Burnout in Pediatric Residents: Three Years of National Survey Data

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abstract

BACKGROUND: We aimed to describe the national epidemiology of burnout in pediatric residents.

METHODS: We conducted surveys of residents at 34 programs in 2016, 43 programs in 2017, and 49 programs in 2018. Survey items included the Maslach Burnout Inventory, demographics, program characteristics, personal qualities, experiences, and satisfaction with support, work-life balance, and learning environment. Analyses included cross-sectional comparisons and cross-sectional and longitudinal regression.

RESULTS: More than 60% of eligible residents participated; burnout rates were >50% in all years and not consistently associated with any demographic or residency characteristics. Cross-sectional associations were significant between burnout and stress, sleepiness, quality of life, mindfulness, self-compassion, empathy, confidence in providing compassionate care (CCC), being on a high-acuity rotation, recent major medical error, recent time off, satisfaction with support and career choice, and attitudes about residency. In cross-sectional logistic regression analyses, 4 factors were associated with an increased risk of burnout: stress, sleepiness, dissatisfaction with work-life balance, and recent medical error; 4 factors were associated with lower risk: empathy, self-compassion, quality of life, and CCC. Longitudinally, after controlling for 2017 burnout and 2018 risk factors (eg, recent error, sleepiness, rotation, and time off), 2017 quality of life was associated with 2018 burnout; 2017 self-compassion was associated with lower 2018 stress; and 2017 mindfulness, empathy, and satisfaction with learning environment and career choice were associated with 2018 CCC.

CONCLUSIONS: A majority of residents met burnout criteria. Several identified factors (eg, stress, sleepiness, medical errors, empathy, CCC, and self-compassion) suggest targets for interventions to reduce burnout in future studies.

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Dr Kemper helped design the data collection instruments and drafted the initial manuscript; Dr Schwartz supervised data management and conducted the data analysis; Drs Wilson, Mahan, Schubert, Staples, McClafferty, Serwint, and Batra helped design the data collection instruments and assisted in recruiting program directors and residents to participate in the study; and all authors conceptualized and designed the study, reviewed and revised the manuscript, approved the final manuscript as submitted, and agree to be accountable for all aspects of the work.

A complete list of nonauthor contributors appears in Supplemental Table 7.

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WHAT'S KNOWN ON THIS SUBJECT: Small studies in pediatric residents and larger studies on medical students and practicing physicians suggest that burnout is common, increasing, and associated with demographic and other risk factors, but most are cross-sectional.

WHAT THIS STUDY ADDS: We examined burnout's epidemiology in a national sample of pediatric residents over 3 years, assessing a broad range of risk and protective factors. We identified modifiable risk factors for both individuals and programs, laying the groundwork for intervention studies.

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Symptoms of burnout among physicians, including pediatricians, have increased over the past 10 years.[1–3] Burnout is associated with impaired professional behavior, worse quality of care, lower satisfaction with care, and poorer personal health behavior (eg, substance abuse and suicide).[4–15] Numerous national physician organizations have called for more monitoring of burnout to better address burnout's effects on physicians and patients.[3,16,17]

In studies of physician burnout, researchers have reported that burnout peaks during residency and fellowship training, with a range of 39% to 74% among residents.[13,18–20] Certain demographic characteristics and personal experiences have been associated with physician burnout: sex, more work hours, overnight call rotations, and greater debt.[21–28] Protective factors include training in mind-body skills and higher scores on mindfulness and self-compassion scales.[29–34] Other factors, including empathy, have had mixed relationships with the risk of burnout.[35–38] However, most studies have been limited by the lack of a national sample, lack of sequential assessments, and failure to explore longitudinal relationships between risk and protective factors and burnout.

To assess the epidemiology of burnout among pediatric residents in the United States, address previous limitations, and guide future interventions, we established the Pediatric Resident Burnout and Resilience Study Consortium (PRB-RSC) in 2015 (Supplemental Table 7). For this project, we addressed 3 study questions: (1) What is the prevalence of burnout among pediatric residents from 2016 to 2018? (2) What demographic and personal characteristics, residency program experiences, and attitudes are significantly associated with burnout cross-sectionally? (3) Building on our earlier study,[39] what factors are longitudinally associated with burnout, stress, and confidence in providing compassionate care (CCC)? We hypothesized that (1) burnout rates would be comparable to those reported previously (~50%), (2) previously identified cross-sectional risk and protective factors for burnout in other populations would be confirmed in pediatric residents, and (3) our earlier findings about longitudinal risk and protective factors for burnout, stress, and CCC would be confirmed. We plan to use the answers to inform interventions aimed at decreasing burnout among pediatric residents.

