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Correlates of physician burnout across regions and specialties: a meta-analysis

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Abstract

Background: Health care organizations globally realize the need to address physician burnout due to its close linkages with quality of care, retention and migration. The many functions of health human resources include identifying and managing burnout risk factors for health professionals, while also promoting effective coping. Our study of physician burnout aims to show: (1) which correlates are most strongly associated with emotional exhaustion (EE) and depersonalization (DP), and (2) whether the associations vary across regions and specialties.

Methods: Meta-analysis allowed us to examine a diverse range of correlates. Our search yielded 65 samples of physicians from various regions and specialties.

Results: EE was negatively associated with autonomy, positive work attitudes, and quality and safety culture. It was positively associated with workload, constraining organizational structure, incivility/conflicts/violence, low quality and safety standards, negative work attitudes, work-life conflict, and contributors to poor mental health. We found a similar but weaker pattern of associations for DP.

Physicians in the Americas experienced lower EE levels than physicians in Europe when quality and safety culture and career development opportunities were both strong, and when they used problem-focused coping. The former experienced higher EE levels when work-life conflict was strong and they used ineffective coping. Physicians in Europe experienced lower EE levels than physicians in the Americas with positive work attitudes. We found a similar but weaker pattern of associations for DP.

Outpatient specialties experienced higher EE levels than inpatient specialties when organization structures were constraining and contributors to poor mental health were present. The former experienced lower EE levels when autonomy was present. Inpatient specialties experienced lower EE levels than outpatient specialties with positive work attitudes. As above, we found a similar but weaker pattern of associations for DP.

Conclusions: Although we could not infer causality, our findings suggest: (1) that EE represents the core burnout dimension; (2) that certain individual and organizational-level correlates are associated with reduced physician burnout; (3) the benefits of directing resources where they are most needed to physicians of different regions and specialties; and (4) a call for research to link physician burnout with performance.

Keywords: Physician burnout, Work engagement, Health and safety, Mental and physical well-being, Coping strategies, Health behaviors

Background

Health care organizations globally realize the need to address physician burnout due to its close linkages with quality of care, retention and migration. A 2008 World Health Organization (WHO) report found that the major factors for turnover and migration were poor or dangerous working conditions, insufficient resources, limited career opportunities, and economic instability [1]. The field of health human resources (HHR) deals with human resource issues for workers in the health sector, and has been suggested as a way to strengthen health system performance and to improve well-being for health professionals [2]. The many functions of HHR include identifying and managing the individual and

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environmental burnout risk factors, while simultaneously promoting effective coping [3-5].

Burnout is a specific pattern of response to chronic work-related stress that is a serious issue for many physicians [6]. Physician burnout is characterized primarily by a depletion of mental energy, known as emotional exhaustion (EE). With such depletion, providers feel unable to give of themselves, which leads to cynical attitudes and detached feelings toward patients, known as depersonalization (DP). The third burnout dimension is negative self-appraisal, especially in the competencies required to work with others, known as diminished personal accomplishment [6]. Our study will focus on the EE and DP dimensions only.

The frameworks to explain the development of burnout in health professionals have ranged from personal characteristics to work organization variables or a combination of the two. For example, Wiskow *et al.*'s model emphasizes the impact of the work environment, which is influenced by: (a) organizational functionality; (b) organizational culture; (c) management and patient support; (d) staff development; and (e) work-family balance [7]. These elements have been linked to burnout, medical errors and quality of care [7,8]. In turn, burnout is posited to be a risk factor for increased turnover and migration in physicians [2,8,9]. Existing evidence supports models with personal and work characteristics. The three levels of change to reduce burnout risk are: (1) modifying the organizational structure and work processes; (2) improving the fit between the organization and the individual physician, including professional development programs to facilitate better adaption to the work environment; and (3) individual-level actions to reduce stress and poor health symptoms through effective coping and promoting healthy behaviors [2,3,10].

The aims of our study of physicians are to determine which correlates would be most strongly associated with EE and DP, and whether the associations would vary across geographical regions and specialties. The three levels of burnout risk served as the framework for the categorization of variables that we created in this study. Our findings will help the field of HHR to identify personal and work characteristics that are the most significant risk factors for EE and DP, and direct resources most needed to physicians of different regions and specialties.

Methods

We chose meta-analysis in this study. The use of multi-sample data of physicians from different regions and specialties allows for the examination of a more diverse range of risk factors than would be possible with any single-sample data. Our study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and reporting standards [11].

Literature search

We searched for published studies from 1991 to 2011, using the terms, 'physician/doctor emotional exhaustion,' 'physician/doctor burnout,' and 'physician/doctor coping,' with the search engines: Cochrane, Embase, TheFreeLibrary.com, Google, Google Scholar, LILACS, PsycINFO, PubMed, SciELO and Scopus. Our search yielded 92 studies of medical doctors, but 27 were excluded either because they each included physicians with other health professionals (k = 13), or did not report or respond to email requests for the necessary statistics (k = 14). The remaining (K = 65) sampled exclusively physicians and provided either the sample correlations (r) or statistics that could be converted to r. The studies used in our meta-analysis are listed in the Appendix. Four of these were published in Spanish, with the variables and text recorded and translated into English by the fifth author.

Procedure

For the coding of sample characteristics, we coded each study sample on the method of survey administration, response rate, sample size, gender distribution, mean years of age, mean years in practice, country of the sample and medical specialty distribution.

For the coding of statistics, the internal consistency reliability estimates (Cronbach's α) and the associations between each correlate with EE and DP were recorded.

For conversion to r, 30 studies provided either a 2×2 χ^2, t-ratio, one-way F-ratio or odds ratio (OR). To convert the χ^2 to r, we used the formula [12]:

$$r = \left(\chi^2/N\right)^{1/2}, \quad (1)$$

and to convert the t-ratio or F-ratio to r, we used the formula [12]:

$$r = \left(t^2/\left[t^2 + df\right]\right)^{1/2}. \quad (2)$$

To convert the OR to r, we used the formula [13]:

$$r = \left(OR^{3/4} - 1\right)/\left(OR^{3/4} + 1\right). \quad (3)$$

For the correlates, the classification of variables as either environmental drivers or constraints were informed by Lewin's field theory [14], which posits that behavior is the function of the person and the environment, and Lowe and Chan's classification of healthy work environment indicators [15]. The remaining variables were categorized either as work-life conflict, contributors to good health, contributors to poor mental health or coping strategies (see the correlates under each of the categories in Table 1). The fourth author classified all the variables, and the first author checked the categorizations. The inter-rater agreement for the classification was 100%.

