and nondepressed residents and burned out and non-burned out residents. Box and whisker plots show median, interquartile range, upper and lower adjacent values, and outliers. P values were calculated with the use of 2-sided t tests.

DEPRESSION

Five residents (10%) met criteria for depression. Depression was not related to age, gender, or year of residency. Depressed residents were significantly more likely to report their job satisfaction as poor than nondepressed residents (60% vs 4.5%; $P = .006$). Depressed residents were

significantly more likely to have increased stress from uncertainty than nondepressed residents (51.6 ± 9.07 vs 38.7 ± 6.7 ; $P < .001$; Fig. 2). Figure 3 shows the subscales within the physicians' reaction to uncertainty score (depressed vs nondepressed residents, respectively): anxiety due to uncertainty (21.4 ± 4.04 vs 17.5 ± 3.99 ; $P = .046$); concern

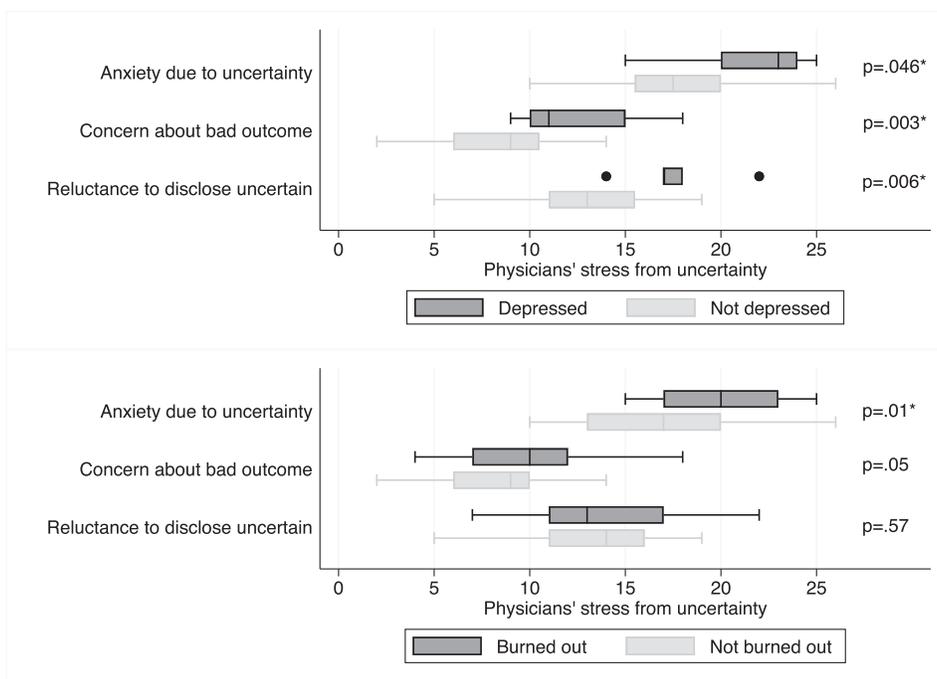


Figure 3. Subscales for physicians' stress from uncertainty scores for depressed and nondepressed residents and burned out and non-burned out residents. Box and whisker plots show median, interquartile range, upper and lower adjacent values, and outliers. P values were calculated with the use of 2-sided t tests.

