Impact of Protected Sleep Period for Internal Medicine Interns on Overnight Call on Depression, Burnout, and Empathy

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Abstract

Background Patient safety and sleep experts advocate a protected sleep period for residents.

Objective We examined whether interns scheduled for a protected sleep period during overnight call would have better end-of-rotation assessments of burnout, depression, and empathy scores compared with interns without protected sleep periods and whether the amount of sleep obtained during on call predicted end-of-rotation assessments.

Methods We conducted a randomized, controlled trial with internal medicine interns at the Philadelphia Veterans Affairs Medical Center (PVAMC) and the Hospital of the University of Pennsylvania (HUP) in academic year 2009–2010. Four-week blocks were randomly assigned to either overnight call permitted under the 2003 duty hour standards or a protected sleep period from 12:30 AM to 5:30 AM. Participants wore wrist actigraphs. At the beginning and end of the rotations, they completed the Beck Depression Inventory (BDI-II), Maslach Burnout Inventory (MBI-HSS), and Interpersonal Reactivity Index (IRI).

Results A total of 106 interns participated. There were no significant differences between groups in end-of-rotation BDI-II, MBI-HSS, or IRI scores at either location ($P > .05$). Amount of sleep while on call significantly predicted lower MBI-Emotional Exhaustion ($P < .003$), MBI-Depersonalization ($P < .003$), and IRI-Personal Distress ($P < .006$) at PVAMC, and higher IRI-Perspective Taking ($P < .008$) at HUP.

Conclusions A protected sleep period produced few consistent improvements in depression, burnout, or empathy, although depression was already low at baseline. Possibly the amount of protected time was too small to affect these emotional states or sleep may not be directly related to these scores.

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Introduction

In 2003, the Accreditation Council for Graduate Medical Education (ACGME) duty hour regulations were introduced with the broad goals of enhancing patient safety, resident education, and resident well-being.[1] The 2011 revisions to the regulations largely share the same goals.[2] An underlying assumption of the regulations is that limiting work hours would reduce resident fatigue and thereby improve both patient outcomes and resident well-being, including education and learning opportunities.

Some research[3–5] after the duty hour reform showed that residents felt more rested or slept more hours. Studies reported reduced burnout in internal medicine residents[6,7] and decreased burnout[5] and improved quality of life among surgical trainees after the 2003 duty hour reform.[3,8] Overall, an early review concluded that quality of life probably improved.[9]

Although the exact relationship between the amount of sleep and emotional well-being is unclear, the Biobehavioral Model of Altered Dysregulation in Circadian Systems suggests that psychological functioning (eg, depression, mood states) has direct reciprocal relationships with the sleep system, among others, thus dysregulation of the sleep system can cause decrements in quality of life.[10] Empirically, that relationship has been shown in some contexts, such as burnout among a sample of orthopedic surgery residents[11] and emotional exhaustion in internal medicine residents.[12] Emotional well-being was significantly related to "getting enough sleep" among a sample of residents from 13 specialties.[13] Longer sleep duration and prevention of sleep deprivation were associated with reduced fatigue and depression at the end of the internal medicine intern year, but were not related to burnout.[14] Most studies assessed sleep subjectively and/or retrospectively by self-report.

Recent randomized trials by this research team found internal medicine interns on overnight call experienced more sleep, fewer sleepless nights, and fewer sleep interruptions during a 5-hour protected sleep period, as shown by wrist actigraphy for an objective and reliable measurement of the amount slept.[15] Here, we report the results of the first randomized, controlled trial examining how increased amounts of sleep on call affect intern burnout, depression, and empathy. We hypothesized that end-of-rotation burnout, depression, and empathy scores for interns who were scheduled for a protected sleep period during overnight call would be more favorable than those for interns who were not assigned to protected sleep periods. We also predicted that the total amount of sleep obtained during the on-call days would predict end-of-rotation assessments of burnout, depression, and empathy scores.

What was known

Ensuring some protected sleep time for on-call residents is thought to enhance patient safety and resident well-being.

What is new

A protected sleep period produced few consistent improvements in assessments for depression, burnout, or empathy.

Limitations

The study was not sufficiently powered and the indicator subscales were not sensitive enough to detect small changes in outcomes that might occur with small increases in sleep.

Bottom line

Protected sleep time for on-call interns did not produce statistically or practically significant improvement in indicators of personal well-being and empathy.