METHODS

The PRB-RSC membership as well as the overall design, participant eligibility and recruitment and use of standard instruments in the de-identified annual survey through the Association of Pediatric Program Directors' Longitudinal Educational Assessment Research Network have been described previously.[39,40] In 2016, the PRB-RSC consisted of 34 US residency programs; in 2017, 43 programs participated; and in 2018, 49 programs participated.

Briefly, participants were eligible if they were residents in categorical or combined (eg, medicine-pediatrics, pediatrics-psychiatry, etc) programs at PRB-RSC sites. There were no exclusion criteria.

The final survey consisted of 141 items, took 12 to 15 minutes to complete, and included demographic characteristics, residency experiences, and widely used scales to measure personal attributes associated with burnout and well-being (described below) and questions about satisfaction with social support, career, and learning environment.

The 22-item Maslach Burnout Inventory Human Services Survey was used to assess burnout.[41,42] Burnout was defined as having high subscale scores for personal emotional exhaustion ($\geq$27) and/or depersonalization ($\geq$13).[43,44]

Current physical and mental health was assessed by using the Patient-Reported Outcomes Measurement Information System questions; raw scores were converted to T-scores with a population mean score of 50.[45,46] Sleepiness was measured by using the Epworth Sleepiness Scale.[47–49] Stress was measured with the Perceived Stress Scale; scores among health professionals typically range from 14 to 18.[50–56] Mindfulness was assessed with the 10-item Cognitive and Affective Mindfulness Scale, Revised; the average item score in normative populations is 2.8 $\pm$ 0.5.[57–59] Resilience was assessed by using with the Brief Resilience Scale.[60] Self-compassion was measured by using Neff's 12-item measure of self-compassion; average item scores in normative populations range from 2.7 to 3.2.[61] CCC was assessed by using the 10-item Confidence in Providing Compassionate Care Scale; average scores in other studies of health professionals range from 60 to 80.[62] Empathy was measured by using the Davis empathy scales, with perspective-taking and empathic concern subscales used in the analyses.[63]

Additional items that were aimed at assessing recent training in mind-body skills and satisfaction with career, support, personal life, and the educational environment were included as exploratory variables.

Descriptive statistics were used to describe participants' demographic characteristics, burnout, and residency experiences. Fisher's exact tests, χ^2 tests, t tests, and analysis of variance tests were used to determine if characteristics were associated with residency response rate and burnout, as appropriate. To account for the clustering of learners

TABLE 1 Residents' Demographics, Residency Characteristics, and Burnout

Characteristic	2016 Not Burned Out	2016 Burned Out	*P*	2017 Not Burned Out	2017 Burned Out	*P*	2018 Not Burned Out	2018 Burned Out	*P*
No. programs and residents	34 (*N* = 1664)	34 (*N* = 1664)	—	43 (*N* = 2153)	43 (*N* = 2153)	—	49 (*N* = 2241)	49 (*N* = 2241)	—
No. participating residents, *n* (%)	739 (44)	925 (56)	—	989 (46)	1164 (54)	—	1036 (46)	1205 (54)	—
Demographic factors									
Age, mean ± SD	29.3 ± 2.7	29.3 ± 3.3	.6	29 ± 2.6	29 ± 2.4	.9	29 ± 2.6	29 ± 2.5	.9
Sex, *n* (%)			.9			.5			.2
Female	532 (72)	665 (72)		702 (71)	846 (73)		739 (72)	887 (74)	
Male	207 (28)	260 (28)		287 (29)	318 (27)		297 (29)	318 (26)	
Race, *n* (%)			.4			.5			.4
African American	23 (3)	28 (3)		30 (3)	37 (3)		43 (4)	44 (4)	
Asian American	122 (17)	137 (15)		144 (15)	166 (14)		179 (17)	187 (16)	
Caucasian	504 (69)	662 (72)		720 (73)	868 (75)		720 (70)	873 (73)	
Hispanic, Latino	45 (6)	37 (4)		43 (4)	45 (4)		48 (5)	46 (4)	
Other, mixed, no answer	40 (5)	57 (6)		48 (5)	44 (4)		43 (4)	51 (4)	
Married, *n* (%)			.6			.9			.9
Yes	439 (60)	540 (59)		597 (61)	701 (60)		614 (59)	713 (59)	
No	300 (41)	385 (42)		392 (40)	463 (40)		422 (41)	492 (41)	
Children, *n* (%)			.2			.6			.7
Yes	132 (18)	144 (16)		170 (17)	189 (16)		165 (16)	184 (15)	
No	607 (82)	781 (84)		819 (83)	975 (84)		871 (84)	1021 (85)	
Pregnant, *n* (%) of female residents			.8			.1			.1
Yes	27 (5)	31 (5)		42 (6)	32 (4)		51 (7)	43 (5)	
No	500 (95)	630 (95)		658 (94)	811 (96)		684 (93)	838 (95)	
Debt			.5			.45			.8
<$50 000	208 (28)	260 (28)		290 (29)	312 (27)		306 (30)	339 (28)	
$50 000–$100 000	75 (10)	78 (9)		88 (9)	103 (9)		96 (9)	116 (10)	
>$100 000	451 (62)	581 (63)		608 (62)	743 (64)		632 (61)	744 (62)	
Residency characteristics									
Type of resident, *n* (%)			.1			.6			.9
Categorical	630 (86)	753 (82)		792 (80)	938 (81)		851 (82)	991 (82)	
Combined or medicine-pediatrics	107 (15)	171 (19)		187 (20)	226 (19)		185 (18)	214 (18)	
Residency year, *n* (%)			.006			.001			.8
PGY1	227 (31)	334 (36)		352 (36)	388 (33)		368 (36)	418 (35)	
PGY2	234 (32)	310 (34)		279 (28)	415 (36)		326 (32)	394 (33)	
PGY3 or more	278 (38)	281 (30)		358 (36)	361 (31)		342 (33)	393 (33)	
Program size, *n* (%)			.2			.05			<.001
Small, <30 residents	23 (3)	18 (2)		42 (4)	33 (3)		32 (3)	25 (2)	
Medium, 30–60 residents	171 (23)	194 (21)		246 (25)	257 (22)		333 (32)	273 (23)	
Large, >60 residents	545 (74)	713 (77)		701 (71)	874 (75)		671 (65)	907 (75)	