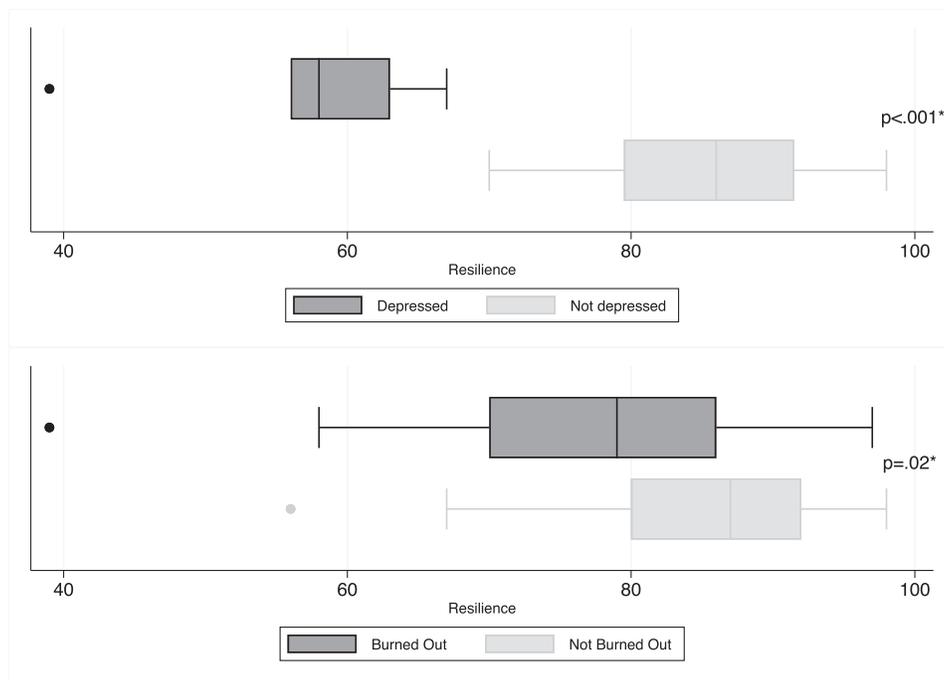


Figure 4. Resilience scores for depressed and nondepressed residents and burned out and non–burned out residents. Box and whisker plots show median, interquartile range, upper and lower adjacent values, and outliers. P values were calculated with the use of 2-sided t tests.

about bad outcome (12.6 ± 3.78 vs 8.18 ± 2.96 ; $P = .003$); and reluctance to disclose uncertainty (17.6 ± 2.88 vs 13.0 ± 3.42 ; $P = .006$).

We examined ROC curves for physicians' stress from uncertainty to assess whether there were possible cutoff scores that could predict depression and burnout. A physicians' reaction to uncertainty score of 47 had 80% sensitivity and 86% specificity for predicting depression (area under the ROC curve [AUC], 0.87; 95% confidence interval [CI], 0.65–1.0).

Depressed residents were significantly more likely to have low resilience (80%) than nondepressed residents (0%; $P < .001$). Similarly, depressed residents had significantly lower mean resilience scores than nondepressed residents (56.6 ± 10.7 vs 85.4 ± 7.97 ; $P < .001$; Fig. 4).

BURNOUT

Fifteen residents (31%) met the criteria for risk of burnout. Burnout was not related to age, gender, or year of residency. Twenty percent of burned out residents reported their job satisfaction as poor, compared with 6% of non–burned out residents ($P = .19$), although this tendency was not statistically significant.

Burned out residents were significantly more likely to have increased stress from uncertainty than non–burned out residents (44 ± 8.46 vs 38.3 ± 7.1 , respectively; $P = .02$; Fig. 2). On the subscale analyses of physicians' reaction to uncertainty, burned out residents versus non–burned-out residents had more anxiety due to uncertainty (20.1 ± 3.3 vs 17.0 ± 4.1 ; $P = .01$) and concern about bad outcome (10 ± 3.5 vs 8.03 ± 3.1 ; $P = .05$). There was no difference in burned out and non–burned out physicians' reluctance to disclose

uncertainty (13.9 ± 3.77 vs 13.3 ± 3.60 ; $P = .57$; Fig. 3). A physicians' stress from uncertainty score of 40 had 80% sensitivity and 59% specificity for predicting burnout (AUC, 0.69; 95% CI, 0.53–0.85).

