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

HARVARD MEDICAL SCHOOL | Master of Medical Sciences in Medical Education

STRESS FROM UNCERTAINTY AND RESILIENCE AMONG DEPRESSED AND BURNT OUT RESIDENTS: CROSS-SECTIONAL STUDY

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Abstract

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

Study Design and Setting: Cross-sectional study of 50 residents in pediatric residency programs from four urban freestanding children's hospitals in the United States and Canada.

Main outcome measures: Stress from uncertainty using the Physicians' Reaction to Uncertainty Scale, resilience using the 14-item Resilience Scale, depression using the Harvard national depression screening scale, and burnout using single item measures of emotional exhaustion and depersonalization from the Maslach Burnout Inventory.

Results: There was a strong correlation between stress from uncertainty and resilience ($r = -.597$; $p<0.00001$). 5 residents (10%) met the criteria for depression and 15 residents (31%) met the criteria for high burnout. Depressed residents were more likely to be stressed by uncertainty (mean 51.6; SD 9.07 vs. mean 38.7; SD 6.73; $p=0.0003$) and to lack resilience (mean 56.6; SD 10.7 vs. mean 85.4; SD 7.97; $p<0.0001$) compared to residents who were not depressed. Burnt out residents were also more likely to be stressed by uncertainty (mean 44; SD 8.46 vs. mean 38.3; SD 7.13; $p=0.0186$) and to lack resilience (mean 76.7; SD 14.8 vs. mean 85.0; SD 9,77; $p=0.0242$) compared to residents who were not burnt out. We were able to identify the scores at which stress from uncertainty best predicts depression and burnout.

Conclusion: Depression and burnout are major problems among pediatric residents. We found strong correlations between stress from uncertainty, resilience, depression, and burnout. Efforts to enhance tolerance of uncertainty and resilience among residents may provide opportunities to mitigate resident depression and burnout.

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"...at once it struck me what quality went to form a Man of Achievement...

when a man is capable of being in uncertainties, mysteries, doubts,

without any irritable reaching after fact and reason."

- Keats, December 1817(1)

Chapter 1: Background

"A distressing feature in the life of which you are about to enter … is the uncertainty which pertains not alone to our science and art, but also to the very hopes and fears which make us men. In seeking out the absolute Truth we aim at the unattainable, and must be content with finding broken portions."

- Sir William Osler(2)

The medical landscape has changed dramatically in recent decades and continues to evolve rapidly as we move through the 21st century. Psychological demands on providers are intense, due to high responsibility and high stake outcomes. Resilience would seem essential. Many within the medical profession, both in training grades and beyond, are struggling to cope with these demands(3-5). This can lead to disastrous consequences for the individual physician's mental health(6) with a risk of burnout, disillusionment, depression, and suicidal ideation(7-10). The implication for society is also significant, with wasted years of training highly skilled individuals and wasted investment, diminished productivity, ineffective patient care, medical errors, reduced empathy, and decreased patient satisfaction(11-15). Physicians are slow to seek help(16,17) owing to fears of judgment, stigma(18), and punitive actions(19). Trainee depression and suicide are well-known concerns in the medical community that have not been adequately addressed. In study after study over the past two decades, rates of depression among trainees have been consistently elevated over general population rates(19-21). Better understanding and enhancement of the personal qualities and skills needed to thrive in healthcare's challenging environment is essential.

As Osler observes(2), the practice of medicine involves inherent ambiguity. Uncertainty in the field is, however, generally suppressed and ignored, consciously and subconsciously. Physicians are rationally aware, when pushed or discussing concepts theoretically, that uncertainty exists, but there is a deep-rooted unwillingness to acknowledge and embrace it. Strong defenses against, and denial of, uncertainties are consistent observations made by sociologists studying medical training(22). Tolerance of ambiguity has been studied in the social science literature as a cognitive and emotional personality variable since 1948(23). In a seminal study in 1957, Fox articulated three origins of uncertainty(24): limitations of individual knowledge; limitations of knowledge in the field; and the challenge of distinguishing between the two. Doctors continually make decisions based on imperfect data with limitations of knowledge, diagnostic uncertainty, complexities of treatment and outcome, and an unpredictability of patient responses.