Percentages may add to slightly more or <100% because of rounding. —, not applicable.

in programs, mixed-effects linear and logistic regression models were fitted to predict factors associated with burnout in a cross-sectional analysis for each year and all 3 years, with a random intercept for program included in every model and all predictors entered simultaneously to obtain adjusted odds ratios for each. In the data sets for each year and for all years combined, we used multiple imputation by chained equations to impute missing continuous variable predictors from other continuous variable predictors present. We conducted a longitudinal analysis using 2017 and 2018 data, including variables in the model based on their cross-sectional relationships with burnout and potential for intervention: self-compassion, mindfulness, empathy, satisfaction with work-life balance, overall satisfaction with their learning environment, current sleepiness, recent time off, and rotation. Because burnout is a dichotomous outcome, the analysis was a logistic mixed model, reporting odds ratios and 95% confidence intervals. Because stress and CCC are continuous variables, the analysis was a linear mixed model estimate of standardized, *z*-scored outcomes. In all analyses, our a priori level of significance was $P < .05$, and 2-sided tests were performed. Statistical analysis was performed with R 3.4, using the lme4 package for mixed modeling and the mice package for multiple imputation.

Each PRB-RSC member obtained approval from their local institutional review board.

TABLE 2 Residents' Personal Qualities or Characteristics and Burnout

Characteristic	2016 Not Burned Out	2016 Burned Out	*P*	2017 Not Burned Out	2017 Burned Out	*P*	2018 Not Burned Out	2018 Burned Out	*P*
No. participating residents, *n* (%)	739 (44)	925 (56)	—	989 (46)	1164 (54)	—	1036 (46)	1205 (54)	—
Personal qualities or characteristics									
Health, mean ± SD; T-score mean = 50; higher scores indicate better health									
Physical health	47.4 ± 3.6	47.4 ± 4.2	.9	49.1 ± 4.1	48.8 ± 4.7	.1	49.2 ± 4.2	48.8 ± 4.6	.03
Mental health	47 ± 4.5	44 ± 5	<.001	47 ± 4.6	43.8 ± 4.9	<.001	47.1 ± 4.6	43.7 ± 4.8	<.001
Sleepiness, mean ± SD; higher scores reflect more sleepiness	8.7 ± 4.2	10.6 ± 4.7	<.001	8.2 ± 4.2	10.4 ± 4.7	<.001	8.2 ± 4.3	10.5 ± 4.7	<.001
Overall quality of life, mean ± SD; higher scores reflect better quality of life	7.9 ± 1.2	6.6 ± 1.5	<.001	7.7 ± 1.2	6.5 ± 1.6	<.001	7.8 ± 1.2	6.5 ± 1.6	<.001
Stress, mean ± SD; higher scores reflect more stress	12.7 ± 5.1	18.7 ± 5.5	<.001	12.9 ± 5.2	19 ± 5.6	<.001	13.2 ± 5.4	19.1 ± 5.7	<.001
Mindfulness, mean ± SD; higher scores reflect more mindfulness	30.2 ± 4.9	26.5 ± 5.1	<.001	30.2 ± 4.8	26.3 ± 4.9	<.001	30.3 ± 4.9	26.4 ± 5.1	<.001
Self-compassion, mean ± SD; higher scores reflect more self-compassion	3.4 ± 0.6	2.9 ± 0.5	<.001	3.4 ± 0.6	2.9 ± 0.5	<.001	3.4 ± 0.6	2.9 ± 0.6	<.001
CCC, mean ± SD; higher scores reflect more confidence in offering compassionate care	65.5 ± 12.7	58.4 ± 13.8	<.001	67 ± 12.6	58 ± 13.9	<.001	68 ± 13.3	59 ± 14.3	<.001
Resilience, mean ± SD; higher scores reflect greater resilience	3.8 ± 0.6	3.5 ± 0.7	<.001	3.8 ± 0.6	3.4 ± 0.7	<.001	3.8 ± 0.6	3.4 ± 0.7	<.001
Empathy, mean ± SD; higher scores reflect more empathy									
Perspective-taking	19.2 ± 3.5	18.3 ± 4.0	<.001	19.4 ± 3.8	18.5 ± 3.9	<.001	19.8 ± 3.7	18.7 ± 3.9	<.001
Empathic concern scale	23.3 ± 4.1	21.8 ± 4.5	<.001	23.5 ± 4.0	21.9 ± 4.5	<.001	23.4 ± 4	21.8 ± 4.6	<.001
Mind-body skills training in past 3 y, *n* (%); any, including yoga, tai chi, meditation, self-hypnosis, biofeedback, guided imagery	376 (51)	456 (49)	.6	538 (54)	621 (53)	.7	633 (61)	708 (59)	.3