Burned out residents were significantly more likely to have low resilience (20%) than non–burned out residents (2.9%; $P = .03$). Burned out residents had a significantly lower mean resilience score than non–burned out residents (76.7 ± 14.8 vs 85.0 ± 9.77 ; $P = .02$; Fig. 4).

DISCUSSION

This study adds new knowledge by comprehensively evaluating the relationships of stress from uncertainty, resilience, burnout, and depression in a sample of residents located in different geographic areas of North America. This is the first study among pediatric residents to address burnout and stress from uncertainty. We found a strong relationship between stress from uncertainty and resilience among residents. The study showed 10% of surveyed residents to be depressed. Thirty-one percent of surveyed residents met the cutoff for risk of burnout (reporting symptoms at least weekly). Residents who were more stressed by uncertainty were significantly more likely to be depressed or burned out. From our results, we were able to identify the point on the stress from uncertainty score that best predicted risk of depression and burnout. Our findings suggest that it may be important to develop interventions that acknowledge and manage uncertainty in clinical environments. Tolerance of uncertainty appears to be closely linked with resilience, and these 2 attributes appear to be protective against burnout and depression, potentially providing areas to target for curriculum development.

This study builds on earlier research evaluating relationships between physician-in-trainings' resilience and mental health. For example, previous studies found that physicians-in-training who lack resilience were significantly more likely to be depressed or burned out.²⁶ Previous studies have been inconsistent in reporting higher levels of tolerance of uncertainty in men or women, with some reporting higher levels in women,²⁷ some reporting higher levels in men,²⁸ and others remaining inconclusive.²⁹ We found stress from uncertainty to be independent from gender and found no association with age or year of residency. Our study showed 10% of residents to be depressed; rates in trainees reported in other studies range from 7% to 49%.¹ Although our results are at the lower end of this range, they are double the rates found in the general population (4%–5%).⁶ The prevalence of burnout in residents has been shown to range from 27% to 75%, which is higher than for medical students or practicing physicians.² Although the present results (31%) were at the lower end of this range, we found similar rates of burnout in a recent study that looked at pediatric resident burnout and attitudes towards patients, where 39% of residents were reported to be suffering burnout.³⁰

Our results have important implications. Much evidence suggests that both tolerance of uncertainty and resilience are states, not traits, and therefore amenable to change through an educational and experiential process.^{12,31} Anxiety caused by uncertainty was the highest-rated facet of stress from uncertainty in our analysis of the subscales and was significantly associated with depression and burnout. Reframing and acknowledging uncertainty as a surmountable challenge, not a threat, could potentially help to quell some of this anxiety.³² Identifying and effectively managing trainee burnout and depression has proven to be extremely difficult, with high rates persisting in numerous studies over time, despite increased attention to this issue. It is important that we begin to focus on developing early warning signals and surrogate markers that could help to identify trainees who are struggling, because it is often hidden until it reaches dangerous levels.³³ More residents reported symptoms of emotional exhaustion than depersonalization, suggesting that the negative effects of burnout have consequences for the individual before it is obvious to the outside world that they are disengaging. Physicians who do burn out are likely to have been functioning suboptimally for some time before they leave medical practice.³⁴ The findings of the present study add additional evidence to support developing curricula interventions to enhance and nurture tolerance of uncertainty and resilience, because this could be a means of addressing the high rates of depression and burnout among residents, with ultimate effects on patient care. The high prevalence of psychologic distress among physicians and the disturbing ramifications this distress can have on residents' professional development, personal lives, and patients necessitate a response by institutions and training programs.

