



Variability of Burnout and Stress Measures in Pediatric Residents: An Exploratory Single-Center Study From the Pediatric Resident Burnout–Resilience Study Consortium

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Abstract

Residency is a high-risk period for physician burnout. We aimed to determine the short-term stability of factors associated with burnout, application of these data to previous conceptual models, and the relationship of these factors over 3 months. Physician wellness questionnaire results were analyzed at 2 time points 3 months apart. Associations among variables within and across time points were analyzed. Logistic regression was used to predict burnout and compassionate care. A total of 74% of residents completed surveys. Over 3 months, burnout ($P = .005$) and empathy ($P = .04$) worsened. The most significant cross-sectional relationship was between stress and emotional exhaustion (time 1 $r = 0.61$, time 2 $r = 0.68$). Resilience was predictive of increased compassionate care and decreased burnout ($P < .05$). Mindfulness was predictive of decreased burnout ($P < .05$). Mitigating stress and fostering mindfulness and resilience longitudinally may be key areas of focus for improved wellness in pediatric residents. Larger studies are needed to better develop targeted wellness interventions.

Keywords

mindfulness, stress, physician burnout

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More than half of resident physicians in the United States suffer from burnout, as defined by high levels of emotional exhaustion, excessive depersonalization and/or loss of sense of personal accomplishment.^{1,2} Burnout can erode professionalism, affect quality of care, increase risk for medical errors, and contribute to broken relationships, substance abuse, and suicidality.^{2,3} This pervasive phenomenon likely develops in early medical training and has been shown to affect trainees across specialties.^{3,4} The increase in prevalence of burnout in all specialties has been widely reported.^{4,5} In recent large-scale studies, 50% or more of residents report burnout, dwarfing comparative burnout rates in age-matched individuals in other careers in the United States.^{3,4} While there is little evidence so

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far that trainee burnout influences the rate of burnout in practicing physicians, that likelihood is high and underscores significant opportunities for early intervention. Dyrbye et al⁵ and others^{6,7} have recently challenged the medical community to pursue more evidence-based approaches to understanding and preventing/mitigating burnout in both trainees and practicing physicians.

Although many factors have been associated with burnout in medical trainees, consensus on conceptual models that explain the interplay of factors to produce such an undesirable state is still lacking.^{8,9} Conceptual models can also help identify optimal targets for intervention designed to prevent or mitigate burnout in physicians. Stress has long been recognized as a main contributor to burnout in residents.^{10,11} In a study of pediatric residents, stress from uncertainty, and low levels of resilience were strongly correlated with depression and burnout.¹² Excessive job demands have also been identified as predictable causes of high stress and burnout.^{13,14} Prins et al¹⁵ and others have also postulated the influence of specific individual factors on manifestations of burnout in residents (such as gender, age, marital status, family size, and personality type), but these observations have been based on cross-sectional data sets. Dyrbye and Shanafelt,¹⁶ in a recent review of the available literature, suggest that factors within the learning and work environment, rather than individual personal attributes, are the major drivers of burnout in medical students and resident physicians. Olson et al,¹⁷ in a single-center cross-sectional study, was among the first to describe the qualities of resilience, mindfulness, and self-compassion in pediatric residents, and additionally proposed a conceptual model for the relationship among them based on study findings. This model proposed a strong protective relationship of resilience (the ability to bounce back from stress), mindfulness (intentionally bringing one's attention to the present moment) and self-compassion (being kind and understanding toward oneself in instances of pain or failure rather than being self-critical) against burnout in pediatric residents. Also included in this model is the direct relationship of mindfulness and self-compassion with resilience, and the proposal of focus on mindfulness and self-compassion as targets of intervention, facilitating an integrative approach to wellness in resident physicians. Longitudinal investigations of residents may further define the impact of putative factors that have been previously linked to burnout in residents in some but not all smaller cross-sectional studies.