Table 1 Weighted mean reliability estimates of all variables

	k	n	$\alpha_{correlate}$	α_{EE}	α_{DP}
Work engagement drivers					
Recognition/feedback	4	2,125	0.79	0.86	nd
Autonomy	7	2,821	0.71	0.89	0.73
Organization/peer support	3	1,626	nd	0.87	0.69
Adequate resources	2	1,089	nd	0.87	0.68
Work engagement constraints					
Professional values	4	686	0.80	nd	0.70
Organization structures	5	1,084	nd	0.88	nd
Inadequate resources	5	1,023	nd	0.89	0.78
Role ambiguity/conflict	3	622	nd	0.87	0.80
Insufficient input	4	437	0.89	0.89	0.79
Workload	19	6,205	0.74	0.88	0.75
Inadequate skills/preparation	4	1,242	nd	0.87	0.80
Position-specific demands	10	3,550	0.76	0.88	0.76
Work attitudes drivers	17	13,271	0.61	0.84	0.75
Work attitudes constraints	13	4,652	0.74	0.90	0.76
Health and safety drivers					
Quality and safety culture	8	8,618	0.67	0.87	0.69
Clinical skills	3	1,033	0.81	0.88	0.69
Professional development	6	1,377	nd	nd	nd
Health and safety constraints					
Incivility/conflicts/violence	7	1,816	0.84	0.89	0.79
Lack of quality and safety	15	5,612	0.80	0.88	0.76
Work-life/home conflict	14	3,846	0.80	0.88	0.73
Contributions to poor mental health	23	7,345	0.78	0.87	0.69
Contributions to good health	6	3,684	nd	0.87	0.80
Adaptive coping					
Social support	6	2,297	0.74	0.87	0.80
Problem-focused	8	1,856	0.75	0.87	0.78
Ineffective coping	9	2,007	0.78	0.87	0.76

α, Cronbach's *α* weighted mean reliability estimate; DP, depersonalization; EE, emotional exhaustion; k, number of samples; n, sample size across k; nd, no estimate computed.

The correlates classified under work engagement drivers are: recognition/feedback, autonomy, organization/peer support and adequate resources. The correlates classified under work engagement constraints are: professional values (for example, compromise of beliefs), organization structures (for example, supervision, inflexible work arrangements), inadequate resources, role ambiguity/conflict, insufficient input, workload, inadequate skills/preparation, and position-specific demands (for example, patient suffering and emotions). Work attitudes drivers include job and professional satisfaction, and organizational commitment. Work attitudes constraints include lack of motivation, career regret and intent to leave profession. The correlates classified under health and safety drivers are: quality and safety culture (for example, time for patients, management of patient-load), clinical skills, and professional development. The correlates classified under health and safety constraints are: incivility/conflicts/violence, and lack of quality and safety (for example, ergonomics and work-related hazards). Work-life/home conflict is incompatibility between professional and personal obligations and commitments. Contributors to poor mental health include fatigue, anxiety and depression. Contributors to good health include relaxation, hobbies, time for self and others. The correlates classified under adaptive coping are: social support (family, relatives, friends, outside acquaintances) and problem-focused (for example, prioritization of goals, finding meaning, spirituality). Ineffective coping includes over-eating, inactivity and emotion-focused.

Analyses

For point estimates, our meta-analysis did not include any correlate examined in only one sample. Where a study had two or more separate item measures for a given correlate, we first calculated their mean r with the burnout dimension. For each correlate with a k ≥2, we calculated the weighted mean meta-correlation (ρ), and ρ corrected for within-sample measurement unreliability (ρ_c), using the formula [16]:

$$\rho_c = r_{xy}/\left(\alpha_x \alpha_y\right)^{1/2}, \quad (4)$$

where r_{xy} = r of correlate with burnout dimension, α_x = reliability estimate of correlate, α_y = reliability estimate of burnout dimension. We substituted the value of the weighted mean of Cronbach's α or 1 when no reliability estimate was provided.

We considered ρ_c ≥0.30 to have practical significance for evaluation purposes. For example, a ρ_c = 0.30 between a work constraint and burnout could mean that 66% of physicians in restrictive environments have high EE levels, and 66% of those in supportive environments have low EE levels [17].

For dispersion around ρ_c, we calculated the variance of ρ_c ($\sigma^2\rho_c$), and the Q-test for homogeneity of r [16], where significance indicates that the associations vary across k. For homogeneous k, the standard error of ρ_c (SE ρ_c) formula is [18]:

$$SE\,\rho_{c\ \text{homogeneous}} = \left(1-\rho_c{}^2\right)/(n-k)^{1/2}, \quad (5)$$

and for heterogeneous k, the SE ρ_c formula is [18]:

$$SE\,\rho_{c\ \text{heterogeneous}} = \left\{\left[\left(1-\rho_c{}^2\right)/(n-k)^{1/2}\right] + \left(\sigma^2_{res}/k\right)\right\}, \quad (6)$$

where $\sigma^2_{res} = \sigma^2\rho_c - \sigma^2\,\rho$. The SE ρ_c was used to construct the 95% confidence interval (CI) of ρ_c.

For group differences, for heterogeneous k, we compared the difference in ρ_c's between regions and between specialty groups using the formula [12]:

$$|Z|-\text{difference} = z_{c1}{}' - z_{c2}{}' / (1/[n_1-3] + 1/[n_2-3])^{1/2}, \quad (7)$$

$$\text{where } z_c{}' = (1/2)\log_e([1+\rho_c]/[1-\rho_c]).$$

To check for publication bias, the file drawer problem exists when studies with significant results are published, while those with non-significant results are not reported. This and other types of publication bias are evident when the funnel plot (r by n) is asymmetrical or skewed [19]. Publication bias was checked by: (1) estimating the k with non-significant r that would be needed to increase the ρ_c's significance level to ≥0.05 (that is, fail-safe k or k_{fs}) for each correlate [20], and (2) examining the funnel plots of correlates with k ≥15.

Analytical software

We used the META 5.3 meta-analysis program (National Collegiate Software Clearinghouse, Raleigh, NC, USA) [21] to estimate the weighted mean of Cronbach's α, ρ, ρ_c, $\sigma^2\rho_c$, SE ρ_c, 95% CI of ρ_c, Q-test for homogeneity of r, and k_{fs}. We used the Microsoft Excel 2010 (Microsoft, Redmond, WA, USA) spreadsheet to convert the χ^2, t-ratio, one-way F-ratio and OR statistics to r's; compute the K and N, and each group k and n descriptive statistics; and one-way F- and Z-difference tests. We used the Excel scatter chart program to create the funnel plot.