In the face of this reality, medical culture demands and rewards certainty(25,26) and we have an environment that instills a need to be 'right'. Being uncertain is a vulnerable space to occupy, and may induce an affective stress reaction that physicians experience when they are unable to meet the perceived demand for certainty. We need to recognize that what is black and white in the abstract and classroom may rapidly become grey in practice, as clinicians seek to meet their individual patients' needs. Communicating scientific uncertainty is essential for shared decision-making(27) yet traditional medical education fosters a notion that uncertainty is a manifestation of ignorance and failure. A substantial body of literature has suggested that tolerance of ambiguity is an important competency for physicians, linking it to effective communication(28) resource use(29) and rates of burnout in small studies of adult physicians(30,31). However, empirical studies focusing on this attribute are sparse and limited,

and whilst there are suggestions that resident uncertainty may result in delays of care and, in some cases, patient harm(32) there is limited research to rigorously quantify the impact this attribute has on residents. In particular we need to understand at what point an individual's stress from uncertainty begins to have negative consequences. It may be that this could serve to highlight struggling trainees, and could be an important focus for future curricular interventions.

Resilience is born from the interplay between internal disposition and external experience, and is both static and contextual. It is clear from the literature that resilience can be built; it is not an innate trait or fixed state, and is rather a multidimensional construct(33). It connotes inner strength, competence, optimism, flexibility, and the ability to cope effectively when faced with adversity. It is associated with numerous desired outcomes including physical and emotional health(34). Although widely acknowledged in the nursing literature(35) there is scant research about how resilience operates in physicians(36,37). The conscious exploration of resilience with regard to the impact on medical professionals may add new dimensions to learning and reflective practice. Indeed, the level of an individual's resilience may serve as an early warning signal that stressors are overpowering protective factors, flagging those at risk of burnout and depression. Understanding how stress from uncertainty impacts resilience is an important correlation to study.

Pediatricians see a high proportion of undifferentiated illness, and therefore are perhaps particularly exposed to uncertainty in decision-making. The very nature of their patient population results in a subjectivity in history-taking and elicitation of physical signs, and it is a specialty with high emotional demand. The impact reactions to uncertainty have on pediatric trainees is unknown. To address this knowledge gap, we conducted a multi-site study to

quantitatively explore stress from uncertainty and resilience and their impact on the well-being of pediatric trainees.

Chapter 2: Data and Methods

2.1 Study Design

We conducted a cross-sectional study on residents at four pediatric residency training programs in the United States and Canada, after receiving approval from the institutional review boards at all participating institutions. Data were collected from May 2015 through December 2015.

The chosen study units were target units for the Patient and Family-Centered I-PASS Study that is currently on going. This study was conducted concurrently with the collection of data for that effort. All residents in pediatrics and medicine-pediatrics completing an end-of-rotation survey were eligible to participate, except those on extended leave or those working in non-pediatric settings at the time of the study. Residents who agreed to participate in the study gave 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, showed suicidal or homicidal ideation.

2.2 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 were also collected.

We used the Physicians' Reaction to Uncertainty scale, developed by Gerrity et al(38-40) which measures affective reactions to uncertainty in clinical situations. Three subscales were included: anxiety caused by uncertainty (Cronbach's alpha=.85); concern about bad outcomes (Cronbach's alpha=.74); and reluctance to disclose uncertainty to patients (Cronbach's alpha=.76). The items are rated on a 6-point Likert scale. Its ability to measure relevant differences in reaction to uncertainty was demonstrated in several studies(29,39,41) and it is distinguished by its well-documented psychometric properties and its relevance to medical situations(38). The subscales are scored quantitatively, with higher values indicating more stress from uncertainty.

The Resilience Scale-14 measures global resilience, reflecting five core characteristics: purpose/meaningfulness, perseverance, self-reliance, equanimity and existential aloneness(34). The 14 items are scored on a 7-point Likert scale, which are summed to arrive at a global score, with a higher score reflecting increased resilience.