Methods

This study was part of a larger protocol looking at the impact of a protected sleep period on sleep during internship, conducted in academic year 2009–2010, in the internal medicine residency program at the Perelman School of Medicine at the University of Pennsylvania. Specifically, it was conducted on the internal medicine service at Philadelphia Veterans Affairs Medical Center (PVAMC) and on the oncology service at the Hospital of the University of Pennsylvania (HUP). Details of the larger study are reported elsewhere.[15]

Participants were enrolled in the study at the departmental orientation session. Interns were told that participation was voluntary. Between July 2009 and June 2010, 74 interns and 32 senior medical student subinterns served on either an internal medicine rotation at PVAMC or at the oncology unit of HUP or both, with subinterns serving only at PVAMC.

Structure of the Services

During the study period, both services had 4 internal medicine teams. Each was assigned 1 resident and 2 interns or 1 intern and 1 senior medical student (henceforth, all referred to as *interns*) who functioned as an intern. Each team admitted and took call every fourth night. An additional resident served as the night float for 1 week at a time and covered for the on-call resident on overnight shifts from 9 PM to 7 AM. An extra resident was scheduled to assist in covering the protected time at night on the higher-acuity oncology service. On the on-call night, 2 of the 8 interns remained overnight, working until approximately 1 PM the next day.

Intervention

The primary intervention was a 5-hour period of protected time in which interns were expected to sleep. Interns

handed over cell phones/beepers for the duration of the protected period. The planned sleep period was from 12:30 AM to 5:30 AM. During sleep time, the night float residents covered all medical patients but were instructed to wake either or both interns should extra help be needed.

Monthly Schedule and Randomization

The intern schedule was divided into 12 blocks, each 4 weeks long. Within each of 6 consecutive pairs of 4-week blocks, 1 block was randomized to an intervention schedule or the standard schedule. Participants underwent the assigned condition for all 4 weeks they were on rotation. Intern schedules were assigned independent of the study. Randomization allocations of each 4-week period were concealed from participants at the time of consent. Analysts and investigators were kept blinded until the data were analyzed.

During the year, at PVAMC, 48 interns were assigned to protected sleep months and 52 interns were assigned to control months. At HUP, 40 interns were assigned to protected sleep months and 39 were assigned to control months. Interns (except for subinterns) may have been assigned to rotate more than once and/or at 1 or both locations, so the total is greater than 106.

Measures

On the first Monday of the 4-week rotation, participants were met at intern report and given a packet with the following instruments: the Beck Depression Inventory (BDI-II), the Interpersonal Reactivity Index (IRI), and the Maslach Burnout Inventory-Human Services Survey (MBI-HSS). They also provided general demographic information and received an Actiwatch Spectrum actigraph (Philips, Bend, OR). On the last Friday of the rotation, participants returned their actigraphs and completed an identical packet of instruments.

The BDI-II is a 21-item self-report of specific attitudes and symptoms of depression. Items are scored from 0 to 3, with 3 indicating more symptomatology. Item scores are summed for a total score. A total score of 0 to 13 is considered minimal, 14 to 19 is mild, 20 to 28 is moderate, and 29 to 63 is severe. Scores on this shorter version are highly correlated with the well-studied longer version.[16,17] It has been used in resident samples.[3,14]

The IRI is a 28-item instrument consisting of 4 different 7-item subscales. We assessed states of perspective taking, empathic concern, and personal distress. Items are scored on a 0 to 4 scale, where 0 indicates "does not describe me well" and 4 indicates "describes me very well." The empathic concern subscale assesses "other oriented" feelings of sympathy and concern for unfortunate others. The perspective-taking subscale assesses the respondent's tendency to spontaneously adapt the psychological viewpoint of others. The personal distress subscale measures "self-oriented" feelings of anxiety and unease in interpersonal settings. Previous studies have reported that subscale scores are internally consistent and are strong indicators of social functioning, self-esteem, emotionality, and sensitivity to others.[18] The IRI has been used with resident samples.[14]

The MBI-HSS is a 22-item rating scale designed to assess 3 aspects of the burnout syndrome: emotional exhaustion (9 items), depersonalization (5 items), and lack of personal accomplishment (8 items).[19] Items are answered on a frequency scale of 0 to 6, where 0 indicates never, and 6 indicates every day. No method of combining the subscale scores is reported.

The Actiwatch Spectrum is a watch-like device that contains a highly sensitive accelerometer to measure physical motion and a 3-color light sensor to measure ambient light. Data from the actigraphs were collected in 1-minute epochs and stored in the watch until downloaded at the end of each rotation. Similar actigraphy devices have been validated and applied to successfully study sleep patterns in physicians on night call.[15,20,21]

Approval for this study was obtained from the Institutional Review Boards of the PVAMC and the University of Pennsylvania.