Burnout models are limited by lack of knowledge of the stability and interplay of factors related to burnout in resident physicians over time.¹⁸ West et al¹⁹ demonstrated the link of burnout to subsequent self-reported medical errors in internal medicine residents at a single center, but their study design did not allow longitudinal tracking of burnout levels in individuals over time. Pantaleoni et al²⁰ measured burnout serially over time in a cohort of pediatric residents and demonstrated relatively consistent levels of group burnout over time, but they did not report on consistency of burnout measures in individual residents.

Deeper understanding of risk and protective factors that are associated with burnout, both cross-sectionally and over time, help inform integrative intervention strategies to improve wellness in resident physicians. We aimed address some of these gaps in our understanding of burnout in residents., using Olsen's model of resilience, mindfulness and self-compassion as defined protective features against burnout in cross-sectional analysis. Our study addressed 3 aims in a sample of pediatric residents at a large academic medical center: (1) determine the short-term stability of burnout and risk/protective factors associated with burnout in individual residents between winter and spring of the same academic year; (2) determine application of conceptual models linking burnout to stress, self-compassion, mindfulness, resilience, confidence in providing compassionate care, and empathy to this longitudinal data set; and (3) determine, using Olsen's proposed burnout model as a framework, predictive factors of burnout and calm compassionate care over a 3-month period.

Methods

Design

This was a prospective cohort study conducted at one large academic pediatric residency program, as part of the larger *Pediatric Residency Burnout-Resilience Study Consortium (PRB-RSC)*. The PRB-RSC is a multi-institutional collaborative that provides a platform for members to study the epidemiology and ultimately develop best methods to prevent and mitigate burnout and promote resilience in pediatric residents. The consortium included over 40 member pediatric and internal medicine-pediatric training programs at the time of this study (<https://pedsresilience.com>).

Participants

Participants were eligible if they were part of the categorical pediatrics or combined internal medicine/pediatrics residency programs at a single large, Midwestern, free-standing children's hospital between February and June 2016. Residents completed an electronic survey at 2 time points: time 1 (T1), February-March 2016 and time 2 (T2), May-June 2016. The survey was distributed through the Association of Pediatric Program Directors (APPD) Longitudinal Education Assessment Research Network (LEARN), using Limesurvey (LimeSurvey: An Open Source Survey Tool, LimeSurvey GmbH, Hamburg, Germany; <http://www.limesurvey.org>). T2 was previously determined by the PRB-RSC (survey is distributed annually at the same time of year), so T1 timing was chosen to capture residents already acclimated to the current academic year, yet still with a significant amount of time before the PRB-RSC annual survey.

Survey Content

The complete PRB-RSC survey contained 141 items and included demographic data and a series of validated scales related to physician wellness described below. Demographic questions included age, gender, race/ethnicity, marital status, and whether the resident had any children. Other questions included level of educational debt and time since last vacation.

Burnout was assessed with the Maslach Burnout Inventory¹ (MBI), a widely used measure of burnout in health professionals. This measure uses 3 domains to assess burnout: emotional exhaustion (being emotionally overextended and exhausted by one's work) and depersonalization (negative, callous, and detached responses to others), which are both elevated in burnout; and personal accomplishment, which is low in burnout. We focused on the subscales of emotional exhaustion and depersonalization since they have been shown to have the highest correlation with overall burnout.^{21,22}

Stress was measured by the 10-item Perceived Stress Scale (PSS),^{23,24} which has been used in many studies of health professionals and the general population. The 10-item version of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R),²⁵ which has been used with nursing students,²⁶ was used to measure mindfulness. The short form of Neff's Self-Compassion Scale, previously studied in a variety of health care professionals,²⁷ was used to measure self-compassion.²⁸ Resilience was assessed using Smith's Brief Resilience Scale (BRS),²⁹ which has been used previously in student and clinical populations. The Confidence in Providing Calm, Compassionate Care scale (CCCS),³⁰ also studied in a variety of health care providers,²⁷ was used to measure self-efficacy in providing compassionate care. Two subscales of the Interpersonal Reactivity Index (IRI)³¹ were used to measure empathy, the 7-item scale on Perspective Taking (PT) and the 7-item Empathic Concern (EC) Scale. The IRI has previously been used in medical residents.³²

No financial or programmatic incentive was used to encourage completion of the survey. To facilitate survey completion, residency program leadership introduced the survey in a face-to-face meeting with residents and presented the importance of further understanding of resident wellness.

