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Research and Applications

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The impact of time spent on the electronic health record after work and of clerical work on burnout among clinical faculty

Lauren A. Peccoralo, [1,2,3] Carly A. Kaplan, [2] Robert H. Pietrzak, [4,5,6] Dennis S. Charney, [7,8,9] and Jonathan A. Ripp [1,2,3]

[1]Department of Medicine, Icahn School of Medicine at Mount Sinai, New York, New York, USA, [2]Department of Medical Education, Icahn School of Medicine at Mount Sinai, New York, New York, USA, [3]Office of Well-being and Resilience, Icahn School of Medicine at Mount Sinai, New York, New York, USA, [4]US Department of Veterans Affairs National Center for Posttraumatic Stress Disorder, VA Connecticut Healthcare System, West Haven, Connecticut, USA, [5]Department of Psychiatry, Yale University School of Medicine, New Haven, Connecticut, USA, [6]Department of Social and Behavioral Sciences, Yale School of Public Health, New Haven, Connecticut, USA, [7]Department of Psychiatry, Icahn School of Medicine at Mount Sinai, New York, New York, USA, [8]Department of Neuroscience, Icahn School of Medicine at Mount Sinai, New York, New York, USA, and [9]Department of Pharmacological Sciences, Icahn School of Medicine at Mount Sinai, New York, New York, USA

Corresponding Author: Lauren Peccoralo, MD MPH, One Gustave L. Levy Place, Dean's Office, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA (lauren.peccoralo@mounstinai.org)

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ABSTRACT

Objective: To identify specific thresholds of daily electronic health record (EHR) time after work and daily clerical time burden associated with burnout in clinical faculty.

Materials and Methods: We administered an institution-wide survey to faculty in all departments at Mount Sinai Health System from November 2018 to February 2019. The Maslach Burnout Inventory and Mayo Well-Being Index assessed burnout. Demographics, possible confounding variables, and time spent on EHR work/clerical burden were assessed.

Results: Of 4156 eligible faculty members, 1781(42.9%) participated in the survey. After adjustment for background factors, EHR frustration (odds ratio [OR]=1.64–1.66), spending >90 minutes on EHR-outside the workday by self-report (OR = 1.41–1.90) and >1 hour of self-reported clerical work/day (OR = 1.39) were associated with burnout. Reporting that one's practice unloads clerical burden (OR = 0.50–0.66) and higher resilience scores (OR = 0.77–0.84) were negatively associated with burnout.

Spending >90 minutes/day on EHR-outside work (OR = 0.66–0.67) and >60 minutes/day on clerical work (OR = 0.54–0.58) was associated with decreased likelihood of satisfactory work–life integration (WLI) and professional satisfaction (PS). Greater meaning in work was associated with an increased

likelihood: of achieving WLI (OR = 2.51) and PS (OR = 21.67).

Conclusion: Results suggest there are thresholds of excessive time on the EHR-outside the workday (>90 minutes) and overall clerical tasks (>60 minutes), above which clinical faculty may be at increased risk for burnout, as well as reduced WLI and PS, independent of demographic characteristics and clinical work hours. These thresholds of EHR and clerical burden may inform interventions aimed at mitigating this burden to reduce physician burnout.

Key words: well-being, burnout, clinical faculty, clerical burden, electronic health record

INTRODUCTION

Burnout is prevalent in physicians and other clinical faculty and associated with numerous negative consequences, including depression, substance abuse,[1] suboptimal patient care,[2] and an increased likelihood to leave clinical practice.[3,4] A large national effort is currently underway to identify and address drivers of physician burnout with considerable focus on system-level solutions.[5,6] To date, system factors that have been linked to burnout include greater number of hours worked per week,[7–11] team-based care inefficiencies,[12,13] and excessive time spent on clerical tasks.[14]

The electronic health record (EHR) is a major contributor to excess clerical burden, in large part due to disproportionate time spent on documentation, order entry, billing, and general inbox management.[7,15] Most physicians report that the EHR negatively affects their work–life balance,[16] and there is widespread frustration with current health information technology usability as well as time spent on clerical tasks.[14,16–18] Additionally, physicians using EHRs have a higher prevalence of burnout than those using other documentation methods, such as paper, and an association between increased EHR time and burnout has been documented.[7,14,16,17,19] Furthermore, some ambulatory care physicians spend roughly 50% of their workday on EHR and clerical work, 1–2 hours of which is often completed outside of work.[4,15] As such, interventions to decrease burnout have targeted efficiency and clerical burden, such as enhancing team-based care, increasing communication, and hiring scribes or utilizing voice recognition software for documentation. While many teamwork-based interventions may help decrease burnout and stress,[20–23] other studies have observed no effect or even an increase in burnout with workflow changes.[20,24,25] Further, there is limited information on how a physician's perception of their practice's effort to unload clerical work may impact burnout.

In order to more fully understand the relationship between burnout, EHR burden, administrative tasks, and efforts to unload clerical burden, we conducted a faculty-wide survey across all departments at the Mount Sinai Health System in New York City. We sought to identify thresholds of time spent on the EHR outside the workday and daily clerical work associated with burnout to identify target goals for interventions designed to decrease that burden. We hypothesized that specific thresholds (60 and 90 minutes) of time spent on EHR outside of the workday and clerical work throughout the day would be positively associated with burnout, and that one's practice unloading clerical work would be negatively associated with burnout.

MATERIALS AND METHODS

Between November 2018 and February 2019, we administered an anonymous, institution-wide cross-sectional survey to clinical faculty within the Mount Sinai Health System, a large academic medical center with 7 hospital sites in New York City. Eligible participants included any of the 4156 individuals (MD, DO, PhDs) with a faculty appointment at the time of survey administration identified via the Dean's Office faculty records. Individuals were eligible for entry into a raffle for 4 Apple watches as an incentive for participation. The survey was disseminated electronically via e-mail using the RedCap survey platform and was approved by the institutional review board at the Icahn School of Medicine at Mount Sinai.