We used two standardized screening tools—the Harvard national depression screening day scale(42) and single item measures of emotional exhaustion and depersonalization from the Maslach Burnout Inventory (MBI)(43,44)—to assess the prevalence of depressive symptoms and burnout. Both scales were chosen for their brevity, ease of administration, and sensitivity.

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, similar to both the Beck depression inventory and the Zung self-rating depression scale, which are twice the length(42). We defined participants as being depressed if they scored ≥9.

Although the 22-item MBI is the gold standard for the assessment of burnout in the medical research literature(43,45) 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 scale with response options ranging from "never" to "daily". These 2 items have been shown to stratify risk of burnout in multiple independent samples of physicians and medical students(44,46,47). Consistent with prior literature(43,44,46,48) participants indicating they experienced symptoms in either domain at least weekly were considered to meet the criteria for high burnout.

2.3 Statistical analysis.

Standard univariate statistics were used to characterize the sample. We looked for confounders with the dependent variable using t-tests or one way ANOVA for continuous variables, and Pearson chi square tests for categorical variables. We used Fisher's 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. ROC (receiver operating characteristic) curves were used to assess possible cut-offs for stress from uncertainty scores to predict depression and burnout in pediatric residents. All the analyses were performed using commercially available statistical software (STATA version 14.1; StataCorp LP, TX).

2.4 Results

50 of 86 eligible residents (58%) participated from four sites in North America. No statistical differences were found between age, sex, or postgraduate year for participants and non-participants. There were missing data for resilience, burnout and depression for one resident, and so we excluded this result from our analysis. Table 1 shows the personal data for participants.

Table 1 | Characteristics of participants.

Variable	No (%) of
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)
Sex*	
Women	31 (62)
Men	15 (30)
Age < 30*	32 (64)
*Information missing for 4 participants	

2.4.1 Physicians' Stress from Uncertainty and Resilience

We looked at resilience as a continuous variable as well as trichotomized into low, moderate and high. 28 residents (57.1%) had high resilience scores. 8 residents (16.3%) had low resilience scores. No association was found between resilience and age (p=.485), sex (p=.249), site (p=.230), or year of residency (p=.918). No association was found between stress from uncertainty and age (p=.907), sex (p=.424), site (p=.439), or year of residency (p=.415).

Overall, there was a strong negative correlation between stress from uncertainty and resilience (r=-.597; p<.00001; Figure 1).