Data Collection

The first survey (T1) was conducted and data gathered online by our institution, and the second survey (T2) was conducted online through the PRB-RSC and the APPD LEARN.³³ These surveys were linked for each individual via APPD LEARN identification numbers. For our study, de-identified results from individual residents from our institution at both time points were extracted and examined.

Data Analysis

We compared means at the 2 time points using linear mixed models with a random effect of resident to accommodate a small amount of missing data in each time point, which we assumed to be at random. We examined associations among continuous variables within and across time points using Pearson's correlation coefficients and pairwise deletion of missing data. Finally, we conducted a series of multiple linear or logistic regressions assessing the effects of T1 stress, self-compassion, resilience, and mindfulness in predicting T2 compassionate care, emotional exhaustion, depersonalization, burnout defined by emotional exhaustion ≥ 27 , or burnout defined by depersonalization ≥ 13 , controlling for the T1 value of the same measures. We did not include multiple additional predictors simultaneously due to multicollinearity among these predictors. All analyses were conducted using R 3.3 software,^{34,35} with significance set at $P < .05$.

This study was deemed exempt by the Nationwide Children's Hospital Institutional Review Board prior to resident recruitment and survey dissemination.

Table 1. Demographics (N = 108).

Demographic Characteristic	n (%)
Gender	
Female	68 (63.0)
Male	34 (31.5)
No answer	6 (5.5)
Training level	
PGY-1	36 (33.3)
PGY-2	33 (30.6)
PGY-3	33 (30.6)
PGY-4	3 (2.8)
No answer	3 (2.8)
Age, years, mean \pm SD	28.56 \pm 2.69
Race	
Caucasian	84 (77.8)
Asian	9 (8.3)
African American	3 (2.8)
Hispanic	2 (1.9)
Other	5 (4.7)
No answer	5 (4.6)
Debt burden (\$)	
<50 000	17 (15.7)
50 000-100 000	9 (8.3)
>100 000	77 (71.3)
No answer	5 (4.6)
Marital status	
Single	53 (49.1)
Married	43 (39.8)
Nonmarried partner	6 (5.6)
Divorced	1 (0.9)
No answer	5 (4.6)
Children	
No	88 (81.5)
Yes	14 (13.0)
No answer	6 (5.5)

Results

Of the 146 eligible residents, 108 (74%) completed both T1 and T2 surveys. Of those who completed the survey, there was a predominance of females (63.0%), Caucasians (77.8%), and single residents (49.1%) without children (81.5%). Most residents (71.3%) reported $>$ \$100 000 in debt (Table 1). Most residents (60.2% at T1, 65% at T2) had experienced a vacation in the previous 0 to 3 months at both time points.

In paired analyses of means of each variable, there were significant changes in residents' mean depersonalization (a factor in burnout) and empathic concern (a measure of empathy) over the 3-month study period (Table 2). Depersonalization increased, while empathic concern decreased over the study period. There were no significant variations in mean scores of emotional exhaustion, perceived stress, self-compassion, resilience, or perspective taking. A slightly higher proportion of residents were classified as burned out at time 2 compared with time 1 based on depersonalization (45% [CI 37%-54%] vs 37% [CI 28%-46%], McNemar test $P = .046$) and emotional exhaustion scales (53% [CI 39%-56%] vs 43% [CI 34%-53%], McNemar test $P = .039$). Mean stress levels

Table 2. Wellness Variable Means at Time 1 and Time 2.