Survey design

Participants provided demographic data including gender, age, specialty, faculty rank, full-time status, department, hours worked per week, and percent of time spent on clinical work. We grouped departments into the following categories: Primary Care (general internal medicine, family medicine, general and adolescent pediatrics, and geriatric medicine); General Hospital Based Medicine (emergency medicine and hospital medicine); Subspecialty Medicine/Pediatrics (all nongeneralist medicine and pediatric subspecialties); Surgery (general and specialty surgery); Anesthesia/Radiology/Pathology; Other Specialties (neurology, psychiatry, ophthalmology, genetics, environmental medicine, physiatry, dermatology, dentistry), and Other Department ("Other Department" survey choice, basic science respondents with clinical responsibilities, and those who left department blank). The vast majority of the physicians in the specialties above used the same EHR-EPIC; however, the Anesthesia, Radiology, Pathology departments each used different EHRs during the time of this study, and Radiology and Pathology relied heavily on dictation software/transcription for documentation.

Assessments

Burnout

We utilized 2 validated instruments to measure burnout in order to assess its multiple dimensions and timeframes: the Mayo Well-Being Index (WBI) and the Maslach Burnout Inventory (MBI) 2 item scale.[26,27] The MBI-2 assesses the traditional dimensions of burnout including emotional exhaustion and depersonalization over the past year (Cronbach's $\alpha = 0.74$, all reported Cronbach's α were calculated from our data). A high score (≥ 4) on either subscale is consistent with job-related burnout. The 2-item MBI correlates highly with the 22-item MBI, for which there is an extensive literature supporting its validity.[26] The WBI captures additional well-being dimensions relevant to burnout, including emotional and physical health over the past month. The WBI includes 7 yes/no items: burnout from work, emotional exhaustion, fatigue, overwhelmed feelings, emotional problems, depression, and physical health.[28] A high score (≥ 4) on the WBI is consistent with burnout; $\alpha = 0.71$. For burnout outcomes, we utilized burnout score thresholds as well as average overall scores in analyses to understand how predictor variables relate to positive screens for burnout and overall severity of burnout. For our secondary outcomes, we asked questions to assess professional satisfaction (PS)[17,21] from the Mini-Z and work–life integration (WLI) measure from Sinksy and colleagues' paper in 2017.[4]

EHR and clerical work

To assess burden of the EHR and clerical work, we administered questions modified from the Mini-Z.[17,21] Specifically, respondents were asked to indicate their level of agreement with the statement: "The EHR adds to the frustration of my day" (5-point Likert scale from 0 = Strongly Disagree to 5 = Strongly Agree). They were also asked to report their daily time spent on clerical work (How much time per work day do you spend engaged in clerical or nonphysician work, such as calling for appointments, doing prior authorizations, faxing forms, requesting records, etc?) and daily time spent on the EHR outside of the workday measured in 30-minute intervals. In addition, we asked about the extent to which their patient care setting

made an effort to unload clerical/administrative burden: "My practice makes an effort to unload clerical burden" with 4 response options from "Not at all" to "A lot."

Clinical covariates

Depressive symptoms were assessed using the validated Patient Health Questionnaire-2 item (PHQ-2)[29]; $\alpha = 0.77$. Though not a diagnostic tool,[30] the PHQ-2 performs well against longer diagnostic instruments for depression.[31] Perceived resilience was assessed using the 2-item Connor-Davidson Resilience Scale (CD-RISC),[32] $\alpha = 0.66$, ("I am able to adapt to change," "I tend to bounce back after illness or hardship," with 4 responses from "rarely true" to "true nearly all of the time"); and meaning derived from work using the statement, "The work I do is meaningful to me," using a 5- point Likert scale from 0 = Strongly Disagree to 5 = Strongly Agree.[33]

Statistical analysis

Data analyses proceeded in 7 steps. First, we computed descriptive analyses for all variables. Second, we examined associations between independent variables and measures of burnout using independent-samples t-tests for parametric continuous data, Mann-Whitney U tests for nonparametric continuous data, and chi-square tests for categorical variables. Third, for categorical variables with 4 or more answer choices, we di- or trichotomized responses for the correlation analyses. For the daily time-based questions, we first conducted chi-square analysis with all answer choices to determine if there was a clear cutoff point for dichotomization (using the Bonferroni-corrected difference for both burnout measures separately). Fourth, for variables with 3 or more response options, we conducted posthoc analyses utilizing residuals to compute chi-square *P* values, corrected using the Bonferroni method for multiple comparisons. Fifth, for bivariate analyses of continuous MBI and WBI scores, we conducted independent-samples t-tests for dichotomous predictors (using the Levene's test for the equal variance *P* value assessment). Sixth, we conducted analyses of variance (ANOVAs) for independent variables with more than 2 groups and used Tukey's HSD (equal variances) and Dunnett's T3 (equal variance not assumed) tests, with a Bonferroni correction for multiple comparisons. Seventh, for the multivariable analyses, we conducted logistic regressions for binary outcomes and linear regressions for continuous outcomes; interaction terms were incorporated into these analyses to evaluate the potential role of rank in moderating associations between EHR and clerical burden on measures of burnout. Finally, we conducted relative importance analyses using the R package relampo to assess the unique proportion of variance in burnout that was explained by significant independent variables in the multivariable models; this analysis partitioned the explained variance (R^2) in burnout that was explained by each independent variable after accounting for intercorrelations among these variables.[34]

RESULTS

Descriptives

Of the 4156 eligible employed faculty, 1781 (42.9%) participated in the survey. In the current study, we focused on 1346 (75.6%) faculty who spent some time on patient care duties; faculty who responded that their clinical time during the work week was more than 0% time.