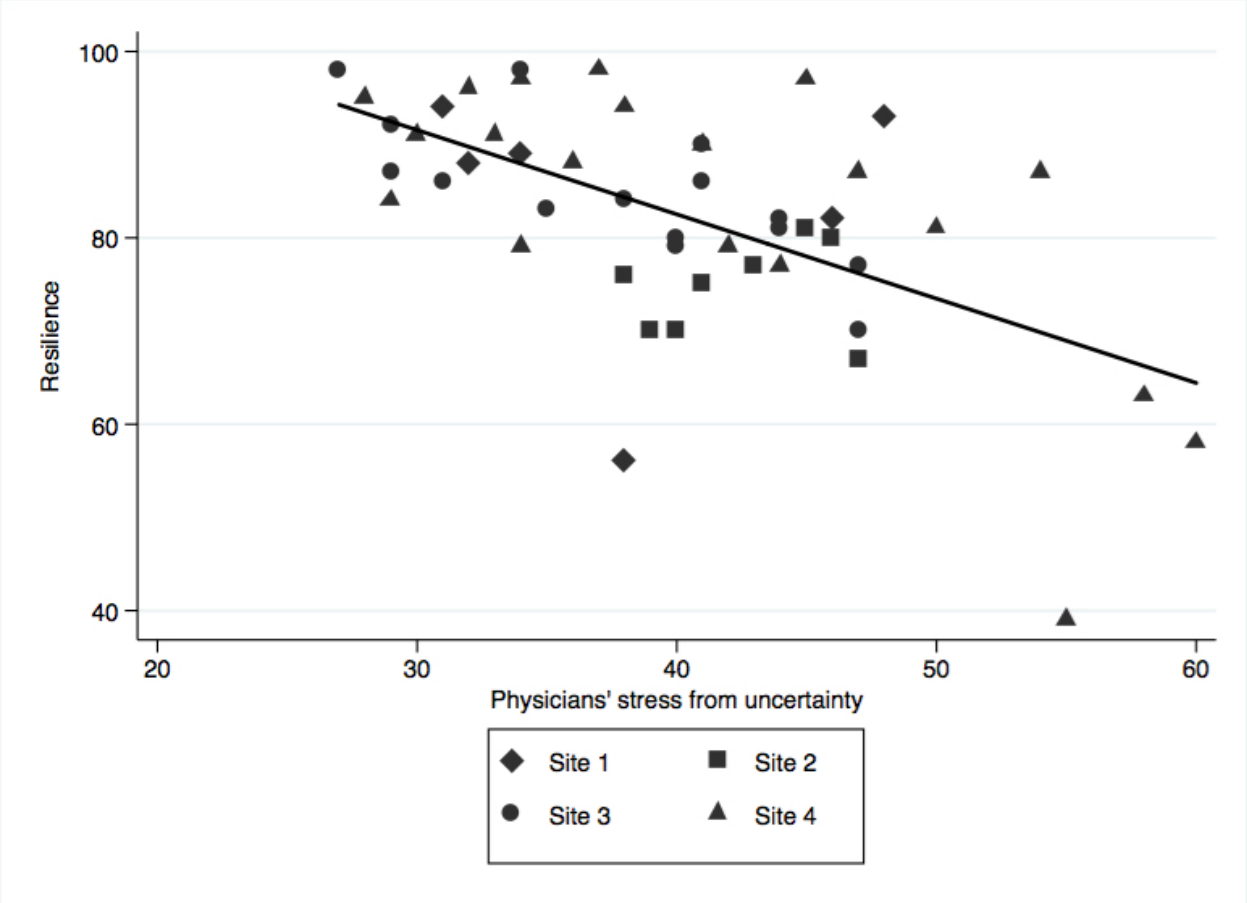

Figure 1 | Correlation between resilience and physicians' stress from uncertainty.

2.4.2 Depression

5 residents (10%) were found to be at high risk for depression. No association was found between depression and age (p=.912), sex (p=.459), or year of residency (p=.298).

Depressed residents were significantly more likely to report their job satisfaction as poor (60%) versus non-depressed residents (4.5%; p=.006).

Depressed residents were significantly more likely to have increased stress from uncertainty (mean 51.6; SD 9.07) than non-depressed residents (mean 38.7; SD 6.73; p=.0003; Figure 2).

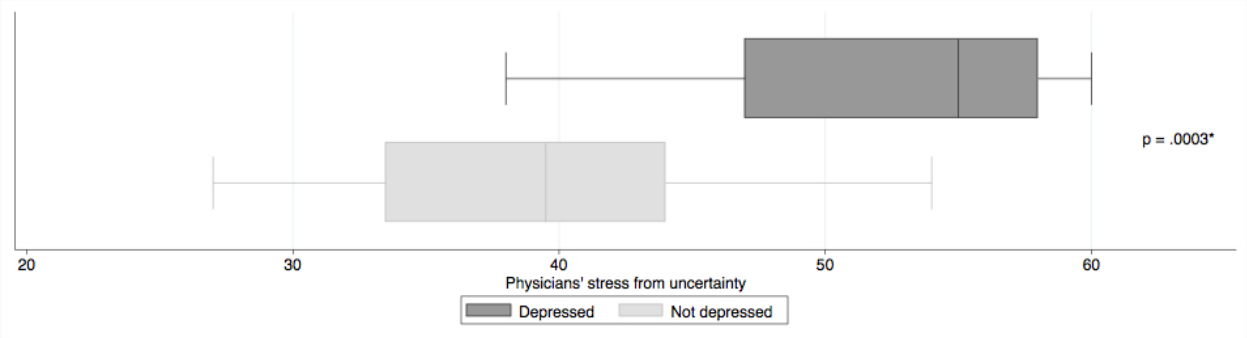

Figure 2 | Physicians' reaction to uncertainty scores for depressed and non-depressed residents. P values calculated using two-sided t-test.

