

Association between physician burnout and patient safety, professionalism and patient satisfaction: A systematic review and meta-analysis.

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Author Contributions

The original idea for the research was developed by MP and AE. The analysis was conducted by MP, KG and AH. MP, KG, JJ and YS conducted the searches, study selection, quality assessments and other data extraction. MP wrote the paper. KG, JJ, AZ, EP, CCG, DP, AH, RR and AE interpreted the findings and contributed to critical revision of the manuscript. MP is the guarantor. MP affirms that the manuscript is an honest, accurate, and transparent account of the research findings and no important aspects of the study have been omitted.

Conflict of interests

All authors declare no conflict of interest

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Abstract

IMPORTANCE: Physician burnout has taken the form of an ‘epidemic’ which may affect core domains of the healthcare delivery, including patient safety, quality of care and patient satisfaction. However this evidence has not been systematically quantified.

OBJECTIVE: We examined whether physician burnout is associated with increased risk of patient safety incidents, suboptimal care outcomes due to low professionalism and lower patient satisfaction.

DATA SOURCES: Medline, Embase, PsycInfo and Cinahl, were searched until October 2017.

We have undertaken detailed standardized searches with no language restriction. The reference lists of eligible studies and other relevant systematic reviews were hand-searched.

STUDY SELECTION: Quantitative observational studies were selected.

DATA EXTRACTION AND SYNTHESIS: Two independent reviewers were involved. The main meta-analysis was followed by subgroup and sensitivity analyses. All analyses were performed using random-effects models. Formal tests for heterogeneity (I^2) and publication bias were performed.

MAIN OUTCOME AND MEASURES: The core outcomes were the quantitative associations between burnout and patient safety, professionalism and patient satisfaction reported as odds ratios with their 95% confidence intervals.

RESULTS: Of the 5,234 records identified, 47 studies on 42,473 physicians were included in the meta-analysis. Physician burnout was associated with an increased risk of patient safety incidents (OR=1.89, 95% CI=1.63 to 2.15), poorer quality of care due to low professionalism (OR = 2.00, 95% CI= 1.71 to 2.30) and reduced patient satisfaction (OR = 2.28, 95% CI= 1.50 to 3.07). The heterogeneity was high and the study quality was low to moderate. The links between burnout and low professionalism were larger in resident/early career physicians compared to middle/late career physicians (Cohen’s $Q = 7.27$, $p < 0.01$). The reporting method of patient safety incidents

and professionalism (physician-reported vs system-recorded) significantly influenced the main results (Cohen's $Q = 8.14$, $p < 0.01$).

CONCLUSION: This meta-analysis provides evidence that physician burnout may jeopardize patient care, a fundamental healthcare policy goal across the globe. Healthcare organizations are encouraged to invest in efforts to improve physician wellness, particularly for early career physicians. The methods of recording patient care quality and safety outcomes require improvements to concisely capture the impact of burnout on the performance of healthcare organizations.

Key points

Question Is physician burnout linked with low quality, unsafe patient care?

Findings This meta-analysis on 42,473 physicians found that burnout is associated with 2-fold increased odds for unsafe care, unprofessional behaviors and low patient satisfaction. The depersonalization dimension of burnout had the strongest links with these outcomes. The association between unprofessionalism and burnout was particularly high across studies of early career physicians.

Meaning Physician burnout is associated suboptimal patient care and professional inefficiencies. Healthcare organizations have a duty to jointly improve these core and complementary facets of their function. Key priority areas are signs of depersonalization and early career physicians.