Table 1 shows the demographic composition of the sample. While we did not ask about degree, the vast majority of our faculty are physician MDs/DOs, with approximately 110 doctoral-level clinical psychologists across the system. Our sample contained an equal distribution of men (44.2%) and women (43.8%). About a third screened positive for burnout (MBI-2: 30.0%, WBI: 34.8%), with 37.7% reporting that they experienced WLI, and 63.1% endorsing overall professional satisfaction. Half of the sample reported that the EHR adds frustration to their day and 40.4% reported spending over an hour on the EHR outside work per day. Additionally, 24.7% spent >60 minutes on daily clerical work time, while 52.0% reported that their practice unloads clerical burden. Correlations did not reveal any moderate-to-strong ($r > 0.4$) significant interactions between demographic/predictor variables, and thus we included all variables in the multivariable analysis except depression, which we excluded in regressions with WBI burnout due to a shared question between this scale and the PHQ-2.

Burnout: MBI-2 and WBI

Table 2 shows results of bivariate analyses of dichotomous burnout for the MBI and WBI; bivariate analyses of continuous MBI and WBI scores are shown in Supplemental Table S1.

Multivariable logistic and linear regression models explained 30% and 32% of the variance for the MBI and 19% and 20% of the variance for the WBI, respectively. Full-time work (MBI and WBI), age 20–39 (MBI and WBI), working >40% clinical (WBI), working >60% clinically (MBI), and being an assistant professor were associated with burnout. Female gender, nonbinary/other gender, working >60 hours/week and being younger than 60 were significantly associated with increased burnout and higher scores on the WBI. Respondents from Anesthesiology/Radiology/Pathology and Other Specialties were less likely to screen positive for burnout on the MBI and had lower scores on both scales. A positive depression screen was associated with positive screen and severity of burnout, while higher resilience scores were associated with lower likelihood of a positive screen for burnout and lower burnout scores. Meaning in work was associated with lower likelihood of screening positive for burnout on the MBI and lower average burnout scores on both scales. (Table 3, Supplemental Table S2).

Figure 1 shows the unadjusted and adjusted relationship between spending increasing amounts of time on the EHR outside work and clerical tasks and overall burnout. As the thresholds for significantly increased likelihood of burnout in the unadjusted model were >90 minutes for EHR-outside work and >60 minutes for clerical time, we utilized these thresholds to dichotomize these variables for further analysis. In the multivariable analyses, EHR-outside work >90 minutes/day, frustration with EHR (MBI and WBI), and clerical work time >60 minutes (WBI) remained significantly associated with burnout. Agreeing that practice unloads clerical burden was associated with a lower likelihood of burnout and lower burnout scores (Table 3 and Supplemental Table S2). We also examined the interaction between faculty rank and hours worked and the EHR predictors and found that of those who spend >90 minutes EHR after work, associate and full professors were less likely than instructors/others to be burned out on the MBI (OR = 0.34, $P = .007$). Among faculty with >90 minutes EHR after work, assistant professors were more likely than the instructors/others to screen positive for burnout on the WBI (OR 3.5, $P = .03$). EHR > 90 minutes remained a significant predictor of burnout on the MBI but not the WBI when adjusting for the rank-EHR > 90 minutes interaction. Among those who spent >60 minutes on clerical work, those who worked 40–60 and >60 hours/week were more likely to be burned

Table 1. Personal and professional characteristics of the 1346 clinical faculty

Participant Demographics n (%) or mean [SD]	
Gender	
Female	589 (43.8)
Male	595 (44.2)
Nonbinary/third gender/other	52 (3.9)
Missing	110 (8.2)
Age	
20–39	372 (27.6)
40–59	639 (47.5)
60+	219 (16.3)
Missing	116 (8.6)
Professional characteristics	
Faculty level	
Instructor, other	153 (11.4)
Assistant professor	639 (47.5)
Associate professor/professor	429 (31.9)
Missing	125 (9.3)
Full-time status	
Full-time	1093 (81.2)
Part-time >60	113 (8.4)
Part-time <60	36 (2.6)
Missing	105 (7.8)
% **Time spent on clinical care**	
1–40%	330 (24.5)
41–60%	277 (20.6)
>60%	739 (54.9)
Hours worked per week	
<=40	199 (14.8)
41–60	625 (46.4)
>60	416 (30.9)
Missing	106 (7.9)
Department	
Primary Care	170 (12.6)
Medicine/Pediatrics subspecialty	226 (16.8)
Surgery (general and subspecialties)	182 (13.5)
Hospital & EM	146 (10.8)
Anesthesia/Radiology/Pathology	205 (15.2)
Other specialties	230 (17.1)
Other departments	82 (6.1)
Depression, Resilience, and Meaning	
Depression (PHQ-2)	
Screen positive	291 (21.6)
Work I do is meaningful to me	
Disagree/strongly disagree	31 (2.3)
Neither agree nor disagree	45 (3.3)
Agree/strongly agree	1265 (93.8)
Missing	7 (0.5)
Resilience (CD-RISC-2)[a]	7.0 [1.3]
Electronic Health Record & Clerical Burden	
EHR adds frustration to my day	
Disagree/strongly disagree	296 (22.0)
Neither agree nor disagree	346 (25.7)
Agree/strongly agree	683 (50.7)
Missing	21 (1.6)
Time spent on EHR (outside work) per day (min)	
0	180 (13.4)
<30	275 (20.4)
30–60	320 (23.8)
61–90	241 (17.9)
>90	303 (22.5)
Missing	27 (2.0)
Time Spent on clerical work per day (min)	
0	194 (14.4)
<30	416 (30.9)
30–60	388 (28.8)
61–90	192 (14.3)
> 90	141 (10.5)
Missing	15 (1.1)
Practice makes an effort to unload clerical burden	
Not at all/a little	624 (46.4)
Somewhat/a lot	700 (52.0)
Missing	22 (1.6)
Burnout, work–life integration, and professional satisfaction	
Maslach Burnout Inventory[b]	2.8 [1.9]
Burned out	390 (29.0)
Not burned out	910 (67.6)
Missing	46 (3.4)
Mayo Well-Being Index[b]	4.0 [3.2]
Burned out	453 (33.7)
Not burned out	849 (63.1)
Missing	44 (3.3)
Work leaves enough time for family (WLI)	
Disagree/strongly disagree	553 (41.1)
Neither agree nor disagree	279 (20.7)
Agree/strongly agree	508 (37.7)
Missing	6 (0.)
Overall I am satisfied with my job (PS)	
Disagree/strongly disagree	239 (17.8)
Neither agree nor disagree	251 (18.6)
Agree/strongly agree	849 (63.1)
Missing	7 (0.5)