Description of Statistical Analyses

We compared the change in scores from the beginning of the month to the end of the month on the BDI-II, IRI, and MBI-HSS indexes in protected sleep periods versus no protected sleep periods, using a difference-in-difference model that computed robust standard errors that accounted for interns who may have contributed multiple observations and scores when measured twice in a month. We used multiple regression to look at relationships between sleep during the rotation and end-of-rotation scaled scores. We used total amount of sleep on the on-call day for that purpose but also tested the relationship by using total amount slept in the previous 7 days, total amount slept in the previous 4 days, total amount slept in the past day, and percentage of on-call nights without sleep. Sleep time captured by actigraphy was augmented by self-reported sleep in the case of unusable actigraph data. Details about sleep time calculation and imputation can be found elsewhere.[15] Other variables in the regressions included day of the call cycle (indicated by number of days since last on call), sex, age, month of the year, and subintern status (PVAMC only).

Results

All 106 interns agreed to be in the study (3 consented but were never scheduled). Of 103 interns, 54 (52%) were

TABLE 1 **Description of Internal Medicine Interns Participants in Academic Year 2009–2010 at the Philadelphia Veterans Affairs Medical Center (PVAMC) and the Hospital of the University of Pennsylvania (HUP)**

	PVAMC			HUP		
	Intervention[a]	Control[b]	*P*	Intervention[a]	Control[b]	*P*
Participants						
Interns studied, No.[c]	48	52		40	39	
Subinterns studied, No.	16	16		0	0	
Women, %	54	50	.68	44.2	52.9	.38
Age, mean (SD)	27.44 (2.44)	27.67 (2.44)	.63	27.61 (1.81)	28.86 (2.08)	.52
Rotations, No.	50	56		52	51	
Sleep						
During on-call days, total h	3.23 (0.99)	2.54 (1.40)	.004	3.36 (1.26)	2.42 (0.86)	< .001
Previous 7 d, total h	49.68 (5.16)	45.75 (8.10)	.008	47.68 (4.51)	46.75 (9.82)	.63
Previous 4 d, total h	27.04 (2.99)	26.03 (4.14)	.18	26.07 (3.55)	25.27 (5.29)	.41
Past day, total h	6.91 (2.57)	6.68 (3.21)	.71	7.43 (1.57)	6.77 (2.26)	.12

[a] Protected sleep period when on overnight call from 12:30 AM to 5:30 AM.
[b] A standard intern schedule of extended-duty overnight shifts of up to 30 hours.
[c] Interns (except for subinterns) may have been assigned to rotate more than once and/or at 1 or both locations.

women. Mean age was just under 28 years. There were a total of 50 (intervention) and 56 (control) rotations at PVAMC and 52 (intervention) and 51 (control) rotations at HUP (TABLE 1). At both sites, interns in the intervention group slept more during on-call days (3.23 versus 2.54 hours at the PVAMC, $P = .004$; 3.36 versus 2.42 hours at HUP, $P < .001$) and had fewer nights without sleep (0.01 versus 0.04, $P = .004$ at PVAMC; 0.01 versus 0.03, $P = .01$ at HUP). At PVAMC, total sleep time during the previous 7 days before the end-of-rotation survey was higher in intervention months compared with control months (49.7 versus 45.8 hours, $P = .008$). There were no differences related to amount of sleep in the prior 4 days or past day.

Baseline and end-of-month scores for the intervention and control groups at PVAMC are shown in TABLE 2A. On average, interns' baseline scores were in the positive/healthy range. For example, mean BDI-II baseline scores at PVAMC were 6.29 (SD, 5.90) for the intervention group and 8.17 (SD, 7.44) for the control group, clearly at the "minimal" end of the 0 to 63 score distribution. Means on the MBI-Personal Accomplishment subscale were 37.32 and 38.08, out of a possible 48 points. The MBI-Emotional Exhaustion subscale means were 23.91 and 25.43, out of a possible 54 points. Mean baseline scores were low for MBI-Depersonalization (11.57 and 12.25, out of a possible 30 points). All IRI subscales had a possible 28 points. Baseline means were 20.02 and 20.33 for Empathic Concern and 19.49 and 17.58 for Perspective Taking. Personal Distress baseline scores were low (mean, 10.62 [SD, 5.43] intervention; mean, 9.13 [SD, 4.52] control). The difference in scores before and after rotation were almost always less than 1 point, except for MBI-Emotional Exhaustion (where scores worsened by 3.09 points in the intervention group and 2.25 points in the control group) and MBI-Depersonalization (where scores worsened by 1.45 points in the intervention group and 1.25 points in the control group). None of the difference-in-difference comparisons were statistically significant ($P > .05$).