Introduction

The view that physician wellness is an indicator of the quality of healthcare organizations is not new – it was introduced over few decades ago and has since gained increasing support.¹⁻⁴ The most well-known inverse metric of physician wellness is burnout, defined as *a response to prolonged exposure to occupational stress encompassing feelings of emotional exhaustion, depersonalization and reduced professional efficacy*.⁵ There is strong evidence that the prevalence of burnout in physicians is high and that its impact on the personal lives of physicians is profound.⁶ The 2017 Medscape Physician Lifestyle Report suggests that 50% of doctors report signs of burnout in the US, representing a rise of 4% within a year⁷. Burnout is linked with increased risk for cardiovascular disease and shorter life expectancy, problematic alcohol use, broken relationships, depression, and suicide.^{8,9}

Despite consistent findings regarding the high prevalence of burnout and the detrimental personal consequences of this for physicians, research evidence about the impact of physician burnout on the quality of care delivered to patients is less definitive. A number of empirical studies have found that burnt-out physicians are more likely to be involved in patient safety incidents,⁸ to fail on critical aspects of professionalism which determine the quality of patient care (e.g. adherence to treatment guidelines, quality of communication and empathy) and to receive lower patient satisfaction ratings.¹⁰ Moreover, two recent systematic reviews have linked high burnout in healthcare professionals with the receipt of less safe patient care.^{11,12} However, these reviews suffer from significant limitations. One included heterogeneous samples of healthcare professionals rather than physicians in particular (making quantification of these links using meta-analysis risky)¹²; the second focused on a limited number of studies.¹¹ Both failed to explore complementary dimensions of patient safety such as suboptimal care outcomes resulting from low-professionalism, and patient satisfaction, and neither used meta-analysis to quantify the strength of associations.¹¹

In this systematic review we examined whether physician burnout is associated with lower quality of patient care focusing on (1) patient safety incidents, (2) suboptimal care outcomes resulting from low professionalism and (3) lower patient satisfaction. We also evaluated the influence of key sources of heterogeneity on these associations including the healthcare setting in which physicians are working and the reporting method of patient care outcomes (physician-reported; patient-reported; system-recorded). This study is essential to acquire a holistic understanding of the impact of physician burnout on healthcare service delivery and to confirm the need for dynamic organization-wide resolutions to mitigate burnout.

Methods

This systematic review was conducted and reported in accordance with the Reporting Checklist for Meta-analyses of Observational Studies (MOOSE)¹³ and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance.¹⁴ The completed MOOSE checklist is available in eTable 1.

Searches

Medline, PsycInfo, Embase, and Cinahl were searched until October 22nd, 2017 with assistance by a librarian. The searches included combinations of 3 key blocks of terms (physicians; burnout; patient care) involving medical subject headings (MESH terms) and text words (eTable 2). Relevant systematic reviews and the reference lists of the eligible studies were hand-searched.

Eligibility criteria

Population: Physicians working in any healthcare setting.

Measure of physician burnout: Burnout was the primary outcome measured with standardized measures such the Maslach Burnout Inventory (MBI) or equivalent. The MBI assesses the three

dimensions of the burnout experience, including emotional exhaustion, depersonalization and personal accomplishment and produces separate scores for each dimension.¹⁵ We also included studies reporting measures of depression and emotional distress as these are closely related to burnout, but these outcomes were analyzed separately.¹⁶

Measure of suboptimal patient care:

- Patient safety incidents defined as ‘any unintended events or hazardous conditions resulting from the process of care, rather than due to the patient's underlying disease, that led or could have led to unintended health consequences for the patient or health care processes linked to safety outcomes’.¹⁷ Examples of patient safety incidents are adverse events, adverse drug events or other therapeutic and diagnostic incidents.
- Professionalism operationalized based on Stern’s four core principles: excellence, accountability, altruism and humanism.¹⁸ As indicators of low professionalism we included suboptimal compliance to treatment guidelines (e.g. US Preventive Services Task Force guidelines on prescription of recommended treatments and medications, tests ordering practices, referrals to treatment/other services and discharge), reduced professional integrity (e.g. malpractice claims), poor communication practices (e.g. provision of suboptimal information to patients) and low empathy. We viewed reduced professionalism as an indicator of suboptimal quality of care and a precursor of patient safety incidents¹⁹ as it involves some type of omission or commission error with potential to result in a patient safety incident.
- Patient-reported outcomes such as satisfaction and perceived enablement scores.