CD-RISC-2 = Conner-Davidson Resilience Scale 2 item; EHR = Electronic health record; EM = Emergency Medicine; MBI-2 = Maslach Burnout Inventory 2 item; min=minutes; PS = Professional Satisfaction (Overall I am satisfied with my job); Path = Pathology; PHQ-2 = Patient Health Questionnaire 2 item; WBI = Mayo Well-Being Index; WLI = Work–life integration (My work schedule leaves enough time for my personal/family life).

[a]Continuous measures are described as mean [SD].

[b]For both burnout measures, percentages represent the percentage of respondents who met the designated threshold for burnout on each scale (see Methods).

out (OR = 5.4, $P = .002$; OR = 2.3, $P = .04$). There were no other significant interactions with rank and hours worked and the EHR/clerical metrics.

Relative importance analyses of significant correlates of burnout from the multivariable logistic regression models revealed that depression (40% relative variance explained [RVE]), spending >90 minutes on the EHR after work (13% RVE), unloading clerical burden (12% RVE) and EHR frustration (10% RVE) accounted for the majority of explained variance in positive screen for burnout assessed by the MBI-2; while resilience (24% RVE), EHR frustration (14% RVE), age (13% RVE), and spending >90 minutes on the EHR after work (11% RVE) accounted for the majority of explained variance in WBI burnout.

Work–life integration (WLI) and professional satisfaction (PS)

Table 2 shows results of bivariate analyses of WLI and PS.

The multivariable regression models explained 28% of the variance for WLI and 33% of the variance for PS. As shown in Table 3,

Table 2. Prevalence of burnout, work–life integration, and professional satisfaction by personal and professional characteristics and EHR clerical burden (bivariate analyses)

	MBI-2 n (%) Burnout	*P* value	WBI n (%) Burnout	*P* value	WLI n (%) (strongly) agree	*P* value	PS *n* (%) (strongly) agree	*P* value
Total	390 (29.0)		453 (34.8)		508 (37.9)		849 (63.4)	
Demographics and professional characteristics								
Gender								
Female	192 (33.4)	$P = .007^a$	224 (39.1)	$P = .001^a$	195 (33.2)	$P = .0007^a$	357 (61.0)	$P = .06$
Male	143 (25.1)	$P = .0007^a$	163 (28.2)	$P < .0001^a$	264 (44.6)	$P < .0001$a	403 (68.0)	$P = .004^a$
Non-binary/third gender/other	20 (40.0)	$P = .11$	26 (54.2)	$P = .004^a$	10 (19.2)	$P = .004$a	25 (48.1)	$P = .02$
Age								
20–39	122 (33.5)	$P = .05$	148 (40.3)	$P = .004^a$	148 (40.0)	$P = .37$	224 (60.7)	P = .13
40–59	190 (30.5)	$P = .48$	221 (35.6)	$P = .32$	216 (33.9)	$P = .001^a$	392 (61.4)	P = .06
60+	40 (19.7)	$P = .0007^a$	42 (20.1)	$P < .0001^a$	104 (47.7)	$P = .001^a$	167 (76.6)	$P < .0001^a$
Faculty level								
Instructor/other	47 (32.2)	$P = .42$	55 (36.9)	$P = .42$	74 (48.7)	$P = .005^a$	97 (63.8)	$P = 1.00$
Assistant prof	198 (31.7)	$P = .06$	229 (36.8)	$P = .04$	229 (36.0)	$P = .12$	370 (58.2)	$P < .0001^a$
Associate prof/professor	101 (24.7)	$P = .009$	120 (28.9)	$P = .007^a$	161 (37.7)	$P = .76$	309 (72.4)	$P < .001^a$
Full-time status								
Full-time	327 (30.8)	$P = .08$	386 (36.3)	$P < .001^a$	386 (35.5)	$P < .001^a$	683 (62.8)	$P = .08$
Part time	32 (23.4)		28 (19.7)		84 (57.1)		103 (70.1)	
% Time spent on clinical care								
1%–40%	79 (24.8)	$P = .02$	95 (29.8)	$P = .03$	133 (40.7)	0.23	230 (70.1)	$P = .004^a$
41%–60%	78 (28.8)	$P = .62$	103 (38.9)	$P = .11$	98 (35.5)	0.37	178 (64.1)	$P = .76$
61%–100%	233 (32.8)	$P = .02$	255 (35.5)	$P = .55$	277 (37.6)	0.76	441 (60.1)	$P = .005^a$
Hours worked/wk								
<40	55 (29.3)	$P = .84$	51 (26.2)	$P = .009$	132 (66.3)	$P < .0001^a$	126 (63.6)	$P = 1.00$
41–60	164 (27.1)	$P = .04$	188 (31.0)	$P = .01$	258 (41.6)	$P = .009$	413 (66.5)	$P = .03$
>60	138 (34.0)	$P = .02$	175 (43.4)	$P < .0001^a$	79 (19.0)	$P < .0001^a$	245 (59.0)	$P = .02$
Department								
Primary Care	70 (41.9)	$P < .001^a$	66 (39.5)	$P = .169$	50 (29.6)	$P = .02^a$	85 (50.3)	$P < .001^a$
All Others	320 (28.2)		387 (34.1)		458 (39.1)		764 (65.3)	
Medicine/Pediatric Subspecialty	60 (27.5)	$P = .38$	80 (36.7)	$P = .52$	65 (28.9)	$P = .002^a$	145 (64.4)	$P = .72$
All Others	330 (30.5)		373 (34.4)		443 (39.7)		704 (63.2)	
Surgery	52 (29.7)	P = .93	67 (38.1)	$P = .33$	59 (32.4)	$P = .10$	114 (62.6)	$P = .82$
All Others	338 (30.0)		386 (34.3)		449 (38.8)		735 (63.5)	
Hospital/EM	52 (35.9)	$P = .10$	55 (38.2)	$P = .36$	73 (50.0)	$P = .001$a	88 (60.3)	$P = .40$
All others	338 (29.3)		398 (34.4)		435 (36.4)		761 (63.8)	
Anes/Rad/Path	37 (19.4)	$P = .001^a$	44 (22.7)	$P < 0.001^a$	98 (48.0)	$P = 0.001^a$	153 (75.0)	$P < .001^a$
All others	353 (31.8)		409 (36.9)		410 (36.1)		696 (61.3)	
Other specialty	56 (25.0)	$P = .07$	66 (29.5)	$P = 0.07$	99 (43.3)	$P = 0.06$	161 (70.6)	$P = .01^a$
All others	334 (31.0)		387 (35.9)		409 (36.8)		688 (61.9)	
Other depart	22 (28.9)	$P = .84$	27 (32.9)	$P = .71$	34 (42.5)	$P = .38$	52 (65.0)	$P = .76$
All others	369 (30.1)		426 (34.9)		474 (37.6)		797 (63.3)	
EHR and clerical work								
Daily clerical work time- min								
<=60	250 (26.0)	$P < .001^a$	295 (30.5)	$P < .001^a$	414 (41.7)	$P < .001^a$	683 (68.8)	$P < .001^a$
>60	138 (42.5)		155 (48.1)		86 (25.9)		155 (46.8)	
Daily EHR time outside work- min								
<=90	251 (25.6)		302 (30.8)	$P < .001^a$	434 (43.0)	$P < .001^a$	677 (67.1)	$P < .001^a$
>90	134 (45.4)	$P < .001^a$	143 (48.3)		61 (20.1)		155 (51.2)	
EHR frustration								
Agree	250 (37.7)	$P < .001^a$	278 (41.9)	$P < .001^a$	212 (31.2)	$P < .001^a$	382 (56.2)	$P < .001^a$
Disagree/neutral	136 (22.0)		171 (27.6)		284 (44.4)		452 (70.8)	
Practice unloads clerical work								
Agree	153 (22.7)	$P < .001^a$	203 (29.9)	$P < .001^a$	286 (41.1)	$P = .01^a$	496 (71.1)	$P < .001^a$
Disagree/neutral	230 (38.0)		245 (40.6)		213 (34.2)		338 (54.6)	
depression, meaning and resilience								
Depression								
Yes	169 (58.7)	$P < .001^a$	235 (81.9)	$P < .001^a$	70 (24.1)	$P < .001^a$	103 (35.5)	$P < .001^a$
No	215 (21.5)		217 (21.5)		431 41.7)		737 (71.4)	
Meaning in work								
Agree	341 (28.0)	$P < .001^a$	415 (33.8)	$P < .001^a$	494 (39.2)	$P < .001^a$	843 (66.9)	$P < .001^a$
Neutral/disagree	47 (63.5)		37 (52.9)		14 (18.4)		5 (6.6)	