Figure 3 shows the subscales within the physicians' reaction to uncertainty score (depressed versus non-depressed residents): anxiety due to uncertainty (mean 21.4, SD 4.04; versus mean 17.5, SD 3.99; p=.0456); concern about bad outcome (mean 12.6, SD 3.78; versus mean 8.18, SD 2.96; p=.0034); reluctance to disclose uncertainty (mean 17.6, SD 2.88; versus mean 13.0, SD 3.42; p=.0061). We looked at the receiver operating characteristic (ROC) curves for physicians' stress from uncertainty to assess whether there were possible cut-off scores that

could predict depression and burnout. For depression, a physicians' reaction to uncertainty score of 47 had 80% sensitivity and 86% specificity (AUC 0.868; 95% CI 0.65 – 1.0).

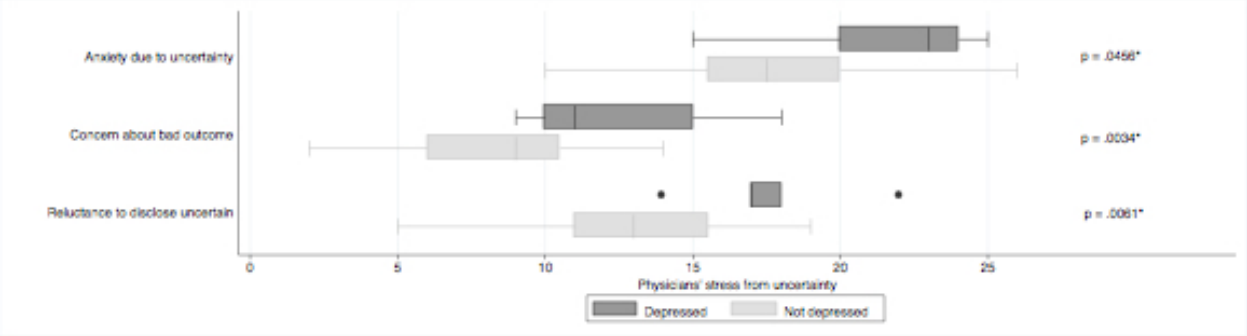

Figure 3 | Subscales for physicians' reaction to uncertainty scores for depressed and non-depressed residents. P values calculated using two-sided t-test.

Depressed residents were significantly more likely to have low resilience (80%,) than non-depressed residents (0%; p<.0001). Depressed residents had significantly lower mean resilience scores (56.6; SD 10.7) than non-depressed residents (85.4; SD 7.97; p<.0001; Figure 4).

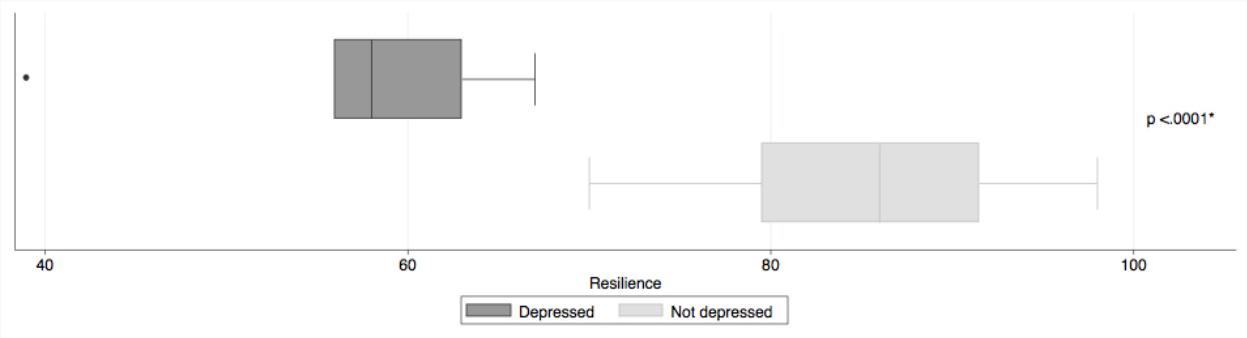

Figure 4 | Resilience scores for depressed and non-depressed residents. P values calculated using two-sided t-test.