Quantitative data for the association between physician burnout and patient outcomes: Data to allow the computation of an effect size in each study were sought. We extracted these data from

the published reports where available, and we contacted the lead authors of studies which did not report sufficient data to compute an effect size (i.e. only reported p-values).

Design: Any quantitative study reporting data on the association between physician burnout and patient safety.

Setting: Any healthcare setting and language.

Exclusions: Grey literature (e.g. unpublished conference presentations, theses; government reports and policy statements) was excluded. We excluded studies which reported generic health outcomes such as quality of life, overall well-being or resilience.

Data selection, extraction and critical appraisal

The results of the searches were exported into Endnote. After removal of duplicates, a two-stage selection process was followed. At stage 1, titles and abstracts of studies were screened for relevance. At stage 2, full texts of studies ranked as relevant in stage 1 were accessed and fully screened against the eligibility criteria. A standardized excel data extraction spreadsheet was devised to facilitate the extraction of a) descriptive data from the studies including study characteristics (e.g. design and setting), participant characteristics (age, gender) and main outcome measures (physician burnout measure; indicators of suboptimal care); b) quantitative data for computing effect sizes in each study. The data extraction spreadsheet was piloted in 5 randomly selected studies before use. We used 3 widely used fundamental criteria adapted from guidance on the assessment of observational studies (cross-sectional and cohort studies).²⁰

- 1) A response rate of 70% or greater at baseline (Yes=1; No/Unclear=0);
- 2) Control for confounding factors in analysis (Yes=1; No/Unclear=0);
- 3) Study design (Longitudinal=1; Cross-sectional=0).

Ratings were not used to exclude papers prior to synthesis but to provide a context for assessing the validity of the findings (e.g. sensitivity analyses). Screening, data extraction and the critical appraisal were independently undertaken by two reviewers. The interrater agreement was high (0.91, 0.89, and 0.88, respectively). Any disagreements were resolved by discussion and the involvement of a third reviewer.

Data synthesis

The primary outcome was the association of burnout (overall burnout; emotional exhaustion, depersonalization and personal accomplishment) with suboptimal patient care indicators (patient safety incidents, professionalism and patient satisfaction). Secondary outcomes were depression/emotional distress with suboptimal patient care. Odds ratios (ORs) together with the 95% confidence intervals were calculated for all primary and secondary outcomes in each study. Studies were eligible for inclusion in more than one analyses (e.g. if they reported all three dimensions of burnout and/or more than one suboptimal patient care outcomes) but none of the studies is represented twice in the same analysis (to avoid double counting). ORs were typically computed from dichotomous data (number/rates of safety incidents), but continuous data (i.e. means) were also converted to ORs using appropriate methods proposed in the Cochrane Handbook. An OR >1 indicates that burnout is associated with increased risk of suboptimal patient care outcomes, whereas an OR <1 indicates burnout is associated with reduced risk for suboptimal patient care outcomes. Due to high heterogeneity, random effects models were applied to calculate pooled ORs in all analyses.^{35,36}

Heterogeneity was assessed using the I^2 statistic with values of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively.²¹ A sensitivity analysis was performed to evaluate the stability of the results when only studies less susceptible to risk of bias were retained in the analysis. One pre-specified subgroup analysis explored whether the main findings were

influenced by the reporting method of patient care outcomes (physician-reported; system-based). We also conducted two post-hoc subgroup analyses to examine whether the geographic region of the studies (US versus non-US studies) and the career stage of physicians (residents/early career versus middle/late career) influenced the main findings. We inspected the symmetry of the funnel plots and performed the Egger's test to examine for publication bias.²² All meta-analyses were performed in STATA (version 14) using the metaan command.²³ Funnel plots were constructed using the metafunnel command,²⁴ and the Egger test was computed using the metabias command.²⁵

Results

We identified 5,234 records and following the removal of duplicates, we screened 3,554 titles and abstracts for eligibility in this review. Following screening, 47 studies met our inclusion criteria.

^{4,8,10,26-69} The flowchart of the study selection process is presented in Figure 1.