Results

Sample characteristics

Table 2 shows that the overall K = 65; N = 28,882; weighted mean for years of age = 45, weighted mean for years in practice = 15, and weighted mean for proportion of males = 73%. All research participants were administered questionnaires either through postal mail (61%), email (4%), in person (24%) or unspecified (12%), and the weighted mean response rate = 62%.

For the Americas, k = 26, n = 12,457; for Europe, k = 28, n = 13,085, and for Australia/Asia, k = 11, n = 3,340. On average, the European samples were older (47 years) than either the American (42 years) or Australian/Asian (41 years) samples. On average, the American samples provided a lower response rate (53%) than either the European (69%) or Australian/Asian (68%) samples.

We divided the samples into three specialty groups. The first was where, within a study sample, all the physicians saw their patients in hospital settings (inpatient specialties); the second was where, within a study sample, all of the physicians saw their patients in non-hospital settings, such as in walk-in clinics (outpatient specialties); and the third was where, within a study sample, some physicians saw patients in hospital settings and other physicians saw patients in non-hospital settings (mix of inpatient and outpatient specialties). For the inpatient specialty group (anesthesiology, internal, gynecology, oncology, otolaryngology, pediatric, surgical), k = 25, n = 10,935; for the outpatient specialty group (emergency medicine, infectious diseases, general/family, ophthalmology, psychiatry), k = 17, n = 4,775; and for the mixed group, k = 23, n = 13,172. On average, the outpatient specialty group had fewer years of practice experience (13 years) than either the inpatient specialty (16 years) or mixed (15 years) groups. On average, the outpatient specialty group provided a higher response rate (76%) than either the inpatient specialty (63%) or mixed groups (57%).

Reliability estimates

Table 1 shows the k, n and the weighted mean of Cronbach's α of each variable. The weighted mean of Cronbach's α ranged from 0.61 to 0.89 for the correlates, with 15/17 (88%) above 0.70. The weighted mean of

Table 2 Sample distribution

	k	n_k	Years of age	Years in practice	Males (%)	Response rate (%)
Region						
Americas	26	12,457	42 (14)	16 (3)	74 (13)	53 (24)
Europe	28	13,085	47 (4)	15 (3)	72 (14)	69 (10)
Asia/Australia	11	3,340	41 (4)	15 (3)	76 (12)	68 (14)
F-ratio, df = 2, 62	-	-	2.57[a]	0.90	0.39	6.28[b]
Specialty group						
Inpatient	25	10,935	42 (14)	16 (2)	73 (16)	63 (19)
Outpatient	17	4,775	44 (3)	13 (3)	76 (14)	76 (14)
Mixed	23	13,172	47 (4)	15 (3)	73 (12)	57 (18)
F-ratio, df – 2, 62	-	-	1.80	6.49[b]	0.28	5.89[b]
N	65	28,882	45 (9)	15 (3)	73 (14)	62 (19)

Values presented as weighted mean (SD). k, number of samples; n_k, cumulative n across k. [a]P <0.05; [b]P <0.01.

Cronbach's α ranged from 0.84 to 0.90 for EE and from 0.68 to 0.80 for DP.

Overall associations

Tables 3 and 4 show the k, n, ρ, ρ_c, $\sigma^2_{\rho c}$, 95% CI of ρ_c, Q-test, and k_{fs}. Table 3 reveals that EE had 25 correlates with k ≥2, and 17/25 (68%) had ρ_c's ≥0.30. Autonomy (ρ_c = −0.36) was the strongest correlate of the work engagement drivers; workload (ρ_c = 0.66) and organizational structure (ρ_c = 0.45) were the strongest correlates of the work engagement constraints. EE was associated with the work attitude drivers (ρ_c = −0.47) and work attitude constraints (ρ_c = 0.46). Quality and safety culture (ρ_c = −0.34) was the strongest correlate of the health and safety drivers; incivility/conflicts/violence (ρ_c = 0.41), and lack of quality and safety (ρ_c = 0.42) were equally strong correlates of the health and safety constraints. EE was strongly associated with work-life conflict (ρ_c = 0.49), and contributors to poor mental health (ρ_c = 0.62), moderately associated with contributors to good health (ρ_c = −0.32) and ineffective coping strategies (ρ_c = 0.33).

EE had 22/25 (88%) correlates with k_{fs} ≥10, and 17/25 (68%) correlates with a k_{fs}/k ratio ≥4/1, indicating minimal risks of the file drawer problem. Figures 1, 2, 3 and 4 show the plots of r by n for workload, work attitude drivers, lack of quality and safety, and contributors to poor mental

Table 3 Meta-correlations with emotional exhaustion (EE)