—, not applicable.

RESULTS

In 2016, 61% of 2723 eligible residents from 34 programs participated; in 2017, 66% of 3273 residents from 43 programs participated; and in 2018, 61% of 3657 residents from 49 programs participated.

In Table 1, we show that the prevalence of burnout exceeded 50% in all 3 years. There were no consistent significant differences between residents meeting criteria for burnout and those not meeting criteria for burnout in terms of any demographic characteristic (Table 1). There were also no significant differences in having received training in mind-body skills (Table 2); participating in a special residency pathway, such as global health or primary care track; or recently experiencing a patient's death (Table 3). Certain factors, such as residency year and program size, were associated with burnout in some years but not in others; for example, there were significant differences in burnout rates among postgraduate year 1 (PGY1), postgraduate year 2 (PGY2), and postgraduate year 3 (PGY3) in 2016 and 2017 but not in 2018. On the other hand, 2018 was the only year in which there were significant differences in burnout by program size (Table 1).

Compared with residents who did not meet criteria for burnout, those who did reported significantly worse mental health, more sleepiness, and greater stress (Table 2). Residents meeting burnout criteria consistently reported lower mindfulness and self-compassion scores, less CCC, and lower levels of empathy and resilience ($P < .001$ for all).

Residents who met criteria for burnout were more likely to be on high-acuity rotations (Table 3). They were approximately twice as likely to report recently having made a medical error, more likely to report a work-life conflict, less likely to have had a vacation within the past month, and less likely to have had a recent weekend off than those who did not meet criteria for burnout ($P < .001$ for all).

Residents who met burnout criteria consistently reported significantly less satisfaction with support from family, spouse, friends, faculty, and colleagues (Table 4). They also reported significantly lower quality of life, less satisfaction with their choice to go into pediatrics, and less satisfaction with the balance between personal and professional life ($P < .001$). Residents who were not burned out were much more likely than burned-out residents to strongly agree that they worked in a "collaborative rather than