Descriptive characteristics of the included studies

Descriptive details of the eligible studies are presented in Table 1. Across all 47 studies, a pooled cohort of 42,473 physicians was formed. The median number of recruited physicians= 243; range=24 to 7,926; 59% men with a median age of physicians of 38 (range=27 to 53 years). Our pooled cohort consisted of physicians at different stages of their career; 21 studies were primarily based on residents and early career (up to 5 years post-residency) physicians (46%) and 26 on experienced physicians (55%). Thirty studies were based on hospital physicians (63%), 13 studies were based on primary care physicians (28%) and 4 studies were based on mixed samples of physicians across any healthcare setting (9%). Thirty-seven studies were cross-sectional (79%) and 10 were prospective cohort studies (21%). Half of the studies were conducted in the US (51%), 15 in Europe (31%) and 9 elsewhere (19%).

All studies used validated measures of physician burnout. The Maslach Burnout Inventory (the original or revised iterations) was the most common measure of burnout (n=41 out of 43 studies which reported data on burnout; 83%). Fourteen studies reported secondary measures of depression and emotional distress, which were analyzed separately. Twenty-one studies reported patient safety incidents, 28 reported indicators of low professionalism, and 7 studies reported measures of patient satisfaction. Nine studies reported more than one of these outcomes. Patient safety incidents and suboptimal patient care due to low professionalism were assessed based on physician self-reports across the majority of the studies (n=17 out of 21 studies; n=22 out of 29 respectively) whereas the remaining used patient record reviews and surveillance systems. Patient satisfaction was based on self-reports by patients.

Nineteen studies reported a response rate of 70% or greater at baseline (40% met criterion 1), 36 studies adjusted for confounders in the analyses (77% met criterion 2) and 10 studies were prospective cohorts (21% met criterion 3). In total, 20 (43%) studies met at least 2 of the 3 quality criteria whereas only 5 studies (11%) met all three criteria.

Main Meta-analyses

Burnout and patient safety incidents: The pooled effects of the main analysis indicated that physician overall burnout is associated with twice the odds of involvement in patient safety incidents (OR=1.82, 95% CI=1.59 to 2.04, $I^2=88\%$; Figure 2). All dimensions of burnout, were associated with significantly increased odds of involvement in patient safety incidents (emotional exhaustion: OR = 1.62, 95% CI = 1.42 to 1.82, $I^2 = 87\%$; depersonalization: OR = 2.05, 95% CI = 1.52 to 2.58, $I^2 = 89\%$; personal accomplishment: OR = 1.45, 95% CI = 1.23 to 1.66, $I^2 = 86\%$). The heterogeneity across all analyses was moderate to high in most analyses as indicated by the I^2 values.

Symptoms of depression/emotional distress in physicians was associated with a two-fold increased risk of involvement in patient safety incidents (OR = 2.38, 95% CI = 1.84 to 2.92, I^2 = 74%; eFigure 1).

Burnout and professionalism: Overall burnout in physicians was associated with twice the odds of exhibiting low professionalism (OR = 2.00, 95% CI= 1.70 to 2.30, I^2 = 90%). Particularly, the depersonalization was associated with a 3-fold increased risk for reporting low professionalism (OR = 3.25, 95% CI= 2.42 to 4.07, I^2 = 94%, $p < 0.001$). Emotional exhaustion and reduced personal accomplishment were associated with over 2.5-fold increased odds for low professionalism (OR = 2.59, 95% CI = 1.95 to 3.22, I^2 = 90%; OR = 2.50, 95% CI = 1.82 to 3.18, I^2 = 89%)

Symptoms of depression or emotional distress was associated with 1.5 times increased risk for low professionalism (OR = 1.68, 95% CI = 1.44 to 1.92, I^2 = 61.0%; eFigure 2).