(continued)

Table 2. continued

	MBI-2 n (%) Burnout	*P* value	WBI n (%) Burnout	*P* value	WLI n (%) (strongly) agree	*P* value	PS *n* (%) (strongly) agree	*P* value
Resilience- CD-RISC-2 Mean (std)								
Burned out/agree	6.676 (1.403)	$P < .001^a$	6.696 (1.403)	$P < .001^a$	7.140 (1.281)	$P = .002^a$	7.173 (1.177)	$P < .001^a$
Not burned out/neutral Disagree	7.138 (1.189)		7.166 (1.177)		6.916 (1.278)		6.711 (1.402)	

Abbreviations: Anes/Rad/Path, Anesthesia/Radiology/Pathology; CD-RISC-2, Conner-Davidson Resilience Scale 2 item; EM: emergency medicine; EHR: electronic health record; MBI-2: Maslach Burnout Inventory 2 item; min: minutes; PS: Professional Satisfaction (Overall I am satisfied with my job); PHQ-2: patient health questionnaire 2 item; WBI: Mayo Well-Being Index; wk: week; WLI: Work-life integration (My work schedule leaves enough time for my personal/family life).

Note: Percentages were calculated as a proportion of each subgroup in the first column that were positive for burnout on the WBI, MBI, or agreed with the WLI or PS. See Table 1 for subgroup totals. Missing responses for burnout, WLI, and PS were not imputed.

[a]*P* values for trichotomous variables represent posthoc residual analysis with converted Chi square *P* values with significance level of .008 based on the Bonferroni correction for multiple comparisons. *P* values for dichotomous variables represent the Pearson Chi-square 2 sided with a significant *P* value < .05.

being female nonbinary/third gender, working 41–60 or >60 hours per week, and having higher academic rank were associated with lower likelihood of WLI. Assistant professors and those who spent >60% time on clinical care were significantly less likely to endorse overall PS, whereas those in Anesthesia/Radiology/Pathology and Other Specialties were nearly twice as likely to experience PS. Those who screened positively for depression were less likely to experience WLI and PS; and those endorsing meaning in work were over 2 and 21 times as likely as those who did not to have WLI and PS, respectively. Higher resilience scores were associated with PS. Given the strong relationship with meaning in work and PS, we conducted a sensitivity analysis without that variable and found similar results for the PS outcome (results not shown, available from the corresponding author upon request).

Spending >90 minutes/day on EHR-outside work and >60 minutes/day on clerical work were significantly associated with lower likelihood of WLI and PS. Agreement that one's practice unloads clerical work was associated with a higher likelihood of WLI and PS.