2.4.3 Burnout

15 residents (31%) met the criteria for high burnout. No association was found between burnout and age (p=.243), sex (p=1.0), or year of residency (p=.809). 34 residents (69%) reported feelings of burnout a few times a month or more.

More burnt out residents reported their job satisfaction as poor (20%) versus non-burnt out residents (5.9%; p=.188), but this tendency was not significant.

Burnt out residents were significantly more likely to have increased stress from uncertainty (mean 44; SD 8.46) than non-burnt out residents (mean 38.3; SD 7.13; p=.0186; Figure 5).

Figure 5 | Physicians' reaction to uncertainty scores for burnt out and non-burnt out residents. P values calculated using two-sided t-test.

Figure 6 shows the subscales within the physicians' reaction to uncertainty score (burnt out versus non-burnt-out residents): anxiety due to uncertainty (20.1, SD 3.31; versus mean 17.0, SD 4.14; p=.0140); concern about bad outcome (mean 10, SD 3.50; versus mean 8.03, SD 3.06; p=.0527); reluctance to disclose uncertainty (mean 13.9, SD 3.77; versus mean 13.3, SD 3.60; p=.575). For burnout, a physicians' reaction to uncertainty score of 40 had 80% sensitivity and 59% specificity (AUC 0.691; 95% CI 0.53 – 0.85).

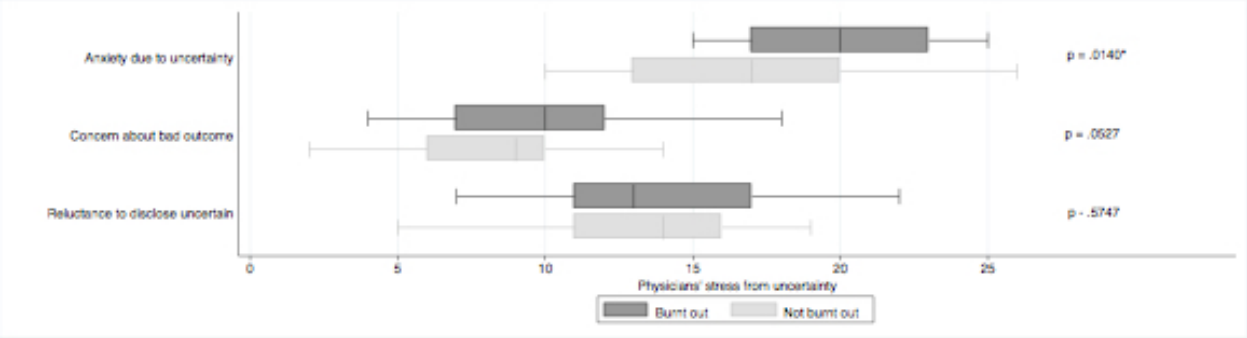

Figure 6 | Subscales for physicians' reaction to uncertainty scores for burnt out and non-burnt out residents. P values calculated using two-sided t-test.

Burnt out residents were significantly more likely to have low resilience (20%) than non burnt-out residents (2.9%; p=.034). Burnt out residents had a significantly lower mean resilience score (76.7; SD 14.8) than non-burnt out residents (85.0; SD 9,77; p=.0242; Figure 7).