Burnout and patient satisfaction: Overall burnout in physicians was associated with a 2-fold increased odds for low patient-reported satisfaction (OR = 2.28, 95% CI= 1.50 to 3.07, I^2 = 81%). Particularly, depersonalization was associated with 5-fold increased odds for low patient-reported satisfaction (OR = 5.15, 95% CI= 1.40 to 8.90, I^2 = 82%). Personal accomplishment were also associated with over 2-fold increased odds for low patient-reported satisfaction (OR = 1.89, 95% CI = 1.05 to 2.73, I^2 = 72%) whereas emotional exhaustion was not significantly associated with patient-reported satisfaction (OR = 2.76, 95% CI = 0.19 to 5.41, I^2 = 87%).

Small-Study Bias: No substantial funnel plot asymmetry was observed in the main analyses, indicating that the results were not influenced by publication bias (Egger test P = 0.07; eFigure3).

Sensitivity analysis: The pooled effect sizes derived by the studies with higher quality scores (studies which met 2 of the 3 criteria) were similar to the pooled effect sizes of the main analyses (overall burnout and safety incidents: OR=1.93, 95% CI = 1.45 to 2.41; overall burnout and professionalism: OR=2.32, 95% CI = 1.66 to 2.98).

Subgroup analyses

Reporting method of patient care outcomes: Burnout was associated with twice the risk of physician-reported safety incidents and low professionalism (OR=2.07, 95% CI=2.03 to 2.11, $I^2=65\%$; OR=2.67, 95% CI=2.19 to 3.15, $I^2=56\%$, respectively) whereas the association between physician burnout and system-recorded safety incidents and low professionalism was statistically nonsignificant or marginally significant (OR=1.00, 95% CI=0.81 to 1.18, $I^2=15\%$; OR=1.15, 95% CI=1.02 to 1.31, $I^2=10\%$, respectively). Both subgroup differences were statistically significant (Cohen's $Q = 8.14$ and $Q=7.78$, $p<0.01$).

Country of origin: The pooled associations of physician burnout with patient safety incidents and low professionalism did not differ across studies based on US physicians (OR=1.69, 95%CI=1.46 to 1.92; $I^2=71\%$ OR=2.02, 95% CI=1.59 to 2.44, $I^2=75\%$ respectively) and studies based on physicians in other countries (OR=1.96, 95%CI=1.62 to 2.30; OR=1.97, $I^2=82\%$ 95% CI=1.57 to 2.38, $I^2=87\%$ respectively). The Cohen's Q tests for both analyses were statistically non-significant ($p>0.05$).

Career stage of physicians: The pooled association of burnout with patient safety incidents did not differ across studies based on residents/early career physicians and studies based on middle/late career physicians (OR=1.73, 95%CI=1.46 to 2.00, $I^2=79\%$ versus OR=1.87, 95%CI=1.49 to 2.25, $I^2=76\%$ respectively; Cohen's $Q=1.32$, $p=0.172$). However, the pooled association of burnout with low professionalism was significantly larger across studies based in residents/early

career physicians, compared to studies based on middle/late career physicians (OR=3.39, 95% CI=2.38 to 4.40, $I^2=23\%$ versus OR=1.73, 95%ci=1.46 to 2.01, $I^2=67\%$, respectively; Cohen's $Q = 7.27$, $p=0.003$).

Discussion

Summary of main findings

This systematic review and meta-analysis provides robust quantitative evidence that physician burnout is associated with suboptimal patient care in the process of healthcare service delivery. We found that burnt-out physicians are twice as likely to be involved in patient safety incidents, twice as likely to deliver suboptimal care to patients due to low professionalism, and three times more likely to receive low satisfaction ratings from patients. The depersonalization dimension of burnout appears to have the most adverse impact on the quality and safety of patient care and on patient satisfaction. The association of burnout with low professionalism was particularly strong among studies based on residents and early career physicians. The reporting method of patient safety incidents and professionalism had a significant influence on the results suggesting that improved assessment standards for patient safety and professionalism are needed in the healthcare.