Parallel data are shown in TABLE 2B for HUP. The baseline scores and average before and after differences mirror the PVAMC scores. Again, none of the difference-in-difference comparisons were statistically significant ($P > .05$).

TABLE 3A shows the regression results for the PVAMC. Notably, the only consistent predictor of end-of-month scores for depression, burnout, and empathy was the baseline score (all $P < .001$). Amount of sleep while on call significantly predicted lower MBI-Emotional Exhaustion ($P < .003$), MBI-Depersonalization ($P < .003$), and IRI-Personal Distress ($P < .006$). The regression results for HUP are shown in TABLE 3B. Again, the only consistent predictor of end-of-month scores was the baseline score (all $P < .001$), although amount of sleep while on call significantly predicted higher IRI-Perspective Taking

TABLE 2A **Difference-in-Difference Comparisons of Scores on the Beck Depression Inventory (BDI), Maslach Burnout Inventory (MBI), and Interpersonal Reactivity Index (IRI) for Internal Medicine Interns Randomized to Protected Sleep Periods at the Philadelphia Veterans Affairs Medical Center in Academic Year 2009–2010**

	Intervention[a]				Control[b]				
Measures	Intern-Months, No.	Before Rotation, Mean (SD)	After Rotation, Mean (SD)	Difference	Intern-Months, No.	Before Rotation, Mean (SD)	After Rotation, Score, Mean (SD)	Difference	*P* Value
BDI	38	6.29 (5.90)	6.47 (5.85)	0.18 (5.92)	46	8.17 (7.44)	9.11 (7.98)	0.93 (4.65)	.52
MBI									
EE	47	23.91 (11.10)	27.00 (12.42)	3.09 (11.70)	53	25.43 (10.48)	27.68 (11.96)	2.25 (5.88)	.65
DP	47	11.57 (6.90)	13.02 (6.69)	1.45 (6.86)	53	12.25 (6.03)	13.49 (6.49)	1.25 (4.22)	.86
PA	47	37.32 (7.92)	37.49 (9.03)	0.17 (8.39)	53	38.08 (6.43)	37.53 (7.48)	−0.55 (4.23)	.59
IRI									
PT	45	19.49 (4.27)	19.53 (4.38)	0.04 (2.76)	52	17.58 (4.43)	18.38 (4.86)	0.81 (2.74)	.17
EC	45	20.02 (4.40)	20.13 (4.31)	0.11 (3.11)	52	20.33 (4.59)	20.25 (4.36)	−0.08 (2.35)	.74
PD	45	10.62 (5.43)	9.29 (5.82)	−1.33 (2.92)	52	9.13 (4.52)	8.60 (4.50)	−0.54 (2.56)	.15

Abbreviations: EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; PT, perspective taking; EC, empathic concern; PD, personal distress.

[a] Protected sleep period when on overnight call from 12:30 AM to 5:30 AM.

[b] A standard intern schedule of extended-duty overnight shifts of up to 30 hours.

TABLE 2B **Difference-in-Difference Comparisons of Scores on the Beck Depression Inventory (BDI), Maslach Burnout Inventory (MBI), and Interpersonal Reactivity Index (IRI) for Internal Medicine Interns Randomized to Protected Sleep Periods at the Hospital of the University of Pennsylvania in Academic Year 2009–2010**