This study has several limitations. It was conducted concurrently with baseline data collection from a large multicenter study; this offered us the ability to collect far more data than would otherwise have been feasible, but we recognize that the design of the study was consequently

atypical. Although it was a multicenter study, it focused solely on residents in pediatrics, so it is unclear to what extent our findings can be generalized across other specialties in medicine. However, there is no reason to postulate that relationships between resilience, stress from uncertainty, burnout, and depression would be unique to pediatrics. Nevertheless, further studies are needed to confirm our findings in other specialties. The use of established psychometric instruments allowed us to compare our findings with the general population and other samples of medical students, residents, and practicing doctors. Although we used measurement scales that have strong validity evidence, they are self-reported and potentially susceptible to social desirability bias. To address this, we collected responses in a deidentified and confidential manner. In addition, participants were unaware of the specific hypothesis of this study and we have no information to suggest that they would have chosen to participate or not on the basis of whether they were depressed or burned out. Our response rate of 58% is similar to other multisite studies of medical trainees.^{35,36} Although, therefore, our overall response rate is acceptable, we recognize that the different quantity of responses we got from each of the sites represents a small variable percentage of total residents within each program, which may have affected the results. It is important to note that this study was conducted in real pediatric settings, where other interventions that may have been underway that potentially could have confounded results, although we are aware of no other such interventions or initiatives. Because of the design of our study, we could only test for associations and cannot draw conclusions about causality from our findings alone. It will be important to develop additional evidence of causal relationships with the use of longitudinal studies.

Our findings give impetus to further psychometric and conceptual research on tolerance of uncertainty scales. Understanding how the attributes of tolerance of uncertainty and resilience can be recognized, developed, and supported during and after clinical training, could be enhanced by research with larger samples of physicians at all levels across specialties. Further studies are needed that concentrate on links between reactions to uncertainty and patient outcomes to establish to what extent it affects quality of care. Finally, we need further research into what triggers and drives the development of burnout, because without this knowledge it is hard to know what interventions to recommend.

CONCLUSION

Depression and burnout in trainees have a profoundly negative effect on individuals, patients, and quality of health care delivery.^{1,2,8–11} The present study adds to an increasing body of literature attempting to identify solutions to this problem.^{7,12,26,31,33,36} Overall, pediatric residency populations have not been well studied concerning burnout, and to our knowledge this is the first study to explore reactions to uncertainty across a diverse sample of pediatric residents and to evaluate the association between burnout and stress from uncertainty. We have shown that high levels of stress from uncertainty and low levels of resilience were strongly correlated with depression and burnout. Further

efforts to study and improve stress from uncertainty and resilience in physicians should be a priority. Doing so may be an important underused means of mitigating burnout and depression and improving patient safety.

ACKNOWLEDGMENTS

The authors thank the members of the Patient and Family Centered I-PASS Study Group and the residents, doctors, unit staff, and research assistants who helped us in our efforts to collect the data.

Financial disclosure: Drs Landrigan, Spector, West, and Sectish have received monetary awards, honoraria, and travel reimbursement from multiple academic and professional organizations for teaching and consulting on physician performance and handoffs. They have consulted with and hold equity in the I-PASS Institute, which seeks to train institutions in best handoff practices and aid in their implementation. Dr Landrigan has also served as a paid consultant to Virgin Pulse to help develop a Sleep and Health Program. He is supported in part by the Children's Hospital Association for his work as an Executive Council member of the Pediatric Research in Inpatient Settings network. In addition, Dr Landrigan has received monetary awards, honoraria, and travel reimbursement from multiple academic and professional organizations for teaching and consulting on sleep deprivation and safety, and he has served as an expert witness in cases regarding patient safety and sleep deprivation. Drs Simpkin, Khan, and Ms Garcia have no financial relationships relevant to this report to disclose.

Supported by a grant from the Patient-Centered Outcomes Research Institute (CDR-1306-03556; PI: Landrigan). Dr Khan's time was supported by an Agency for Healthcare Research and Quality K12 grant (K12HS022986; PI: Finkelstein).

Authorship statement: Dr Simpkin, Dr Spector, and Dr Landrigan conceptualized and designed the study, designed the data collection instruments, carried out the initial analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Dr Khan, Dr West, Dr Sectish, and Ms Garcia coordinated and supervised collection of data on participants at the four sites, assisted in data analysis, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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