Strengths and limitations

We undertook a rigorous quantitative assessment of the association between burnout and patient care quality and safety in a pooled sample of over 42 thousand physicians. Meta-analysis allowed us to compare the results across individual studies, to examine the consistency of effects and to explore variables that might account for inconsistency. However, there are also limitations. A wide range of outcomes were included in this review, and some of outcomes pooled together in the same subcategory exhibited substantial variation (e.g. professionalism). Similarly, although we focused on physicians, this is a broad research population of health professionals working in

various healthcare settings and specialties. We accounted for the large heterogeneity by applying random effects models, to adjust for study-level variations, and by undertaking subgroup analyses to explore key factors that may account for variation. We only explored the impact of basic sources of heterogeneity, because multiple subgroup analyses inflate the probability of finding false results.⁷⁰ We excluded grey literature because the quality of research contained in the grey literature is generally lower and more difficult to combine with research contained in peer-reviewed journal articles.⁷¹ The visual inspection of the funnel plot and Egger test did not identify evidence of publication bias in any of our analyses which supports our decision. However, we cannot fully eliminate the possibility that the exclusion of grey literature has introduced undetected selection bias. Finally, the design of the original studies (mostly cross-sectional) imposes limits on our ability to establish causal links between physician burnout and patient safety, professionalism and patient satisfaction and the mechanisms that underpin these links.

Comparison with previous systematic reviews

Two previous systematic reviews have linked burnout in healthcare professionals with patient safety outcomes.^{11,12} In the present review we undertook a meta-analysis, enabling the quantification of these links and the exploration of key sources of heterogeneity among the studies. We focused on physicians alone but established links between burnout/stress and a wider range of patient care indicators, including patient safety incidents, low professionalism and patient satisfaction. We chose to focus on physicians as the function of any healthcare system primarily relies on physicians but evidence suggests that physicians are two-times more likely to experience burnout than any other worker including other healthcare professionals.^{1,72,73} We thought it is critical, therefore, to better understand the impact of physician burnout on patient safety, professionalism and patient satisfaction. We chose to investigate a wider range of patient care indicators as while professionalism/patient satisfaction are precursors of safety risks with

potential to lead to active patient safety incidents¹⁹, previous research has not systematically reviewed the association between burnout/stress and these outcomes. Moreover, aspects of professionalism such as poor empathy and suboptimal patient-physician rapport could result in under-investigated but important adversities for patients such as psychological harm and an overall negative experience of healthcare.

Implications for researchers, clinicians and policymakers

We found that physician burnout is associated with a reduced efficiency of healthcare systems to deliver high quality, safe care to patients. Preventable adverse events cost several billions to healthcare systems every year.⁷⁴ Physician burnout therefore is costly for healthcare organizations and undermines a fundamental societal need for the receipt of safe care. Current interventions for improving healthcare quality and safety have mainly focused on identifying and monitoring *vulnerable patients* (e.g. patients with complex healthcare needs) and occasionally *vulnerable systems*.^{75,76} Our findings support the view that existing care quality and patient safety standards are incomplete; a core but neglected contributor is physician wellness.¹⁻⁴ This recommendation is in accordance with all well-recognized patient safety classification systems (e.g. WHO) which concur that there are three major contributory factors to patient safety incidents: patient factors, healthcare system factors and clinician factors.

High depersonalization in physicians was particularly indicative that patient care could be at risk, as it had strong associations with both increased patient safety incidents and reduced professionalism. It was also closely linked with lower patient satisfaction, suggesting its effects can be perceived by patients. These findings are consistent with existing evidence showing that depersonalization is strongly related to low professionalism.^{77,78} Depersonalization scores in physicians could be measured by healthcare organizations together with other well-established

quality strategies, to guide system-level interventions for improving quality of healthcare and patient safety.