	Intervention[a]				Control[b]				
Measures	Intern-Months, No.	Before Rotation, Mean (SD)	After Rotation, Mean (SD)	Difference	Intern-Months, No.	Before Rotation, Mean (SD)	After Rotation, Mean (SD)	Difference	*P* Value
BDI	47	5.91 (4.87)	6.89 (6.00)	0.98 (4.22)	44	8.52 (8.19)	9.20 (8.24)	0.68 (3.81)	.72
MBI									
EE	51	24.24 (10.03)	27.88 (10.47)	3.65 (7.08)	47	26.60 (11.92)	30.40 (10.89)	3.81 (6.68)	.91
DP	51	10.71 (5.38)	11.65 (5.55)	0.94 (4.42)	47	11.70 (7.01)	13.06 (6.78)	1.36 (4.17)	.62
PA	51	38.51 (7.91)	37.86 (7.01)	−0.65 (7.12)	47	36.60 (6.60)	36.81 (6.33)	0.21 (4.36)	.46
IRI									
PT	48	18.31 (3.73)	17.81 (4.56)	−0.50 (3.27)	48	17.42 (4.04)	17.04 (4.72)	−0.38 (2.99)	.84
EC	48	20.00 (4.61)	19.94 (4.58)	−0.06 (3.17)	48	19.08 (4.08)	19.21 (4.38)	0.13 (2.50)	.74
PD	48	8.92 (4.80)	8.73 (4.99)	−0.19 (3.36)	48	9.88 (4.82)	9.38 (4.94)	−0.50 (2.27)	.59

Abbreviations: EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; PT, perspective taking; EC, empathic concern; PD, personal distress.

[a] Protected sleep period when on overnight call from 12:30 AM to 5:30 AM.

[b] A standard intern schedule of extended duty overnight shifts of up to 30 hours.

TABLE 3A **Multiple Regression Results Predicting Beck Depression Inventory (BDI), Maslach Burnout Inventory (MBI), and Interpersonal Reactivity Index (IRI) Scores for Medicine Interns Randomized to Protected Sleep Periods at the Philadelphia Veterans Affairs Medical Center in Academic Year 2009–2010**

		BDI	MBI-EE	MBI-DP	MBI-PA	IRI-PT	IRI-EC	IRI-PD
Parameter	Level	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
Intercept		7.18	11.92	7.83	0.80	−2.19	0.89	3.89
Baseline		0.63[a]	0.76[a]	0.63[a]	0.67[a]	0.89[a]	0.75[a]	0.94[a]
Age		−0.10	0.06	0.01	0.30	0.08	0.07	−0.03
Sex	M	−1.55	−4.06[b]	−2.83[b]	1.53	−0.16	−0.14	−0.63
Sleep–on call		−0.75	−2.41[b]	−1.38[b]	0.63	0.08	0.36	−0.59[b]
Postcall–day 1	2	−0.11	2.44	−0.36	−1.70	1.04	0.59	−0.70
Postcall–day 2	3	1.14	0.08	−0.01	0.45	0.88	1.26	−1.49[c]
Postcall–day 3	4	−0.34	0.06	−0.06	1.46	1.49	0.62	−1.17
August	2	0.34	8.02	6.36[c]	−1.67	0.47	1.36	0.12
September	3	2.60	−2.38	0.70	1.52	2.65	1.74[c]	−1.40
October	4	−1.16	3.57	3.90	2.36	0.92	−0.10	−0.29
November	5	2.55	4.94	3.46	0.04	2.53[c]	1.34	0.88
December	6	4.14	5.23	4.27[c]	−0.23	2.09	0.49	0.03
January	7	7.88	1.01	1.81	−0.22	0.32	0.85	−2.75
February	8	2.76	7.05	5.95[b]	−0.45	−0.24	−1.61	1.54
March	9	1.04	2.42	1.01	−1.55	0.66	1.24	1.42
April	10	−0.57	2.50	4.33	1.95	1.09	−0.87	−0.29
May	11	3.75	10.64[c]	7.89[a]	0.81	−1.01	0.64	−0.26
June	12	0.15	−0.02	2.04	−1.58	2.09	2.12[c]	−0.94
Subinterns		−0.68	−0.21	−1.38	3.12[b]	0.88	0.61	−1.36[c]

Abbreviations: EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; PT, perspective taking; EC, empathic concern; PD, personal distress.

[a] $P < .001$.
[b] $P < .01$.
[c] $P < .05$.

($P < .008$). When time slept during the on-call day was replaced with time slept in previous 7 days, time slept in previous 4 days, time slept in the past 1 day, and percentage of on-call nights with no sleep, they yielded similar results for baseline scores and even fewer sleep-related results.

Discussion

Randomized trials of protected sleep periods at 2 sites where there was a significant increase in the amount slept during on call gave us the opportunity to also look at possible improvements in multiple affective measures that are well described in the training literature—depression, burnout, and mood, especially empathy.[15] Somewhat surprisingly, given the suggestion in regulations and descriptive literature about the powerful impact of sleep, we found no differences in end-of-rotation scores compared with baseline scores between the protected sleep and control groups in any of the measures. Moreover, amount of sleep was generally not related to affective scores.