Relative importance analyses revealed that hours worked (50% RVE), spending >90 minutes on the EHR after work (14% RVE), depression (12% RVE), and spending >60 minutes/day on clerical work (10% RVE) accounted for the majority of explained variance in WLI, while meaning in work (38% RVE), depression (24% RVE), and >60 minutes/day on clerical work (8% RVE) accounted for the majority of explained variance in PS.

DISCUSSION

Our study demonstrates a significant association between EHR time and clerical burden and burnout in clinical faculty. While previous studies have observed a link between EHR frustration and work after hours with burnout,[7,14,16,17,19] our study suggests that specific time thresholds of EHR outside of work and clerical work may be linked to burnout, even after controlling for other key risk factors of burnout. Specifically, spending more than 90 minutes on the EHR outside of work was associated with 90% and 40% increased odds of burnout on the MBI and WBI, respectively, and accounted for >10% of the explained variance in multivariable models, while spending >60 minutes/day on clerical work was associated with a 40% increased odds of WBI burnout.

EHR and clerical burden were also negatively associated with WLI and professional satisfaction. Spending >90 minutes on the EHR outside work was associated with 33% lower odds of WLI and spending >60 minutes/day on clerical work with 42% and 46% lower odds of attaining WLI and PS, respectively. However, the perception of one's practice unloading clerical burden was associated with half the odds of burnout on the MBI and a third lower odds of burnout on the WBI and with 70% higher odds of achieving professional satisfaction. As expected, depression and MBI burnout were closely associated, and screening positive for depression had the strongest association with MBI-assessed burnout in our multivariable model. These findings are consistent with prior work.[35–41]

Our study highlights a number of other notable findings. While perceiving greater meaning in work, being resilient, and not having depression are associated with a lower likelihood of burnout, one can still be burnt-out in the presence of these protective factors. There are clearly other unmeasured factors that may contribute to burnout risk in clinical faculty. It is also important to note the lower prevalence of burnout in the Anesthesia, Radiology, Pathology group. These departments used a different EMR than the others in our study and they also interact with that EMR in very different ways. Radiologists and pathologists use dictation software or a transcription service for documentation. While they must review and correct the documentation, the burden and type of documentation is distinct from those who type notes and navigate through a complex and redundant EHR system. In addition, while the group was small, we were able to gather data on nonbinary/third gender/other faculty members and showed that this group is at significantly higher risk for burnout and less likely to be professionally satisfied or have work–life integration. Finally, faculty rank seems to moderate the effect of the EHR on burnout in faculty. While it may not be a person's rank itself that impacts burnout, it's possible that those in the lower ranks may feel additional stress to be productive both clinically and academically.

In our study, the threshold of >90 minutes on the EHR outside of the workday was an important predictor of burnout in both bivariate and multivariable analyses. Interventions that focus on reducing documentation and EHR burden below this threshold may be effective in mitigating risk for burnout in clinical faculty. Scribes have been shown to decrease time spent on documentation, and improve the patient and provider experience, as well as decrease burnout and improve professional satisfaction.[20,22,25] Other lower cost approaches, such as predesigned templates and phrases, and EHR efficiency trainings may also help decrease EHR burden, increase professional satisfaction, and decrease overall stress.[20,41] Artificial intelligence-based solutions, such as voice recognition and automated dictation/note writing similar to what our Anesthesia, Radiology, and Pathology colleagues use,[42,43] may also help reduce EHR and clerical burden. Studies on the impact of transcription and voice

Table 3. Prevalence of burnout, work–life integration, and professional satisfaction by personal, professional characteristics and EHR clerical burden (multivariable analyses)