TABLE 3 Residents' Experiences and Burnout

Characteristic	2016 Not Burned Out	2016 Burned Out	*P*	2017 Not Burned Out	2017 Burned Out	*P*	2018 Not Burned Out	2018 Burned Out	*P*
No. participating residents, *n* (%)	739 (44)	925 (56)	—	989 (46)	1164 (54)	—	1036 (46)	1205 (54)	—
Experience									
Current rotation, *n* (%)			<.001			.001			.004
High acuity: ICU, emergency medicine, NICU, inpatient	305 (41)	466 (50)		431 (44)	599 (52)		441 (43)	595 (50)	
Low acuity: elective, ambulatory, nursery, research	337 (46)	361 (39)		435 (44)	435 (37)		447 (43)	467 (39)	
Other	97 (13)	97 (11)		123 (12)	130 (11)		147 (14)	140 (12)	
Participate in residency pathway or track, such as global health, *n* (%)			.3			.4			.6
Yes	335 (45)	380 (41)		407 (41)	432 (37)		425 (41)	454 (38)	
No	404 (55)	545 (59)		582 (59)	732 (63)		611 (59)	751 (62)	
Errors or death, *n* (%)									
Major error in past 3 mo			<.001			<.001			<.001
Yes	81 (11)	221 (24)		114 (12)	252 (22)		101 (10)	240 (20)	
No	658 (89)	704 (76)		875 (88)	912 (78)		935 (90)	965 (80)	
Patient death on this or previous rotation?			.3			.4			.7
Yes	234 (32)	316 (34)		290 (29)	363 (31)		319 (31)	383 (32)	
No	505 (68)	609 (66)		699 (71)	801 (69)		717 (69)	822 (68)	
Conflict between work and personal responsibilities in past month			<.001			<.001			<.001
Yes	548 (74)	814 (88)		712 (72)	1009 (87)		704 (68)	1062 (88)	
No	191 (26)	111 (12)		277 (28)	155 (13)		332 (32)	143 (12)	
Time off, *n* (%)									
Vacation			.01			.001			.03
Within past month	186 (26)	183 (20)		303 (31)	263 (23)		281 (27)	274 (23)	
1–3 mo ago	273 (38)	403 (45)		390 (39)	498 (43)		419 (41)	492 (41)	
3–6 mo ago	185 (25)	239 (27)		225 (23)	295 (25)		251 (24)	320 (27)	
>6 mo ago	84 (12)	78 (9)		71 (7)	106 (9)		83 (8)	105 (10)%	
Weekend off			<.001			<.001			<.001
<4 wk ago	636 (86)	712 (77)		825 (84)	881 (76)		857 (83)	919 (76)	
≥4 wk ago	100 (14)	206 (23)		162 (16)	279 (24)		177 (17)	284 (24)	

—, not applicable.

competitive environment," that resident education and mentoring were high priorities in their programs, and that they were strongly satisfied with their learning environment ($P < .001$ for all factors for all 3 years).

In the cross-sectional mixed model logistic regression analysis, the variable most strongly associated with burnout was perceived stress (Table 5); other variables significantly associated with an increased risk of burnout were sleepiness, having made a recent medical error, and being dissatisfied with work-life balance. Four factors were consistently associated with a lower risk of burnout: empathy, self-compassion, overall quality of life, and CCC ($P < .05$ for each).

In the longitudinal logistic regression model predicting 2018 burnout, the strongest predictors were 2017 burnout and 2018 recent error, sleepiness, no recent weekend off, and current high-acuity rotation; after controlling for these factors, the only 2017 factor associated with 2018 burnout was quality of life (Table 6).

In the longitudinal regression for 2018 stress, the strongest predictors were 2017 stress and 2018 recent error, sleepiness, and no recent weekend off; after controlling for these predictors, the only 2017 factor longitudinally associated with 2018 stress was self-compassion (Table 6).

In the longitudinal regression for 2018 CCC, the strongest predictors were 2017 CCC and 2018 recent error; after controlling for these predictors, the 2017 factors longitudinally associated with 2018 CCC were mindfulness, satisfaction with the learning environment and career choice of pediatrics, and empathy (Table 6).

DISCUSSION

In this 3-year national survey of US pediatric residents, overall rates of burnout consistently exceeded 50%. We confirmed several previously identified risk factors (stress, sleepiness, recent medical error, and high-acuity rotation) and protective factors (mindfulness, self-