Why were no significant results observed? One possibility is that, although we observed significant differences in the amount slept during on call, average amounts slept during the previous 1, 4, and 7 days were similar between those with protected sleep periods and those without protected sleep. Another possibility is that a 4-week period is too brief to markedly change affective

TABLE 3B **Multiple Regression Results Predicting Beck Depression Inventory (BDI), Maslach Burnout Inventory (MBI), and Interpersonal Reactivity Index (IRI) Scores for Medicine Interns Randomized to Protected Sleep Periods at the Hospital of the University of Pennsylvania in Academic Year 2009–2010**

		BDI	MBI-EE	MBI-DP	MBI-PA	IRI-PT	IRI-EC	IRI-PD
Parameter	Level	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
Intercept		−1.75	12.89	2.19	10.44	−10.35	−6.61	−3.23
Baseline 1		0.73[a]	0.71[a]	0.79[a]	0.78[a]	0.86[a]	0.70[a]	0.84[a]
Age		0.46[b]	0.09	0.04	−0.02	0.32	0.28	0.17
Sex	M	−3.57[a]	0.95	0.22	2.17[b]	−0.43	−0.39	−0.78
Sleep–on call		−0.45	−0.96	0.07	0.26	0.88[c]	0.34	−0.01
Postcall–day 1	2	−1.62	2.59	3.49	0.75	1.09	0.68	−2.68[b]
Postcall–day 2	3	−0.88	2.29	2.43	−1.05	2.05	1.26	−1.35
Postcall–day 3	4	−2.01	3.12	4.49[b]	−2.60	1.68	1.32	−0.32
August	2	−2.93	−3.53	−0.37	−3.43	−0.93	3.48[b]	2.57
September	3	−1.55	−3.89	−3.28	−1.55	1.29	3.24	2.09
October	4	−3.65[b]	−3.77	−3.44	0.13	−2.75	2.16	−0.11
November	5	1.20	−3.71	−3.45	−4.92	1.49	4.42[c]	4.23
December	6	−4.86[b]	−1.76	−0.78	−2.57	−0.04	2.92	0.82
January	7	−7.10[c]	−4.75	−5.78[b]	−5.30	−3.60[b]	1.37	2.18
February	8	−1.67	−6.66	−2.69	−2.87	0.40	4.63[c]	3.63[b]
March	9	−4.11[b]	−2.14	−1.61	−5.63	−0.97	2.66	2.79
April	10	−2.52	−3.48	−3.53	−1.85	−2.27	1.97	0.81
May	11	−3.57[b]	−7.19[b]	−1.33	−7.03[b]	2.24	5.46[a]	1.47
June	12	−7.01[a]	−4.69	−3.62	0.46	−0.10	2.92	0.69

Abbreviations: EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; PT, perspective taking; EC, empathic concern; PD, personal distress.

[a] $P < .001$.
[b] $P < .05$.
[c] $P < .01$.

"states." Alternatively, some baseline scores, such as those for depression, were so low there was little opportunity for a group mean to change.

As stated above, much of what we know about these affective states is cross-sectional. With the exception of a few studies,[12,22] most literature does not examine how these attributes change over time in trainees. However, several studies suggest empathy declines with increased clinical experience.[23] Strategies to address burnout in physicians or health care workers have focused predominantly on intervening at the individual level via mindfulness or stress-reduction courses, with some degree of success.[24,25] However, those time-intensive workshops may not be feasible for residents whose time is already subject to competing priorities of patient care, education, and personal life.

Our study has several limitations. First, participants were at a single institution. Second, although the measures used are widely cited in the literature, alternative methods of assessments may have more validity. Likely, these subscales were not sensitive enough to detect small changes that might occur with small increases in sleep. Third, our study was not specifically powered to detect changes in depression or burnout scores. For example, using the observed standard deviations, we had 70% power to detect a magnitude of change in BDI-II of 3 points or more, much larger than the observed differences. Fourth, we did not control for the rotation from which the intern had come when the shift started, although the impact should be equal across arms. Finally, the participants were interns or intern equivalents, who are no longer allowed to work more than

16-hour shifts. Nevertheless, learning more about how sleep is (or is not) related to the constructs may generalize to interns on night-shift rotations as well as to residents.

Conclusion

Protected sleep periods help interns get more sleep during on-call work, yet, largely, do not significantly affect the degree of depression/burnout in an intern population. Given that the most important predictor of affective disorders was baseline score, it would seem that early identification of those at risk and targeted interventions may be helpful for programs to undertake.

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