Wellness Variable	Time 1	Time 2	P value	Reference Range (Average)
Burnout (EE)	24.3	25.3	.08	17-26 (Shanafelt et al ³)
Burnout (DP) ^a	10.9	12.1	.005	6-9 (Shanafelt et al ³)
Perceived stress (PSS)	15.8	15.5	.12	12-14 (Poghosyan et al ²²)
Self-compassion (Neff's)	37.9	37.7	.88	36 (Feldman et al ²⁵)
Resilience (BRS)	3.7	3.7	.61	3-4 (Chamberlain et al ²⁶)
Empathy (PT)	19.7	19.0	.09	16-18 (Raes et al ²⁸)
Empathy (EC) ^a	22.9	22.1	.04	19-21 (Raes et al ²⁸)

Abbreviations: EE, emotional exhaustion; DP, depersonalization; PT, perspective taking; EC, empathetic concern; BRS, Brief Resilience Scale; Neff's, Neff's Self-Compassion Scale; PSS, Perceived Stress Scale.

^aSignificant difference in means at $P < .05$.

were higher than average for the normal population, and emotional exhaustion levels were in the high-moderate range ($>27 =$ high emotional exhaustion) at T1. Mean empathy scores were slightly higher than national averages. There were no differences in mean values for burnout, perceived stress, or empathy in first-year compared with senior residents.

Each variable at T1 was significantly correlated with the same variable at T2, ranging from a high of $r = 0.81$ for resilience and 0.78 for depersonalization and emotional exhaustion to a low of 0.52 and 0.55 for empathic concern and perspective taking, respectively ($P < .01$ for all).

In cross-sectional analyses, several wellness variables demonstrated significant interrelationships at both time points (Table 3). The strongest positive correlations were between (1) stress and emotional exhaustion, (2) self-compassion and mindfulness, and (3) emotional exhaustion and depersonalization. The strongest negative correlations were between (1) stress and mindfulness and (2) stress and resilience.

In regression analyses, the T1 values of several wellness variables were significantly associated with temporal changes in compassionate care and burnout measures (ie, T2 values of outcomes, controlling for their T1 values) (Table 4). For example, controlling for compassionate care at T, resilience at T1 was positively associated with compassionate care at T2 ($P < .05$). Other significant findings include (all P s $< .05$): controlling for burnout at T1, resilience at T1 was negatively associated with emotional exhaustion at T2; controlling for emotional exhaustion scores at T1, higher self-compassion at T1 was associated with lower emotional exhaustion scores at T2; mindfulness at T1 was negatively associated with emotional exhaustion after controlling for T1 emotional exhaustion values. That is, after controlling for levels of emotional exhaustion at T1, resilience, self-compassion, and mindfulness at T1 were predictive of decreased T2 levels of emotional exhaustion. Perceived stress levels were not associated with temporal changes in compassionate care or burnout.

Table 3. Cross-Sectional Correlations Among All Wellness Variables.

		Time 1	Time 2		Time 1	Time 2		
EE	DP	0.53	0.69	CAMS-R	Neff's	0.6	0.64	
		PSS	0.61			0.68	BRS	0.56
	CAMS-R	-0.44	-0.49		CCCS	0.49	0.46	
	Neff's	-0.39	-0.51		PT	0.15	0.27	
	BRS	-0.32	-0.43		EC	0	0.05	
	CCCS	-0.21	-0.33					
	PT	-0.09	-0.24					
	EC	-0.13	-0.18		Neff's	BRS	0.56	0.57
					CCCS	0.46	0.52	
					PT	0.22	0.34	
DP	PSS	0.37	0.45	EC	0.05	0.11		
	CAMS-R	-0.47	-0.39					
	Neff's	-0.43	-0.46					
	BRS	-0.24	-0.36	BRS	CCCS	0.39	0.37	
	CCCS	-0.42	-0.31	PT	0.04	0.26		
	PT	-0.41	-0.33	EC	-0.03	0.14		
EC	-0.24	-0.23						
PSS	CAMS-R	-0.68	-0.69	CCCS	PT	0.36	0.36	
	Neff's	-0.62	-0.66	EC	0.09	0.22		
	BRS	-0.53	-0.54					
	CCCS	-0.34	-0.37	PT	EC	0.36	0.38	
	PT	0.01	-0.21					
	EC	0.06	-0.06					

Abbreviations: EE, emotional exhaustion; BRS, Brief Resilience Scale; DP, depersonalization; CCCS, Calm Compassionate Care Scale; PSS, Perceived Stress Scale; PT, perspective taking; CAMS-R, Cognitive and Affective Mindfulness Scale-Revised; EC, empathetic concern; Neff's, Neff's Self-Compassion Scale.