Correlates	k	n	ρ	ρ_c	$\sigma^2_{\rho c}$	95% CI ρ_c	Q	k_{fs}
Work Engagement Drivers								
Recognition/feedback	4	2,125	−0.17	−0.20[b]	0.003	−0.24 to −0.11	6.69	10
Autonomy	6	2,189	−0.26	**−0.36**[b]	0.021	−0.60 to −0.01	53.09[b]	30
Organization/peer support	4	2,748	−0.15	−0.18[b]	0.002	−0.21 to −0.09	4.18	8
Adequate resources	2	1,089	−0.14	−0.15[b]	0.002	−0.18 to −0.11	2.35	4
Work Engagement Constraints								
Professional values	2	91	0.36	**0.42**[b]	0.000	0.41 to 0.42	0.01	13
Organization structures	5	1,084	0.44	**0.45**[b]	0.038	0.08 to 0.82	63.41[b]	40
Inadequate resources	5	1,023	0.34	**0.36**[b]	0.012	0.18 to 0.53	15.16[b]	31
Role ambiguity/conflict	3	622	0.23	0.24[b]	0.007	0.12 to 0.34	5.14	11
Insufficient input	4	437	0.34	**0.36**[b]	0.017	0.15 to 0.56	9.79[a]	23
Workload	19	6,205	0.51	**0.66**[b]	0.018	0.28 to 0.79	206.09[b]	183
Inadequate skills/preparation	4	1,242	0.24	0.26[b]	0.002	0.25 to 0.27	3.34	16
Position specific demands	10	3,550	0.32	**0.40**[b]	0.004	0.27 to 0.43	18.19[a]	61
Work Attitude Drivers	16	12,323	−0.30	**−0.47**[b]	0.022	−0.61 to −0.02	328.50[b]	85
Work Attitude Constraints	13	4,652	0.35	**0.46**[b]	0.008	0.21 to 0.52	50.15[b]	82
Health & Safety Drivers								
Quality & safety culture	7	8,226	−0.23	**−0.34**[b]	0.016	−0.50 to 0.00	143.72[b]	28
Clinical Skills	3	1,033	−0.08	−0.08[a]	0.004	−0.16 to −0.00	4.39	2
Professional development	6	1,377	−0.31	**−0.31**[b]	0.014	−0.51 to −0.10	23.74[b]	31
Health & Safety Constraints								
Incivility/conflicts/violence	7	1,816	0.34	**0.41**[b]	0.015	0.14 to 0.58	34.61[b]	43
Lack of quality & safety	15	5,612	0.34	**0.42**[b]	0.007	0.22 to 0.51	50.11[b]	94
Work–Life/Home Conflict	13	3,817	0.40	**0.49**[b]	0.019	0.16 to 0.69	102.49[b]	98
Contributors to Poor Mental Health	23	7,345	0.49	**0.62**[b]	0.013	0.30 to 0.71	168.99[b]	210
Contributors to Good Health	6	4,806	−0.28	**−0.32**[b]	0.01	−0.48 to −0.10	57.76[b]	29
Adaptive Coping								
Social support	7	3,448	−0.17	−0.26[b]	0.007	−0.32 to −0.04	28.34[b]	18
Problem-focused	9	3,007	−0.20	−0.29[b]	0.009	−0.38 to −0.04	30.42[b]	29
Ineffective Coping	9	3,129	0.22	**0.33**[b]	0.009	0.07 to 0.50	31.28[b]	33

95% CI ρ_c, confidence interval; $\sigma^2_{\rho c}$, variance of ρ_c; k, number of samples; k_{fs}, fail-safe k for critical ρ_c ≥0.05; n, sample size across k; ρ, weighted mean meta-correlation; ρ_c, ρ after correcting for measurement unreliability with value ≥0.30 in bold; Q, homogeneity of r test, where significance indicates that the ρ_c's vary across k. [a]P <0.05; [b]P <0.001.

Table 4 Meta-correlations with depersonalization (DP)

Correlates	k	n	ρ	ρ_c	$\sigma^2_{\rho c}$	95% CI ρ_c	Q	k_{fs}
Work Engagement Drivers								
Recognition, feedback	3	853	−0.04	−0.05	0.004	−0.07 to −0.01	3.25	<1
Autonomy	5	1,769	-0.17	−0.24[b]	0.003	−0.42 to 0.01	22.36[b]	15
Organization/peer support	3	1,597	−0.08	−0.09[b]	0.004	−0.18 to 0.01	6.17[a]	2
Work Engagement Constraints								
Professional values	4	686	0.28	**0.36**[b]	0.003	0.34 to 0.37	2.23	21
Organization structures	2	198	0.47	**0.47**[b]	0.003	0.46 to 0.47	1.02	17
Role Ambiguity/conflict	2	593	0.23	0.26[b]	0.003	0.25 to 0.26	0.05	8
Workload	12	3,899	0.26	0.29[b]	0.011	0.11 to 0.48	48.80[b]	58
Inadequate skills/preparation	3	679	0.28	**0.35**[b]	0.001	0.34 to 0.36	0.53	15
Position specific demands	7	1,773	0.28	**0.38**[b]	0.005	0.27 to 0.41	10.30[b]	41
Work Attitudes Drivers	13	11,206	−0.24	**−0.36**[b]	0.008	**−**0.43 to **−**0.10	100.07[b]	55
Work Attitudes Constraints	7	1,945	0.24	**0.32**[b]	0.009	0.11 to 0.40	19.44[b]	33
Health & Safety Drivers								
Quality & safety culture	7	7,640	−0.24	**−0.35**[b]	0.006	−0.41 to −0.12	51.09[b]	30
Clinical skills	2	975	−0.11	**−**0.15[b]	0.001	−0.15 to −0.16	1.12	4
Professional development	5	1,348	−0.18	−0.18[b]	0.000	−0.18 to −0.18	0.61	13
Health & Safety Constraints								
Incivility/conflicts/violence	3	220	0.42	**0.51**[b]	0.01	0.49 to 0.54	3.18	25
Lack of quality & safety	8	2,573	0.27	**0.33**[b]	0.012	0.10 to 0.53	36.49[b]	42
Work–Life/ Home Conflict	9	2,511	0.27	**0.34**[b]	0.01	0.13 to 0.47	29.06[b]	39
Contributors to Poor Mental Health	17	5,411	0.27	**0.34**[b]	0.008	0.14 to 0.42	50.96[b]	78
Contributors to Good Health	5	3,387	−0.15	−0.15[b]	−0.16	−0.27 to −0.04	16.71[b]	11
Adaptive Coping								
Social support	5	1,866	−0.16	−0.21[b]	0.004	−0.23 to −0.10	7.10	11
Problem-focused	7	1,647	−0.14	−0.18[b]	0.004	−0.16 to −0.14	7.31	14
Ineffective Coping	9	2,007	0.19	0.24[b]	0.012	0.02 to 0.40	26.13[b]	25

95% CI ρ_c, confidence interval; $\sigma^2_{\rho c}$, variance of ρ_c; k, number of samples; k_{fs}, fail-safe k for critical $\rho_c \geq 0.05$; n, sample size across k; ρ, weighted mean meta-correlation; ρ_c, ρ after correcting for measurement unreliability with value ≥0.30 in bold; Q, homogeneity of r test, where significance indicates that the ρ_c's vary across k. [a]P <0.05; [b]P <0.001.

health. All four were funnel-shaped with three symmetrical, indicating minimal risks of publication bias [17].

Table 4 reveals that DP had 22 correlates with k ≥2, and 11/22 (50%) had ρ_c's ≥0.30. Three correlates, adequate resources, inadequate resources and insufficient inputs, each had k = 1 and were not included in the meta-analysis for DP. Organizational structure (ρ_c = 0.47) was the strongest correlate of the work engagement constraints. DP was moderately associated with the work attitude drivers (ρ_c = −0.36) and work attitude constraints (ρ_c = 0.32). Quality and safety culture (ρ_c = −0.35) was the strongest correlate of the health and safety drivers; incivility/conflicts/violence (ρ_c = 0.51) was a stronger correlate than lack of quality and safety (ρ_c = 0.33) of the health and safety constraints. DP was moderately associated with work-life conflict (ρ_c = 0.34), and contributors to poor mental health (ρ_c = 0.34).