TABLE 4 Residents' Satisfaction, Attitudes, and Burnout

Characteristic	2016 Not Burned Out	2016 Burned Out	*P*	2017 Not Burned Out	2017 Burned Out	*P*	2018 Not Burned Out	2018 Burned Out	*P*
No. participating residents, *n* (%)	739 (44)	925 (56)	—	989 (46)	1164 (54)	—	1036 (46)	1205 (54)	—
Satisfaction and attitudes									
Satisfaction with choice to go into pediatrics, *n* (%)			<.001			<.001			<.001
Dissatisfied or very dissatisfied	18 (3)	82 (9)		18 (2)	99 (9)		22 (2)	106 (9)	
Neutral	7 (1)	62 (7)		20 (2)	95 (8)		14 (1)	94 (8)	
Satisfied or very satisfied	709 (96)	780 (84)		951 (96)	968 (83)		999 (97)	1004 (83)	
Satisfaction with balance between personal and professional life, *n* (%)			<.001			<.001			<.001
Dissatisfied or very dissatisfied	161 (22)	513 (56)		201 (20)	677 (58)		205 (20)	710 (59)	
Neutral	105 (14)	140 (15)		158 (16)	186 (16)		170 (16)	183 (15)	
Satisfied or very satisfied	470 (65)	272 (29)		628 (64)	297 (26)		660 (64)	312 (26)	
Satisfaction with support, *n* (%)									
Family			<.001			<.001			<.001
Very satisfied	527 (72)	538 (58)		703 (71)	661 (57)		758 (73)	716 (60)	
Less than very satisfied	209 (28)	387 (42)		286 (29)	501 (43)		278 (27)	487 (40)	
Spouse or significant other			<.001			<.001			<.001
Very satisfied	500 (71)	539 (60)		654 (69)	650 (58)		673 (68)	679 (59)	
Less than very satisfied	224 (29)	366 (40)		305 (31)	494 (42)		334 (32)	499 (41)	
Friends			<.001			<.001			<.001
Very satisfied	387 (53)	308 (33)		528 (54)	414 (36)		557 (54)	467 (40)	
Less than very satisfied	347 (47)	617 (67)		451 (46)	740 (64)		476 (46)	724 (60)	
Faculty			<.001			<.001			<.001
Very satisfied	230 (32)	142 (15)		338 (34)	196 (17)		392 (38)	185 (15)	
Less than very satisfied	503 (68)	783 (85)		636 (64)	965 (83)		642 (62)	1020 (85)	
Colleagues			<.001			<.001			<.001
Very satisfied	427 (58)	372 (40)		564 (57)	479 (41)		638 (62)	532 (44)	
Less than very satisfied	311 (42)	553 (60)		425 (43)	685 (59)		394 (38)	673 (56)	
Attitude toward residency environment, *n* (%)									
I work in a collaborative rather than competitive environment			<.001			<.001			<.001
Strongly agree	466 (63)	403 (44)		605 (61)	532 (46)		679 (66)	557 (46)	
Less than strongly agree	273 (37)	520 (56)		484 (39)	632 (54)		352 (34)	648 (54)	
Resident education is a high priority in my program			<.001			<.001			<.001
Strongly agree	291 (40)	191 (21)		368 (37)	245 (21)		382 (37)	245 (20)	
Less than strongly agree	443 (60)	731 (79)		619 (63)	919 (79)		652 (63)	960 (80)	
Resident career mentoring is a high priority in my program			<.001			<.001			<.001
Strongly agree	171 (23)	91 (10)		199 (20)	127 (11)		252 (24)	130 (11)	
Less than strongly agree	568 (77)	833 (90)		790 (80)	1037 (89)		784 (76)	1071 (89)	
Satisfied with learning environment, overall			<.001			<.001			<.001
Strongly agree	376 (51)	204 (22)		435 (44)	225 (19)		478 (46)	234 (20)	
Less than strongly agree	363 (49)	721 (78)		554 (56)	939 (81)		556 (54)	961 (80)	

—, not applicable.

compassion, CCC, and empathy) for burnout. We also built on findings from our earlier study, that is, that mindfulness and self-compassion were longitudinally associated with lower levels of stress and greater CCC, even after controlling for powerful factors like current sleepiness and recent error.[39] These results offer insights into potential targets for future interventions and research.

The stable 54% to 56% rate of burnout found from 2016 to 2018 in this study is similar to burnout rates previously reported in US studies of pediatric residents.[13,20] In surveys of Argentinian and Saudi pediatric residents, researchers have reported burnout rates >65%.[64,65] These consistent findings in our large national data set strengthen the conclusion that burnout is a prevalent, persistent problem.

Our findings on potential risk factors for burnout confirm earlier studies in other groups and identify attractive targets for interventions to improve resident well-being. For example, we confirmed that being on an intensive care rotation is associated with a higher risk of burnout.[66] Studies in

TABLE 5 Cross-Sectional Logistic Regression Mixed-Effects Models With Outcome Variable As Burnout in Each Year