Yellow background: positive correlation (>0.3) at both time points.

Blue background: negative correlation (<-0.3) at both time points.

Discussion

In our single-center study, we aimed to analyze the stability of wellness factors in pediatric residents over a 3-month period; determine 2-timepoint cross-sectional relationships of different wellness factors and compare them with previous conceptual models; and identify predictors of burnout and calm compassionate care after controlling for baseline values. We found that emotional exhaustion, depersonalization, perceived stress, self-compassion, and resilience had the most stable scores over the 3 months. We also found that the most significant and consistent cross-sectional direct relationships among wellness factors were between emotional exhaustion and depersonalization, emotional exhaustion and stress, and self-compassion and mindfulness. These findings are consistent with the conceptual model proposed by Olson et al.¹⁷ Finally, we found that the T1 factor most predictive of T2 compassionate care was resilience, and the T1 factors most protective against T2 burnout, as measured by emotional exhaustion, were resilience, self-compassion, and mindfulness.

Emotional exhaustion, depersonalization, stress, self-compassion, and resilience were the most highly temporally correlated wellness factors, supporting the idea that these factors are more stable over time, or may change more slowly than

Table 4. Regression Analysis, Predictors of T2 Calm Compassionate Care Scale (CCCS), Emotional Exhaustion (EE), and Depersonalization (DP).^a

T1 Additional Predictors	Outcome: CCCS Score T2	Outcome: EE Score T2	Outcome: DP Score T2	Outcome: Burnout (EE Threshold) T2	Outcome: Burnout (DP Threshold) T2
PSS	-0.18 (0.20)	0.21 (0.14)	0.001 (0.07)	0.09 (0.05)	0.03 (0.05)
Neff's	0.31 (0.12)	-0.23 (0.11)	-0.05 (0.08)	-0.09 (0.05)	-0.06 (0.05)
BRS	0.72 (0.34)	-0.27 (0.19)	-0.06 (0.13)	-0.21 (0.08)	0.03 (0.08)
CAMS-R	0.51 (0.29)	-0.37 (0.16)	-0.14 (0.11)	-0.14 (0.06)	-0.07 (0.06)

Abbreviations: PSS, Perceived Stress Scale; Neff's, Neff's Self-Compassion Scale; BRS, Brief Resilience Scale; CAMS-R, Cognitive and Affective Mindfulness Scale-Revised.

^aResults of 20 regression models examining a T1 predictor of a T2 outcome, controlling for T1 value of the outcome. Values in cells are linear (score outcomes) or logistic (burnout outcomes) regression coefficients and standard errors predicting the T2 value of the outcome variable (column) from the T1 value of the outcome variable and a single additional predictor (row). For example, the first cell indicates that in a linear regression predicting CCCS score at time T2 from CCCS and PSS scores at time T1, the coefficient associated with a 1-unit increase in PSS was -0.18, and its standard error was 0.20 (and thus the coefficient was not significantly different from 0—PSS at time T1, controlling for CCCS at time T1, was not associated with CCCS at time T2). Coefficients significantly different from zero ($P < .05$) are in boldface.

our 3-month analysis would detect. This relative lack of short-term variability in these important factors suggests that wellness is much more complex than isolated factors related to work environment (such as a particular rotation) or temporary personal circumstance. It also may be important in considering the nature of interventions directed at improving wellness. The stability of these factors suggests that commitment to longitudinal wellness interventions and programs may be more beneficial than a one-time or short intervention. Interestingly, the wellness factors with the lowest correlations, or that demonstrated relatively less stability, were empathetic concern and perspective taking, 2 factors reflecting empathy. This may suggest that empathy may be more affected by isolated or temporary personal or work factors and may be more amenable to training interventions. And as noted earlier, this is in the context of these residents having somewhat higher empathy scores than the general population.