DP had 18/22 (82%) correlates with k_{fs} ≥10, and 13/22 (59%) correlates with a k_{fs}/k ratio ≥4/1, indicating minimal risks of the file drawer problem. Figure 5 shows the plot of r by n for contributors to poor mental health. It was funnel-shaped and symmetrical, indicating a minimal risk of publication bias.

Group differences

The interpretation of the overall ρ_c's must be qualified due to heterogeneity of r's across k on both burnout dimensions. The r's were heterogeneous on 18/25 (72%) correlates for EE, and on 12/22 (55%) correlates for DP. For these correlates, we compared the significance of ρ_c differences between the two largest regions, the Americas and Europe, and between inpatient and outpatient specialty groups. We did not compare with the mixed group because both

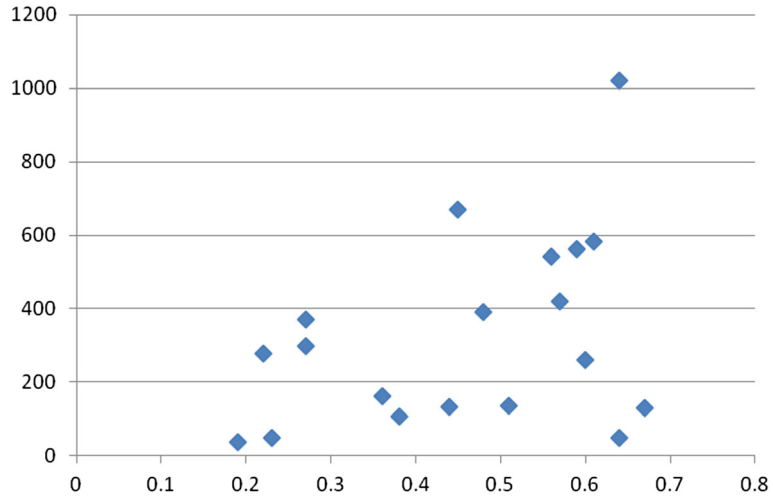

Figure 1 Funnel plot of workload with emotional exhaustion (EE). x-axis: r; y-axis: n. k = 19; range of n: 37 to 1,021.

inpatient and outpatient specialties were combined in a given sample.

Tables 5 and 6 show the k, n, ρ_c and Z-difference between regions. Table 5 reveals that EE had 13/18 (72%) correlates with significant ρ_c differences. The ρ_c's of the Americas were stronger than Europe on 11 correlates. The most notable differences were in quality and safety culture (−0.56 versus −0.25), professional development (−0.41 versus −0.22), work-life conflict (0.57 versus 0.40), problem-focused coping (−0.44 versus −0.17), and ineffective coping (0.53 versus 0.32). Physicians in the Americas were at lower risk than physicians in Europe for EE when quality and safety culture and career development opportunities were present, and problem-focused coping was used. The former were at higher risk than the latter when work-life conflict was present, and ineffective coping was used. The ρ_c of the work attitude drivers was stronger for Europe (−0.64) than for the Americas (−0.28), indicating that the former was at lower risk than the latter for EE when their attitudes were positive.

Table 6 reveals that DP had 8/12 (67%) correlates with significant ρ_c differences. The ρ_c's of the Americas were stronger than Europe on seven correlates. The most notable differences were in lack of quality and safety (0.47 versus 0.29), and work-life conflict (0.42 versus 0.27). Physicians in the Americas were at higher risk than physicians in Europe for DP when quality and safety was compromised and work-life conflict was present.

Tables 7 and 8 show the k, n, ρ_c and Z-difference between specialty groups. Table 7 reveals that EE had 8/16 (50%) correlates with significant ρ_c differences. The ρ_c's of the outpatient specialties were stronger than the inpatient specialties on seven correlates. The most notable differences were in autonomy (−0.79 versus −0.57), organizational structures (0.72 versus 0.32) and contributors to poor mental health (0.77 versus 0.56). The former

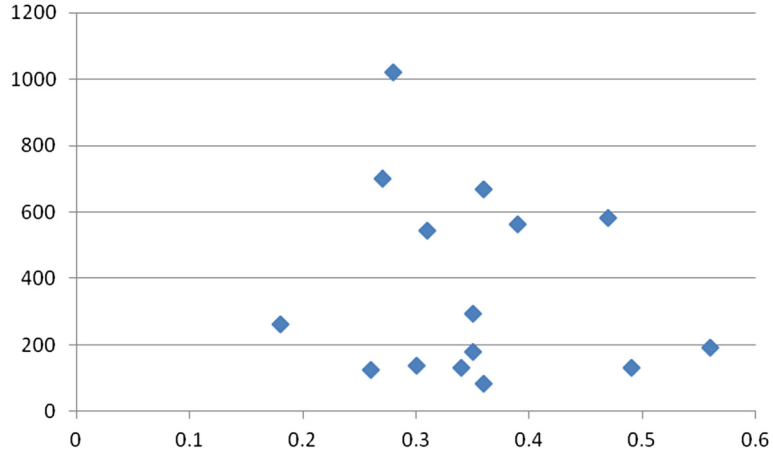

Figure 2 Funnel plot of lack of quality and safety with emotional exhaustion (EE). x-axis: r; y-axis: n. k = 15; range of n: 84 to 1,021.

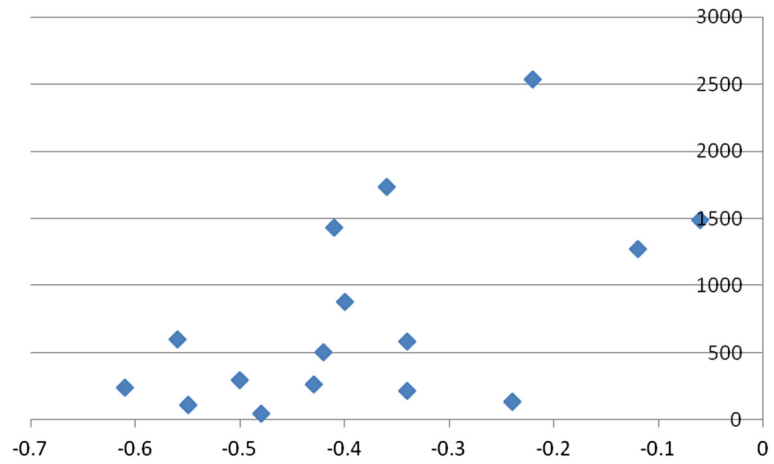

Figure 3 Funnel plot of work attitudes drivers with emotional exhaustion (EE). x-axis: r; y-axis: n. k = 16; range of n: 50 to 2,536.

were at higher risk than the latter for EE when the organization of work was constraining and poor mental health were present, but were at lower risk for EE with autonomy and use of problem-focused coping. The ρ_c of the work attitude drivers was stronger for the inpatient specialties (–0.44) than for the outpatient specialties (–0.29), indicating that the former was at lower risk for EE when their attitudes were positive.