Variable	2016 Adjusted Odds Ratio (95% CI)	*P*	2017 Adjusted Odds Ratio (95% CI)	*P*	2018 Adjusted Odds Ratio (95% CI)	*P*
Intercept	1.25 (0.3–4.9)	.75	0.45 (0.15–1.3)	0.15	1.3 (0.41–4.1)	.66
Factors associated with higher risk of burnout						
Perceived stress	2.4 (1.9–2.9)	<.001	2.1 (1.7–2.5)	<.001	1.7 (1.4–2.0)	<.001
Sleepiness	1.2 (1.1–1.4)	.002	1.3 (1.15–1.5)	<.001	1.3 (1.2–1.5)	<.001
Dissatisfied or very dissatisfied with work-life balance compared with neutral satisfaction	1.6 (1.1–2.3)	.01	2.1 (1.5–2.8)	<.001	1.9 (1.4–2.5)	<.001
Major error in past 3 mo	1.4 (1.02–2.0)	.04	1.4 (1.1–1.9)	.02	1.6 (1.2–2.2)	.002
Program size, large compared with small	2.0 (0.9–4.6)	.09	2.6 (1.3–4.9)	.004	1.4. (0.7–2.9)	.4
Perspective-taking	1.1 (0.9–1.2)	.6	1.2 (1.05–1.4)	.01	1.1 (0.9–1.2)	.3
Dissatisfied or very dissatisfied with faculty support compared with neutral satisfaction	1.2 (0.7–2.1)	.6	1.1 (0.7–1.7)	.8	1.7 (1.1–2.6)	.02
Factors associated with lower risk of burnout						
Empathic concern, empathy	0.67 (0.6–0.8)	<.001	0.7 (0.6–0.75)	<.001	0.7 (0.6–0.8)	<.001
Self-compassion	0.8 (0.6–0.9)	.003	0.8 (0.7–0.9)	.005	0.8 (0.6–0.9)	.001
Quality of life	0.7 (0.6–0.9)	.004	0.8 (0.7–0.99)	.04	0.7 (0.6–0.9)	<.001
CCC	0.8 (0.7–0.98)	.03	0.8 (0.7–0.9)	<.001	0.9 (0.8–0.99)	048
Overall satisfaction with learning environment	0.7 (0.0.6–0.9)	.002	0.8 (0.7–0.9)	.01	0.8 (0.7–1.0)	.06
Collaborative learning environment	0.8 (0.7–0.98)	.02	1.1 (0.96–1.3)	.2	0.98 (0.9–1.1)	.7
PGY2 compared with PGY1	0.8 (0.6–1.1)	.3	1.3 (1.01–1.7)	.04	0.9 (0.7–1.2)	.6
PGY3 compared with PGY1	0.8 (0.6–1.1)	.1	1.8 (0.9–3.6)	.4	1.1 (0.8–1.4)	.7
Satisfied or very satisfied with work-life balance compared with neutral satisfaction	0.9 (0.6–1.3)	.5	0.7 (0.5–0.9)	.01	0.7 (0.5–0.9)	.02
Current rotation: other, ambulatory, research	0.9 (0.6–1.3)	.5	0.7 (0.5–0.9)	.02	0.8 (0.6–1.1)	.14
Satisfied or very satisfied with choice of pediatric career compared with neutral satisfaction	0.4 (0.2–0.99)	.05	0.6 (0.3–1.1)	.1	0.5 (0.2–0.9)	.02

One model was fitted to each year's data, with all row variables entered as predictors; odds ratios reported are adjusted for other predictors and for program. The following were not statistically significant in multivariable logistic regression in any year: PGY3 versus PGY1; mindfulness (Cognitive and Affective Mindfulness Scale, Revised); resilience (Brief Resilience Scale); perception of the program prioritizing education and mentoring; current rotation elective, ambulatory, research, or other compared with intensive care or inpatient; last vacation 1 to 3, 3 to 6, 6 to 9, or >9 months ago compared with <1 month ago; last weekend off 2, 3, or ≥4 weekends ago compared with last weekend; very satisfied with work-life balance compared with neutral satisfaction; satisfaction with support from family, friends, or colleagues; and agreeing that the program prioritizes resident education or career mentoring. CI, confidence interval.

which researchers evaluate interventions that ease the stress of high-acuity rotations are needed. We also found 40% increased odds of reporting a recent medical error in residents who met criteria for burnout, echoing earlier findings in practicing physicians and other specialties.[10,22,67,68] It is difficult to determine if making errors leads to burnout or whether being burned out leads to errors; prospective research

TABLE 6 Longitudinal Regression Analyses for 2018 Burnout, Stress, and CCC

Variables	2018 Burnout Adjusted Odds Ratio (95% CI)	*P*	2018 Stress Estimate (SE)	*P*	2018 CCC Estimate (SE)	*P*
Intercept	0.3 (0.1–1.1)	.07	−0.21 (019.)	.29	0.36 (0.2)	.06
Independent variables						
2017 burnout, 2017 stress, 2017 CCC	6.4 (4.0–10.3)	<.001	0.4 (0.04)	<.001	0.6 (0.03)	<.001
2018 error in past 3 mo	2.2 (1.3–3.5)	.002	0.25 (0.07)	<.001	−0.14 (0.07)	.046
2018 sleepiness	1.7 (1.4–2.1)	<.001	0.21 (0.03)	<.001	−0.04 (0.03)	.2
2018 last weekend off ≥4 weekends ago compared with last weekend	1.6 (1.03–2.5)	.04	0.22 (0.07)	.001	0.1 (0.07)	.15
2018 current rotation elective, ambulatory, research, other	0.7 (0.5–0.9)	.02	−0.05 (0.06)	.3	0.07 (0.05)	.19
2017 overall quality of life	0.8 (0.6–0.998)	.04	−0.02 (0.04)	.5	0.06 (0.03)	.1
2017 empathic concern	0.8 (0.7–1.0)	.05	0.002 (0.03)	.94	0.06 (0.03)	.049
2017 self-compassion	0.9 (0.73–1.12)	.4	−0.17 (0.04)	<.001	0.04 (0.03)	.2
2017 mindfulness	1.0 (0.84–1.3)	.7	−0.05 (0.04)	.14	0.08 (0.03)	.02
2017 satisfaction with learning environment	0.98 (0.8–1.2)	.8	0.04 (0.03)	.3	0.08 (0.03)	.02
2017 satisfaction with choice of pediatric career: some or very satisfied compared with neutral satisfaction	0.8 (0.4–1.8)	.6	0.04 (0.1)	.8	−0.24 (0.12)	.04