Many of our findings regarding cross-sectional relationships of wellness factors were consistent with what has been previously reported in the literature in other groups, strengthening the overall evidence of these relationships. As in other studies, we found direct relationships between burnout and stress,^{36,37} self-compassion and mindfulness,^{38,39} and self-compassion and resilience.^{40,41} We found inverse relationships between stress and mindfulness,^{42,43} burnout and self-compassion^{40,44} and the emotional exhaustion component of burnout and resilience,^{45,46} also reported previously. We found a weaker correlation of empathy components (only depersonalization component of burnout was significantly correlated with perspective taking component of empathy), showing a weaker relationship between burnout and empathy overall. The strongest relationship was between burnout and stress, a relationship well-described in the literature with regard to health care workers in general.^{36,47,48}

Understanding the factors that predict burnout may offer us important targets in prevention. While perceived stress was the most strongly correlated factor related to burnout in cross-sectional analysis, it was not significantly predictive of

confidence in providing compassionate care or burnout in regression analysis over our 3-month study period after controlling for their baseline scores. Self-compassion, mindfulness, and resilience were significantly predictive of reduced burnout as measured by emotional exhaustion. This underscores the importance of these relationships and suggests that wellness interventions with a specific focus on mindfulness, resilience, and self-compassion in residents may have a most profound impact on reduction of burnout over time. In settings with relatively limited time and/or resources, such as in busy residency programs, practical wellness initiatives should be directed toward efforts with the highest yield. Several interventions have been shown to foster mindfulness in a variety of health care providers. Some interventions range in duration from a few 1-hour sessions online to 2-hour sessions over 8 to 12 weeks and include educational strategies such as mindful awareness of breath, mindful movement, mindful eating, and loving-kindness meditation.⁴⁹⁻⁵¹

There were significant changes over the study period in mean measurements of depersonalization and empathetic concern. Interestingly, depersonalization increased, while empathy slightly decreased over the same time. While it seems consistent that this inverse relationship would exist between depersonalization and empathy, it is somewhat surprising that these components would worsen at T2, when workload is typically decreased compared with busier winter months. This could be due to the chronicity of fatigue over the residency year, to an unexpectedly higher workload at T2, or possibly that other factors related to burnout are more impactful than workload, as our cross-sectional and longitudinal data suggest. The lack of difference between first-year and senior residents suggests that it is not simply the difficulties of the first year of post-graduate training that contribute to decreased wellness, and that all residents experience highs and lows of burnout and thus could benefit from targeted interventions. It is important to note the limitations in interpreting mean values, as these could represent significant opposing results for individual residents rather than a trend for all residents, and additional research is needed to

determine the relationship between these variables and clinically relevant outcomes in residents and their patients.

There are several limitations in our study. It was a single-institution study, and wellness factors were measured only over a 3-month period, potentially missing notable relationships among wellness factors that occur more slowly over time. Testing this hypothesis would require additional investigation, evaluating wellness factors at regular intervals across a longer period of time. Another possibility is that by the timing of the first survey (winter), there may have already been an established, or “locked in,” level of burnout reached that was unlikely to change over 3 more months of similar responsibilities. We also did not assess for wellness practices that individual residents may be engaging in, and this may have been a factor in overall wellness measures. Additional limitations include missing/partial data, lack of data on nonresponders, and inability to measure external factors in resident work-life balance that may affect wellness. Larger multicenter studies, such as those underway in the PRB-RSC, will be needed to better understand the interplay of time and training environment factors and in developing targeted wellness interventions.

Conclusion

Wellness in residency is multifaceted and longitudinally affected by personal and professional factors in pediatric residents. Our results demonstrated that self-compassion, resilience, and mindfulness were significantly predictive of later reduced emotional exhaustion and burnout. Mitigating stress in the moment and fostering mindfulness and resilience longitudinally may be key areas of focus for improved wellness in pediatric residents.

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Author Contributions

All authors contributed to the design, data analysis, manuscript preparation, and revision for this study.


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Ethical Approval

This study was approved by the institutional review board.

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