Table 8 reveals that DP had 3/10 (30%) correlates with significant ρ_c differences. The ρ_c's of the outpatient specialties were stronger than the inpatient specialties for work-life/home conflict (0.46 versus 0.32), and contributors to poor mental health (0.63 versus 0.35), indicating that the former were at higher risk than the latter for DP when work-life conflict and poor mental health was present. The ρ_c of the work attitude drivers was stronger ρ_c for the inpatient specialties (–0.45) than the outpatient specialties (–0.29), indicating that the former was at lower risk for DP when their attitudes were positive.

Discussion

Figure 6 shows the overall associations and reveals some significant trends. The ρ_c's with burnout were stronger for constraints than for drivers. Similarly, the ρ_c's with burnout were stronger for work-life conflict and contributors to poor mental health than contributors to good health. EE was more strongly associated with a greater number of correlates than DP. EE's stronger ties with the environmental drivers and constraints support Maslach's contention that it represents the core aspect of burnout [22]. The results also support Maslach's position that EE is more closely tied to health states. The implication is that while drivers are important, the management of constraints may be even more critical for physicians who experience

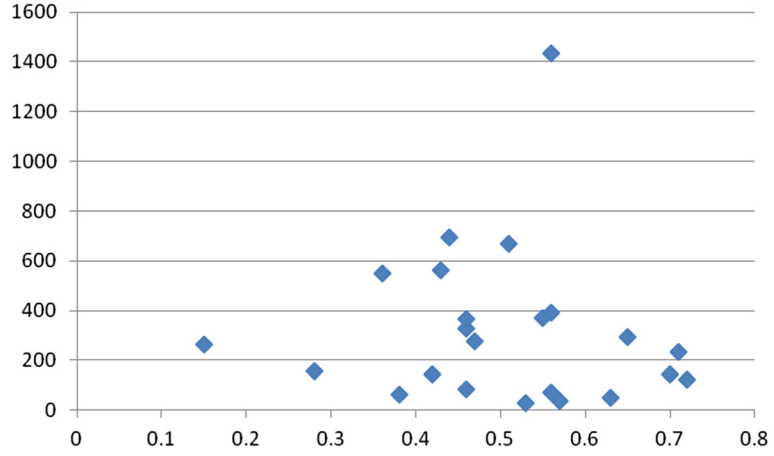

Figure 4 Funnel plot of contributors to poor mental health with emotional exhaustion (EE). x-axis: r; y-axis: n. k = 23, range of n: 29 to 1,435.

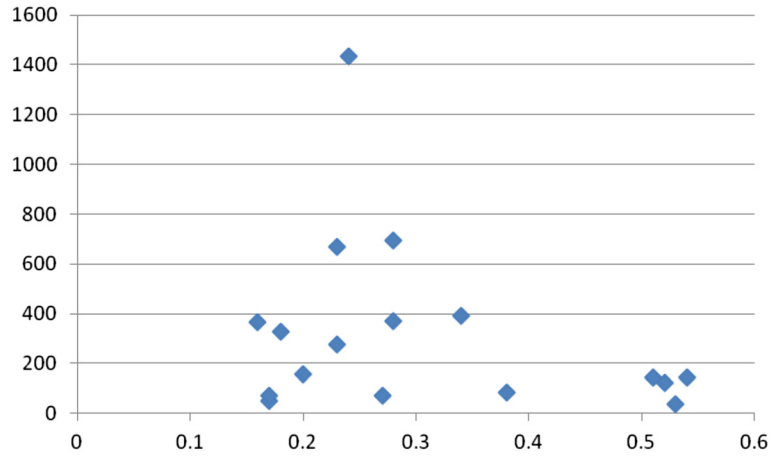

Figure 5 Funnel plot of contributors to poor mental health with depersonalization (DP). x-axis: r; y-axis: n. k = 17; range of n: 37 to 1,435.

Table 5 Regional differences for emotional exhaustion (EE)

	Americas			Europe			
Correlates	**k**	**n**	**ρ_c**	**k**	**n**	**ρ_c**	**Z-dif**
Work engagement drivers							
Autonomy	2	860	**−0.49**	3	1,279	−0.24	6.39[b]
Work engagement constraints							
Organization structures	1	62	0.48	2	857	0.44	0.42
Inadequate resources	3	431	0.33	1	563	0.37	0.78
Insufficient input	2	324	0.37	1	84	0.25	1.11
Workload	9	2,746	**0.70**	8	2,876	0.63	4.79[b]
Position-specific demands	3	578	**0.46**	6	2,429	0.37	2.13[a]
Work attitudes drivers	6	6,114	−0.28	7	5,705	**−0.64**	25.42[b]
Work attitudes constraints	6	1,474	**0.55**	4	1,934	0.38	6.36[b]
Health and safety drivers							
Quality and safety culture	2	2,714	**−0.56**	4	4,815	−0.25	15.74[b]
Professional development	2	652	**−0.41**	2	646	−0.22	3.76[b]
Health and safety constraints							
Incivility/conflicts/violence	3	431	0.34	3	1,356	0.43	1.89
Lack of quality and safety	6	1,921	**0.47**	8	3,148	0.39	3.42[b]
Work-life/home conflict	7	1,881	**0.57**	5	1,907	0.40	7.04[b]
Contributors to poor mental health	5	1,157	0.57	13	5,018	**0.65**	3.86[b]
Contributors to good health	2	879	−0.33	2	2,233	0.30	0.60
Adaptive coping							
Social support	4	1,253	**−0.35**	1	501	−0.22	2.68[a]
Problem-focused	2	342	**−0.44**	3	892	−0.17	4.81[b]
Ineffective coping	1	133	**0.53**	7	1,845	0.32	2.36[a]

k, number of samples; n, sample size across k; ρ_c, weighted mean meta-correlation after correcting for measurement unreliability; Z-dif, tests whether ρ_c's are significantly different from each other. Bold values indicate the stronger of the two ρ_c's for the correlate. [a]P <0.05; [b]P <0.001, two-tailed.