One model was fitted to each 2018 outcome (burnout, stress, CCC) with each respondent's 2017 level of the outcome as a fixed effect, a set of 2017 and 2018 variables included simultaneously as fixed effects, and program as a random effect. Not statistically significant predictors of any of these 2018 outcomes were as follows: program size, mental health, last weekend off 2 or 3 wk ago compared with last week, satisfaction with work-life balance, dissatisfaction with choice of pediatric career compared with neutral satisfaction, and satisfaction with faculty support. CI, confidence interval.

is needed to identify strategies that reduce human error to protect against burnout while improving patient safety. Like others, we found that sleepiness, fatigue, stress, work-life conflicts, and dissatisfaction were associated with an increased risk of burnout.[4,26,34,69–73] Interventions addressing these factors may be worthwhile to test to reduce burnout.[74]

On the other hand, we did not confirm some reported risk factors for burnout, for example, sex and debt.[15,21,26,71,75–78] The reasons for this difference are unclear and must be tested in future studies. Also, unlike Pantaleoni et al,[20] we did not find that burnout rates consistently increased from the beginning to the middle of residency training. Future studies are needed to better understand the natural history of burnout.

With our data, we confirm cross-sectional studies reporting several protective factors for burnout, such as that more mindfulness is associated with a lower risk of burnout.[30,31,33,72,79–82] Also confirmed in our data are earlier findings that self-compassion, CCC, and empathy are associated with a lower burnout risk.[30,38,76,82,83] Controlled trials are needed to evaluate the impact on burnout of programs that improve mindfulness, self-compassion, and CCC.

With this study, we extend previous findings by providing extensive exploratory data on resident satisfaction and attitudes. We confirmed the finding that among Dutch residents, a better perception of the quality of the learning environment was associated with a lower risk of burnout.[84] Longitudinal controlled studies are needed to evaluate the impact of changes in the learning environment on burnout and strategies to enhance satisfaction with support.

We used a similar longitudinal model to extend our earlier research to predict 2018 burnout, stress, and CCC, controlling for the effect of additional variables (2018 recent error, sleepiness, no recent weekend off, and current rotation).[39] After controlling for these factors, 2017 quality of life was protective for 2018 burnout, 2017 self-compassion was protective for 2018 stress, and 2017 mindfulness was protective for 2018 CCC. That is, both the data from 2016 to 2017 and from 2017 to 2018 suggest that mindfulness and self-compassion may be longitudinally related to better scores on factors closely related to burnout, stress, and CCC.

Despite its large size and longitudinal nature, results of this voluntary survey of pediatric residents may not be generalizable to other specialties or stages of training. All of the variables evaluated depend solely on self-report; burned-out residents may view experiences, support, or programmatic activities more negatively than residents who are not burned out. Future researchers should use more objective measures and longitudinal analyses. The annual time frame for this study may not capture shorter- or longer-term effects. The survey was not used to examine unit, system, or cultural factors that may have affected burnout. Future researchers would benefit from having more data at the programmatic level to better understand where and how to best leverage interventions to improve resident well-being and reduce burnout. Future researchers should also include emerging potential cultural risk factors for burnout, including sexism, harassment, bullying, discrimination, or violence, and institutional factors, such as use of the electronic health record, scribes, and access to social workers and psychologists.[85,86]

CONCLUSIONS

In this national longitudinal study, >50% of pediatric residents met criteria for burnout. Promising targets for intervention include program-level interventions during stressful high-acuity rotations and/or in the time period after a major medical error as well as the timing of weekends off and individual training in protective factors, such as adequate sleep, mindfulness, empathy, and compassion. Future researchers should also address broader factors affecting burnout at institutional and cultural levels.

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ABBREVIATIONS

CCC: confidence in providing compassionate care
PGY1: postgraduate year 1
PGY2: postgraduate year 2
PGY3: postgraduate year 3
PRB-RSC: Pediatric Resident Burnout and Resilience Study Consortium

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