	MBI-2 Burnout $R^2 = 0.30$ OR [95% CI]; *P* value	WBI Burnout $R^2 = 0.19$ OR [95% CI]; *P* value	WLI $R^2 = 0.28$ OR [95% CI]; *P* value	PS $R^2 = 0.33$ OR [95% CI]; *P* value
Gender (ref: Male)				
Female	1.29 [0.93–1.78]; $P = .12$	1.60 [1.20–2.14]; $P = .001$[a]	0.48 [0.36–0.65]; $P < 0.001$[a]	0.97 [0.71–1.32]; $P = .83$
Non-binary/third gender/other	1.01 [0.47–2.19]; $P = .97$	2.36 [1.16–4.81]; $P = .02$[a]	0.28 [0.11–0.70]; $P = 0.007$[a]	0.71 [0.33–1.52]; $P = .38$
Age (ref: 20–39)				
40–59	0.98 [0.68–1.42]; $P = .93$	0.82 [0.59–1.14]; $P = .24$	0.74 [0.53–1.05]; $P = .09$	0.89 [0.62–1.26]; $P = .50$
60+	0.65 [0.37–1.13]; $P = .13$	0.44 [0.26–0.73]; $P = .002$[a]	0.97 [0.60–1.57]; $P = .91$	1.56 [0.92–2.63]; $P = .10$
Part-time status (ref: full-time)	0.76 [0.44–1.30]; $P = .31$	0.58 [0.35–0.97]; $P = .04$[a]	1.35 [0.85–2.15]; $P = .20$	1.31 [0.78–2.20]; $P = .30$
Time Spent Clinical Care (ref: 1%–40%)				
41%–60%	0.94 [0.58–1.51]; $P = .79$	1.51 [0.99–2.29]; $P = .06$	0.90 [0.59–1.36]; $P = .62$	0.80 [0.51–1.26]; $P = .34$
61%–100%	1.38 [0.92–2.05]; $P = .12$	1.36 [0.978–2.009]; $P = .09$	0.75 [0.52–1.07]; $P = .11$	0.59 [0.40–0.86]; $P = .007$[a]
Hours worked/wk (ref: <=40)				
41–60	0.96 [0.58–1.58]; $P = .88$	1.27 [0.81–2.00]; $P = .30$	0.37 [0.24–0.56]; $P < .001$[a]	1.32 [0.82–2.11]; $P = .25$
>60	1.17 [0.68–2.02]; $P = .58$	1.93 [1.18–3.16]; $P = .009$[a]	0.12 [0.08–0.21]; $P < .001$[a]	1.04 [0.62–1.75]; $P = .88$
Level (ref: instructor/other)				
Assistant professor	1.14 [0.71–1.82]; $P = .60$	1.00 [0.65–1.53]; $P = 1.0$	0.50 [0.32–0.76]; $P = .002$[a]	0.60 [0.38–0.96]; $P = .03$[a]
Associate/full professor	1.10 [0.63–1.82]; $P = 0.73$	1.07 [0.65–1.77]; $P = .79$	0.55 [0.33–0.92]; $P = .02$[a]	0.85 [0.49–1.45]; $P = .55$
Department				
Primary care	1.09 [0.60–1.97]; $P = .77$	0.83 [0.48–1.44]; $P = .51$	0.68 [0.37–1.22]; $P = .19$	0.76 [0.43–1.34]; $P = .34$
Medicine/Pediatrics subspecialty	0.59 [0.33–1.08]; $P = .09$	0.81 [0.47–1.38]; $P = .43$	0.77 [0.43–1.37]; $P = .37$	1.43 [0.81–2.53]; $P = .22$
Surgery	0.58 [0.313–1.083]; $P = .09$	0.84 [0.48–1.46]; $P = .53$	0.93 [0.52–1.67]; $P = .80$	1.59 [0.88–2.85]; $P = .12$
Hospital/EM	0.89 [0.498–1.749]; $P = .73$	1.04 [0.58–1.85]; $P = .90$	1.30 [0.71–2.38]; $P = .39$	1.68 [0.91–3.11]; $P = .10$
Anes/Rad/Path	0.50 [0.26–0.96]; $P = .04$[a]	0.58 [0.32–1.04]; $P = .07$	1.21 [0.68–2.18]; $P = .52$	2.28 [1.23–4.20]; $P = .009$[a]
Other specialty	0.53 [0.29–0.97]; $P = .04$[a]	0.68 [0.40–1.16]; $P = .16$	1.08 [0.62–1.87]; $P = .79$	1.97 [1.12–3.48]; $P = .02$[a]
Depression, meaning, and resilience				
Depression (PHQ-2)	4.41 [3.14–6.21]; $P < .001$[a]	–	0.54 [0.37–0.78]; $P = .001$[a]	0.27 [0.19–0.38]; $P < .001$[a]
Meaning in work (ref: disagree/neutral)	0.36 [0.19–0.67]; $P = .001$[a]	0.64 [0.36–1.14]; $P = .13$	2.51 [1.23–5.11]; $P = .01$[a]	21.67 [8.17–57.47]; $P < .001$[a]
Resilience score (CD-RISC-2)	0.84 [0.75–0.95]; $P = .005$[a]	0.77 [0.69–0.85]; $P < .001$[a]	1.12 [1.00–1.26]; $P = .06$	1.14 [1.02–1.28]; $P = .02$[a]
EHR and clerical burden				
Practice unloads clerical work (ref: disagree/neutral)	0.50 [0.37–0.69]; $P < .001$[a]	0.66 [0.50–0.87]; $P = .003$[a]	1.32 [0.99–1.75]; $P = .06$	1.72 [1.28–2.32]; $P < .001$[a]
Frustration with EHR (ref: disagree/neutral)	1.64 [1.19–2.26]; $P = .003$[a]	1.66 [1.25–2.21]; $P = .001$[a]	0.75 [0.56–1.01]; $P = .06$	0.81 [0.612–1.132]; $P = .17$
EHR time outside work per Day >90 min (ref:<=90 min)	1.90 [1.40–2.78]; $P < .001$[a]	1.41 [1.01–1.95]; $P = .04$[a]	0.67 [0.46–0.84]; $P = .04$[a]	0.66 [0.46–0.94]; $P = .02$[a]
Time on clerical work/day (ref:<=60 min)	1.24 [0.88–1.75]; $P = .23$	1.39 [1.01–1.91]; $P = .04$[a]	0.58 [0.40–0.84]; $P = .003$[a]	0.54 [0.39–0.76]; $P < .001$[a]

Abbreviations: Anes/Rad/Path, Anesthesia/Radiology/Pathology; CD-RISC-2, Conner-Davidson Resilience Scale 2 item; EM, emergency medicine; EHR, electronic health record; MBI-2, Maslach Burnout Inventory 2 item; min, minutes; PS, professional satisfaction (Overall I am satisfied with my job); PHQ-2, patient health questionnaire 2 item; WBI, Mayo Well-Being Index; wk, week; WLI, work–life integration (My work schedule leaves enough time for my personal/family life).

[a]Multivariable logistic regression, significant factors with *P* value < .05.