Table 6 Regional differences for depersonalization (DP)

	Americas			Europe			
Correlates	**k**	**n**	**ρ_c**	**k**	**n**	**ρ_c**	**Z-dif**
Work engagement drivers							
Autonomy	2	860	−0.28	2	859	−0.20	1.70
Organization/peer support	1	133	−0.15	1	1,435	−0.08	0.80
Work engagement constraints							
Workload	3	993	0.32	7	2,313	0.33	0.29
Position-specific demands	2	385	**0.51**	4	815	0.32	2.71[a]
Work attitudes drivers	5	4,842	−0.31	5	5,148	**−0.38**	4.19[b]
Work attitudes constraints	3	765	**0.38**	3	913	0.25	2.89[a]
Quality and safety culture	2	2,714	**−0.41**	4	4,229	−0.33	3.86[b]
Health and safety constraints							
Lack of quality and safety	2	760	**0.47**	5	1,270	0.29	4.33[b]
Work-life/home conflict	4	1,138	**0.42**	4	1,344	0.27	4.14[b]
Contributors to poor mental health	4	608	**0.45**	10	3,898	0.33	3.23[b]
Contributors to good health	1	582	**−0.27**	2	2,233	−0.13	3.02[a]
Ineffective coping	1	133	0.32	7	1,845	0.23	1.02

k, number of samples; n, sample size across k; ρ_c, weighted mean meta-correlation after correcting for measurement unreliability; Z-dif, tests whether ρ_c's are significantly different from each other. Bold values indicate the stronger of the two ρ_c's for the correlate. [a]P <0.05; [b]P <0.001, two-tailed.

Table 7 Specialty group differences for emotional exhaustion (EE)

	Inpatient			Outpatient			
Correlates	**k**	**n**	**ρ_c**	**k**	**n**	**ρ_c**	**Z-dif**
Work engagement drivers							
Autonomy	2	843	−0.57	1	50	**−0.79**	2.79[a]
Work engagement constraints							
Organization structures	3	654	0.32	1	294	**0.72**	8.27[b]
Inadequate resources	2	592	0.38	3	431	0.33	0.96
Insufficient input	1	29	0.44	3	408	0.35	0.54
Workload	9	4,366	**0.72**	5	558	0.65	2.82[a]
Position-specific demands	4	2,519	0.38	4	591	0.42	1.00
Work attitudes drivers	5	2,854	**−0.44**	5	2,236	−0.29	5.94[b]
Work attitudes constraints	6	2,711	0.44	5	1,346	0.44	0.06
Health and safety drivers							
Professional development	3	1,112	−0.31	1	145	−0.34	0.35
Health and safety constraints							
Incivility/conflicts/violence	2	1,007	0.36	5	809	**0.48**	3.02[a]
Lack of quality and safety	8	4,518	0.41	5	839	**0.50**	3.00[a]
Work-life/home conflict	6	2,055	0.49	3	471	0.52	0.94
Contributors to poor mental health	10	3,498	0.56	5	791	**0.77**	9.86[b]
Adaptive coping							
Social support	3	1,190	−0.18	1	133	−0.17	1.18
Problem-focused	5	1,543	−0.29	1	133	**−0.48**	2.51[a]
Ineffective coping	4	1,469	0.32	2	217	0.47	1.80

k, number of samples; n, sample size across k; ρ_c, weighted mean meta-correlation after correcting for measurement unreliability; Z-dif, tests whether ρ_c's are significantly different from each other. Bold values indicate the stronger of the two ρ_c's for the correlate. [a]P <0.05; [b]P <0.001, two-tailed.

Table 8 Specialty group differences for depersonalization (DP)

	Inpatient			Outpatient			
Correlates	**k**	**n**	ρ_c	**k**	**n**	ρ_c	**Z-dif**
Work engagement drivers							
Autonomy	2	843	−0.33	1	50	−0.51	1.40
Organization/peer support	1	29	−0.50	1	133	−0.15	1.85
Work engagement constraints							
Workload	6	2,485	0.37	1	133	0.34	0.46
Position-specific demands	3	583	0.26	1	207	0.43	1.72
Work attitudes drivers	2	1,083	**−0.45**	5	2,890	−0.29	4.93[a]
Work attitudes constraints	2	1,083	0.28	3	267	0.27	0.22
Health and safety constraints							
Lack of quality and safety	5	2,234	0.32	1	84	0.34	0.24
Work-life/home conflict	5	1,402	0.32	2	278	**0.46**	2.52[a]
Contributors to poor mental health	5	1,858	0.35	4	497	**0.63**	7.41[b]
Ineffective coping	5	1,498	0.22	2	217	0.28	0.78

k, number of samples; n, sample size across k; ρ_c, weighted mean meta-correlation after correcting for measurement unreliability; Z-dif, tests whether ρ_c's are significantly different from each other. Bold values indicate the stronger of the two ρ_c's for the correlate. [a]P <0.05; [b] P <0.001, two-tailed.

high EE. In summary, our findings suggest that attempts to reduce burnout risk could operate at three levels: individual (healthy lifestyle/behaviors, adequate coping), the individual and the environment (social support structures, relationships, improving person-organization fit), and at the organizational level (adequate working conditions, organization of work, design) [7,9,10].

Drivers and constraints of EE

Excessive and unevenly distributed workloads are fairly pervasive constraints, and were strongly associated with EE. The improvement of work processes, flow and interpersonal relationships (quality and safety) were drivers associated with reduced EE. A positive work attitude was another driver associated with reduced EE, and suggests the benefit of fostering greater organizational commitment and career satisfaction. Contributors to poor mental health and work/life conflict were strongly associated with EE, indicating the importance of self-care practices, and improved personal and family management.