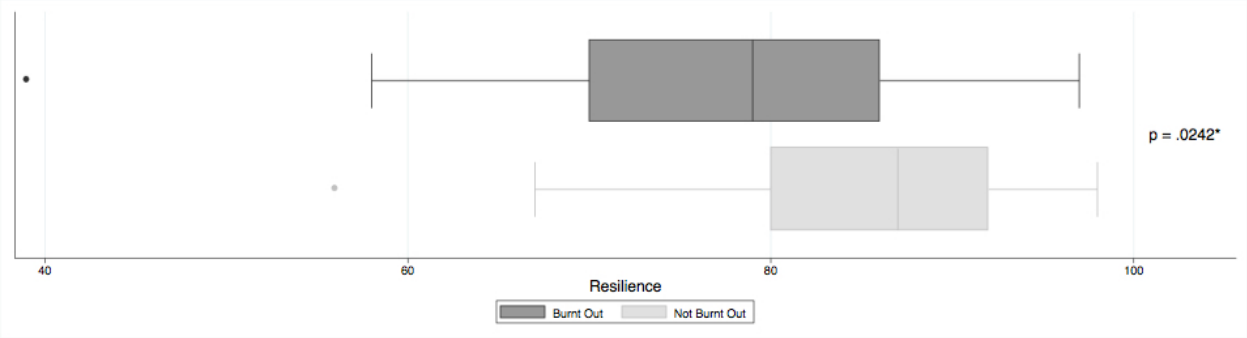

Figure 7 | Resilience scores for burnt out and non-burnt out residents. P values calculated using two-sided t-test.

Chapter 3: Discussion and Perspectives

This study extends evidence in support of building and nurturing resilience and a tolerance of uncertainty in our trainees. There was an extremely strong relationship between stress from uncertainty and resilience, suggesting that enhancing a tolerance of uncertainty may also enhance resilience. Residents who were more stressed by uncertainty were significantly more likely to be depressed or burnt out. To our knowledge this is the first paper that looks specifically at the effect of stress from uncertainty in pediatric residents. Similar to previous papers, residents who were lacking resilience were significantly more likely to be depressed or burnt out(49-51). From our results we were able to identify the point on the stress from uncertainty score that best predicts risk of depression and burnout. Previous papers have been inconsistent in reporting higher levels of tolerance of ambiguity in males or females, with some reporting an increase in females(30,52,53) whilst others report an increase in males(54) and others remaining inclusive(55,56). We found stress from uncertainty to be independent of gender and found no association with age or year of residency.

These results have important implications. They suggest that stress from uncertainty and resilience are associated with depression and burnout. It may be that these attributes could prove to be sensitive indicators that could highlight struggling trainees at an early stage. This would be invaluable for program directors globally. How to stem the rise of burnout in healthcare professionals is an important unanswered question(57). These results would suggest that developing interventions to enhance and nurture resilience and tolerance of uncertainty might be the solution we have been seeking for decades.

The high degree of heterogeneity in the development of depression in response to stress is an important public health problem. Rates of depression are reported to be higher among

physicians than in the general population(19,20), and physician suicide rates are substantially higher than in the general population(6,58,59). Our study showed 10% of residents to be depressed. Rates have previously been shown to range from 7-49% for trainees(12,21). Although our results are at the lower end of this spectrum, they are double the rates found in the general population (4-5%)(21). Our results match previous findings that resilience is inversely associated with depression(60). Depressed residents were significantly less likely to disclose uncertainty, which clearly has consequences that affect patients. The high prevalence of psychological distress amongst physicians and the disturbing ramifications this distress can have on residents' professional development, their personal lives, and their patients necessitates a response by institutions and training programs. Looking to improve the mental health of doctors clearly needs to be a priority.

The prevalence of burnout in physicians at all levels of training is extremely worrying(48) with rates in resident physicians ranging from 27% to 75%, and described as being higher than medical students and practicing physicians(61,62). Our study showed 31% of residents meet the cut-off for high burnout (reporting symptoms at least weekly). Interestingly, 69% of residents reported feeling symptoms of burnout several times a month or more, suggesting the majority of residents are affected by this pathological syndrome. 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 sub-optimally for some time before they leave the health service(63). This adds weight to the importance of developing early warning signals and surrogate markers that could help to identify trainees who are struggling, for it is often hidden until it reaches dangerous levels(10,64).