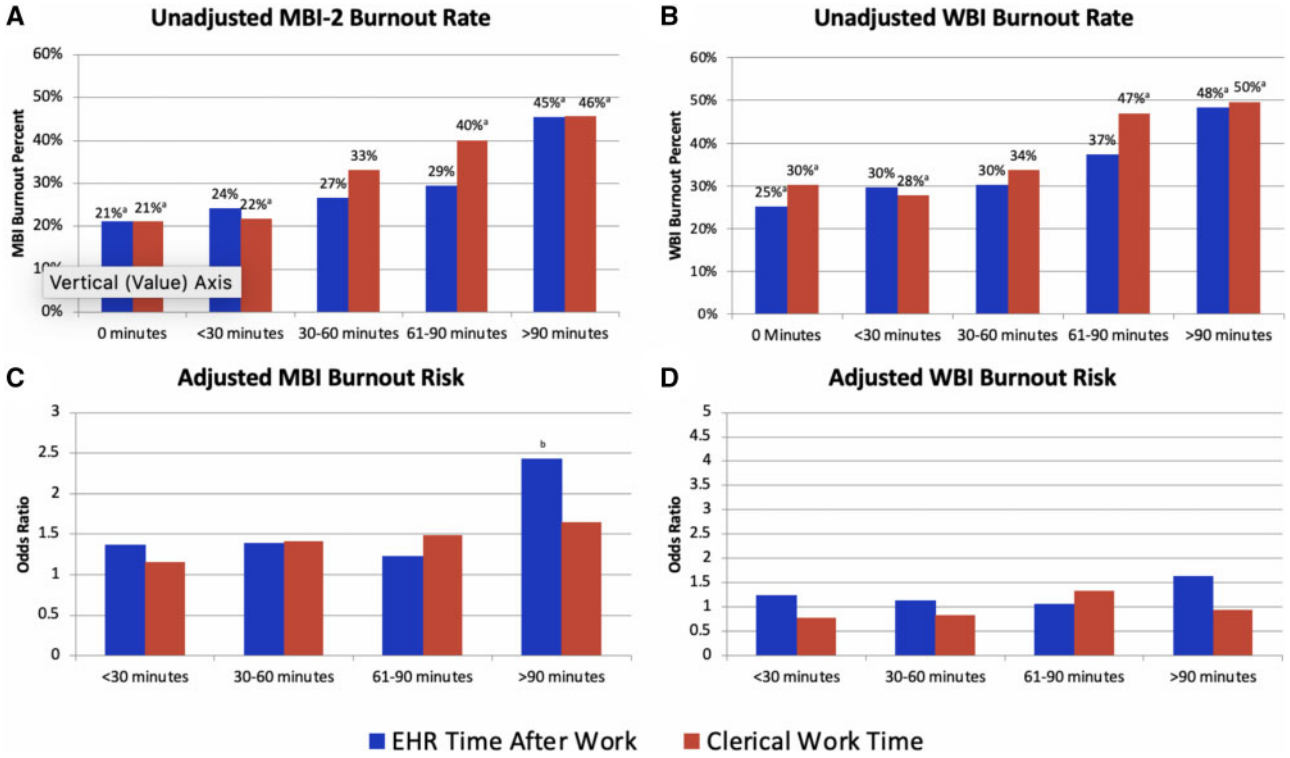

Figure 1. Relationship between daily time spent on the EHR after work and clerical work with burnout on the MBI-2 and WBI: a. Relationship between unadjusted burnout prevalence on the MBI-2 and daily time spent on the EHR after work and clerical time. b. Relationship between unadjusted burnout prevalence on the MBI-2 and daily time spent on the EHR after work and clerical time. c. Relationship between adjusted burnout odds on the MBI-2 and daily time spent on the EHR after work and clerical time. d. Relationship between adjusted burnout odds on the WBI and daily time spent on the EHR after work and clerical time.

*Represents significantly different results from the null hypotheses based on Bonferroni corrected p values for Chi-square analyses.

**Represents significantly associations on the multivariable logistic regression.

Abbreviations: EHR, electronic health record; MBI-2, Maslach Burnout Inventory 2 item; WBI, Mayo Well-Being Index.

recognition software on physician well-being, while limited, show potential improvements in quality and efficiency of documentation and in satisfaction with the EHR.[44,45] Moreover, as clerical burden was a significant predictor of WBI-assessed burnout, team-based interventions aimed at reducing overall clerical burden, such as trainings to improve teamwork, efficiency, and communication skills, as well as added clerical support for clinical faculty, can be considered as part of efforts to reduce burnout.[20–23,46] Whatever the specific planned intervention, the association between a practice's effort to unload clerical work and lower risk for burnout suggests that a practice's effort to engage in the process of how to unload clerical burden—whether successful or not—may improve a provider's sense of overall professional well-being and represents a meaningful touchpoint for organizational interventions on provider burnout.

There are a number of important potential limitations of this study. Our study was cross-sectional, so we were unable to determine directionality or causality for the observed associations. Our moderate response rate may indicate some degree of response bias. In our study, we did not assess advanced practice providers who are similarly burdened with the EHR and clerical burden. We were unable to assess other potential drivers of burnout as we had to keep the survey at a reasonable length. Notably, while the majority of the faculty in this survey population use the same EHR, three departments grouped together—Anesthesia, Radiology, and Pathology—use different electronic medical record systems, some of which have integrated dictation systems, which could have affected their EHR and clerical burden and ultimately impacted their level of burnout. Finally, to minimize participant burden, we utilized brief versions of the MBI and the CD-RISC, which have good validity but may not allow for a more nuanced examination of burnout and resilience that the longer versions offer.

CONCLUSION

Results of this study demonstrate a relationship between EHR/clerical burden and burnout in clinical faculty and suggest specific time spent thresholds associated with burnout. Data suggest that providers who work in a setting where there is a perceived effort to reduce this burden may experience a work culture benefit that buffers some of the negative impacts of clerical burden on physician and clinician well-being. As such, future studies should investigate novel ways of offloading such burdens, a process to involve and communicate with providers, and the impact of such interventions on burnout. In addition, future work should assess the relationship of EHR/clerical burden and burnout among other clinical providers, such as Nurse Practitioners and Physician's Assistants. As we continue to tackle the challenge of physician and provider burnout, efforts designed to reduce EHR and clerical burden to less than an hour or

so a day, while engaging clinicians in a process that visibly moves towards reducing such burden may help promote greater well-being and professional satisfaction in clinical faculty.

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AUTHOR CONTRIBUTIONS

All authors listed have contributed sufficiently and meet all four criteria for authorship, and all who meet the four criteria are identified as authors in this manuscript.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Journal of the American Medical Informatics Association* online.

DATA AVAILABILITY

The data underlying this article cannot be shared publicly due to its confidential nature and the importance of protecting the privacy of our participants. The data will be shared on reasonable request to the corresponding author.

CONFLICT OF INTEREST STATEMENT

None declared.

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