Drivers and constraints of DP

A culture of quality and safety and positive work attitudes were critical drivers associated with reduced DP. Contributors to poor mental health and work/life conflict were associated with DP, although the link between poor mental

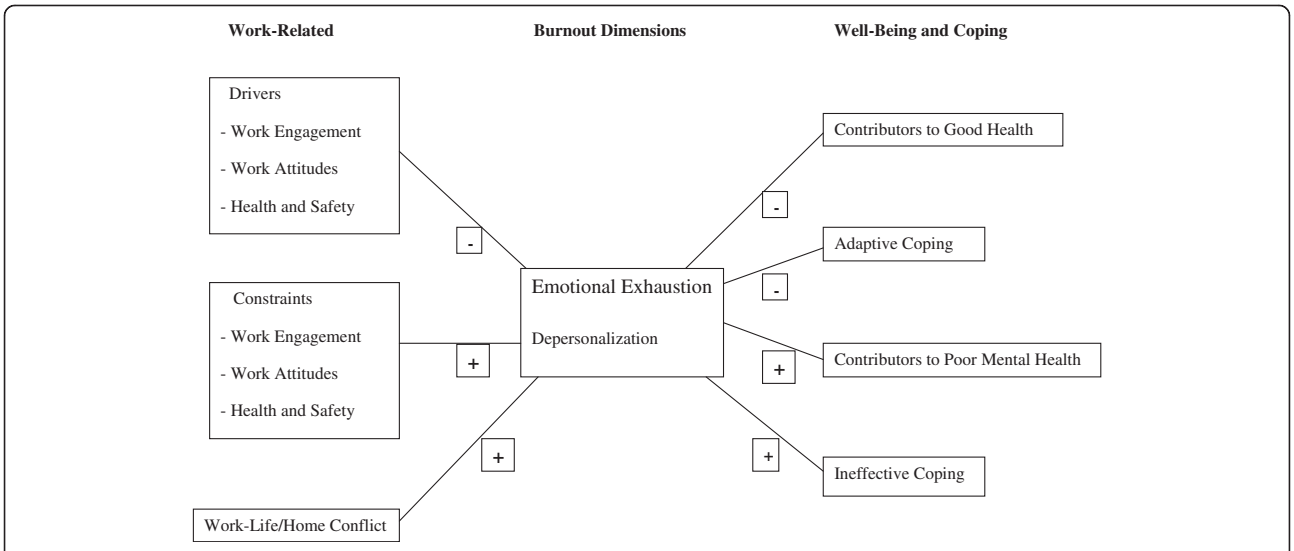

Figure 6 Summary of overall associations. The direction of ρ_c is indicated by either '+' or '−', with the large font indicating high magnitude of association.

health and EE was much stronger. Again, our findings underscore the necessity of self-care and finding the right career balance.

Americas versus Europe

The moderating role of region may be partly due to age differences, with physicians from Europe, on average, being five years older than physicians from the Americas. The age-related maturity may have enabled many of the European physicians to better manage the risk factors. Work-life conflict had stronger associations with burnout in physicians from the Americas than physicians from Europe. In addition to the greater maturity levels, physicians from Europe may have received more extended family support than their colleagues from the Americas. A caveat worth noting is that the dissimilar mean response rates between the physicians from Europe and the Americas may have distorted the group differences in ρ_c's.

For physicians from the Americas, possible ways to reduce EE include rebalancing the constraints of heavy workload and position-specific demands, while improving quality and safety culture, and professional development. For physicians from Europe, possible ways to reduce EE include managing the factors that contribute to poor health. For physicians from the Americas, possible ways to reduce DP include cultivating a climate that generates positive work attitudes, quality and safety culture, work-life balance, and managing the contributors to poor health.

Our findings suggest that factors other than culture and economics should be considered when comparing these two regions. The challenges and complexities inherent in the physicians' work may limit the scope of any proposed changes. Redistributing patient-loads may be difficult within health systems faced with chronic resource constraints. The changes in work routines, resource distribution and decision-making processes may be resisted by physicians and other health professionals. Applying Wiskow *et al.*'s three levels of change require an integrated, systems approach based on careful planning and coordinated implementation [7].

Inpatient versus outpatient specialties

The moderating role of specialties may be partly due to differences in practice experience, with inpatient specialties having, on average, three more years of practice than outpatient specialties. The increased knowledge commensurate with experience may have enabled many of the inpatient specialties to better manage the risk factors. The stronger associations between EE and its correlates for the outpatient specialties also suggest increased difficulties with work organization and processes due to geographical isolation, and the transient nature of patient relations. The most significant finding was the link between contributors to poor mental health and burnout, with the ρ_c stronger for outpatient than inpatient specialties. This may indicate that managing the financial, logistical and other business-related needs of outreach clinics exacts a severe toll on their health. Their health deterioration is associated with increased workload and challenges over and above the demands of clinical practice. Outpatient specialties in managed care systems may experience negative health states due to the highly regulated environment, which limits their autonomy, decision input and ability to develop long-term professional relationships with patients [23]. Possible ways to reduce EE for them include providing informational and material resources, training/development programs, and collegial and administrative support. A caveat worth noting is that the dissimilar mean response rates between the outpatient and inpatient specialties may have distorted the group differences in ρ_c's.

Study limitations

One study limitation is the lack of uniform standards in the reporting of sample characteristics and r's. The conversion of ORs may have yielded imprecise r estimates [13]. A second is the inability to infer causality. Did poor health lead to physician burnout, or vice-versa? Similarly, did work-life conflict precede or follow from burnout? A third is that health contexts may have influenced some of our results, but characteristics of health systems (for example, public versus private) were not always reported. A fourth is the paucity of research on physicians in Africa or the Middle East. Finally, we were unable to collect or interpret studies published in languages other than English or Spanish.

Conclusions

Our study found that reducing the individual and organizational-level risk factors is associated with decreased burnout. Documenting the regional and specialty differences lays the foundation for directing resources where they are most needed. Our findings also reveal the lack of research linking physician burnout with performance. A US study found that physician DP was associated with diminished patient satisfaction and longer post-discharge recovery time [24]. Additional studies could link physician burnout with quality of care and medical errors, which have been found to be negatively associated with patient safety and recovery [25]. Research could examine how physician burnout relates to health behaviors, professional development, communication skills, and overall quality of life.

Appendix

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Abbreviations

CI: Confidence interval; DP: Depersonalization; EE: Emotional exhaustion; HHR: Health human resources; OR: Odds ratio; PRISMA: Preferred reporting items for systematic reviews and meta-analyses; SD: Standard deviation; SE: Standard error; WHO: World Health Organization.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

RL designed the study, interpreted data, wrote first and revised drafts, and constructed figures. BS analyzed and interpreted data, constructed tables, and critically evaluated both drafts for content. SH compiled and analyzed data, and critically evaluated both drafts for content. BL collected, compiled and interpreted data, created the categories for study variables, and participated in writing both drafts. LS collected, compiled and analyzed data, critically evaluated first draft for content, and participated in writing the revised draft. All authors read and approved the final manuscript.

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