Doctors share with military personnel a risk of suffering what is termed ‘moral injury’(65,66) which refers to the emotional and psychological damage suffered by people who repeatedly witness, or participate in, acts that contravene moral expectations. These include situations in which the individual is causing suffering; where there is a proximity to death; and where there is a need to function within highly complex and unpredictable situations. This would seem especially true in the field of pediatrics, where the patient often lacks the capacity to understand the benefits behind the procedure or investigation. It would seem especially important, therefore, that resilience is an attribute that is intentionally developed in pediatric trainees. Shifting between moral contexts can itself represent a risk of moral injury(67). The shift from hospital environment to home on a daily basis could represent a shift in moral context. We need to develop resilience to deal with these transitions.

There is much evidence to suggest that both resilience and tolerance of uncertainty are states, not traits, and thus are amenable to change through an educational and experiential process(24,68-70). In our analysis of the subscales (Figure 3) anxiety caused by uncertainty had the highest scores, and was significantly associated with depression and burnout. Reframing uncertainty as a surmountable challenge, not a threat, could help to quell some of this anxiety. Developing an understanding of the uncertainties in our environment, and a resilience toolkit, could help protect physicians from the negative consequences of their challenging environment.

We need to understand whether there is a critical value at which point intolerance of ambiguity becomes destructive. This could help guide us as we work to protect our trainees from the negative consequences of depression and burnout. Our results strongly imply an association between stress from uncertainty and depression and burnout, suggesting we need to invest resources and research energy to explore ways to enhance a tolerance of uncertainty in healthcare

professionals. There are undoubtedly benefits to the frustration and anxiety encountered by physicians when facing ambiguity: it fuels and motivates physicians to continue to evaluate, ponder, and care for patients even when a diagnosis or positive outcome is not readily apparent. However, we need to ensure physicians do not tip into the counterproductive part of this stress that seems to risk leading to disillusionment, burnout, and depression. If we could work out where this spot is, and monitor our trainees, this attribute may serve as an early warning signal. It seems to be a multifaceted, dynamic state and as such is likely to be amenable to interventional efforts to increase it.

This is the first multicenter study to our knowledge to evaluate comprehensively relationships of tolerance of uncertainty with resilience and burnout and depression in a diverse sample of residents located in different geographical areas of North America. This provided us with a representative sample for different types of pediatric residency program. We used survey responses that were completely anonymised, limiting the biases related to social desirability. The use of established psychometric instruments allows for comparison with general population and other samples of medical students, residents, and practicing doctors.

3.1 Limitations

This study focused solely on residents in pediatrics and is a small sample size, so it is unclear how this would translate to other specialties. Although there is no reason to postulate that these relationships would be unique to pediatrics, further studies are needed to quantify the relation across specialties. We used self-reported scales that are susceptible to participant distortion, but participants were unaware of the specific hypothesis of this study and we have no reason to believe that they would have chosen to participate or not on the basis of whether they were depressed or burnt out. The cross-sectional design may have masked temporal relationships between situational variables, and prohibits any causal conclusions from these findings alone. It will be important to identify causal relationships with longitudinal data.

3.2 Future Research

Our positive findings certainly give impetus to further psychometric and conceptual research on the tolerance of ambiguity scales, and the ways in which resilience can be recognized, developed and supported during and after clinical training. Understanding the attributes of resilience and tolerance of uncertainty 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. Whether using some of the psychological tools which test for resilience and tolerance of uncertainty would be a useful part of admission screening and would predict positive outcomes is a subject for future research. It will be important to develop interventions that look at whether improved communication, with an emphasis on acknowledging the

uncertainty in the environment, enhances resilience and mitigates the development of burnout. We need further research into what triggers and drives the development of burnout, for without this knowledge it is hard to know what interventions to recommend.

3.3 Conclusion

Physicians currently learn to manage uncertainty by receiving “a training for certainty” (25). There is an overemphasis on unambiguous facts, soluble problems and correct answers(24,25). Our data call this disposition into question, as intolerance of ambiguity was strongly associated with burnout and depression. As other fields have recognized, acknowledging and embracing uncertainty, may be critical for physicians to thrive in a greyscale world. Doing so may be an important, underutilized means of mitigating burnout and depression.

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