The vast majority of the studies relied on patient care outcomes which were self-reported by physicians. However, we failed to show significant links between physician burnout and patient safety outcomes recorded in the healthcare systems (e.g. the health records of patients; surveillance). Concerns have frequently been raised about poor and inconsistent system recording of patient safety outcomes.⁷⁹ As such, our findings suggest that existing system-based assessment methods are incomplete and less sensitive to the full range of patient safety outcomes reported by physicians and patients. These uncaptured safety outcomes might include ‘near misses’ but may also concern incidents different in nature such as psychological harm which do not result in directly observable patient harm but may affect the physician-patient relationship and harm indirectly both parties. Reporting systems for quality of care and patient safety outcomes require revision and better standardization across healthcare organizations. This standardization will enable larger and more rigorous studies of the impact of physician burnout on key aspects of patient care which will be accessible at organizational level and will impact on policy decisions. An alternative explanation for this finding is that physicians’ perceptions of safety are unreliable; however this conclusion is not supported by previous research suggesting that staff-reported patient safety outcomes overlap with objective safety indicators.^{80,81} That said, the impact of burnout and self-criticism on physicians’ reports of patient safety outcomes warrants further investigation.

Another important finding is that studies based on resident/early career physicians reported stronger links between burnout and low professionalism compared to studies based on middle/late career physicians. It is likely that burnout signs among residents and early career physicians have detrimental impact on their work satisfaction, professional values and integrity.

⁸²⁻⁸⁴ Healthcare organizations have a duty to support physicians in the demanding transition from training to professional life. Residents will be responsible for the healthcare delivery for over two decades in the future. Investments on their wellness and professional values - which are largely shaped at early career years - is perhaps the most efficient strategy for building organizational immunity against workforce shortages and patient harm/mistrust.

Conclusion

The headline conclusion of this review is that physician burnout might jeopardize patient care. Physician wellness and quality of patient care are critical and complementary dimensions of the healthcare organization efficiency. Investments on organizational strategies to jointly monitor and improve physician wellness and patient care outcomes are needed. Interventions aimed at improving the culture of healthcare organizations as well as interventions focused on individual physicians but supported and funded by healthcare organizations are effective.^{2,85,86} They should therefore be evaluated at scale and implemented.

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Figure 1: PRISMA flowchart

Figure legend: Flowchart of the inclusion of studies in the review

Figure 2: Forest plot of the association between physician burnout and patient safety incidents

Figure legend: Meta-analysis of individual study and pooled effects. Each line represents one study in the meta-analysis, plotted according to the logarithmic odds ratios (log OR). The black box on each line shows the log OR for each study and the blue box represents the pooled log OR. Random effects model used. 95% CI=95% confidence intervals.

Figure 3: Forest plot of the association between physician burnout and low professionalism outcomes

Figure legend: Meta-analysis of individual study and pooled effects. Each line represents one study in the meta-analysis, plotted according to the logarithmic odds ratios (log OR). The black box on each line shows the log OR for each study and the blue box represents the pooled log OR. Random effects model used. 95% CI=95% confidence intervals.

Figure 4: Forest plot of the association between physician burnout and reduced patient satisfaction

Figure legend: Meta-analysis of individual study and pooled effects. Each line represents one study in the meta-analysis, plotted according to the logarithmic odds ratios (log OR). The black box on each line shows the log OR for each study and the blue box represents the pooled log OR. Random effects model used. 95% CI=95% confidence intervals.

714 **Table 1: Descriptive characteristics of included studies**

| Study | Country | Healthcare setting | Research design | N | Men | Mean age | Burnout measure | Depression/ distress measure | Patient safety | Professionalism | Patient satisfaction | Risk of bias |
|---|-----------|---|-----------------|------|-----|----------|------------------|--|------------------------------|---|----------------------|--------------|
| Anagnostopoulos et al. ¹⁰ 2012 | Greece | Physicians in 3 large primary care centers | Cross-sectional | 30 | 85% | 48 years | MBI | n/r | n/r | n/r | Patient satisfaction | 2 |
| Asai et al. ²⁶ 2013 | US | Physicians in of life care (Hospitals and cancer centers) | Cross-sectional | 697 | 92% | 45 years | MBI | General Health Questionnaire | n/r | Self-reported non-optimal communication | n/r | 1 |
| Baer et al. ²⁷ 2017 | US | Residents in 11 pediatric residency programs | Cross-sectional | 258 | 21% | 29 years | 2-items from MBI | n/r | Self-reported medical errors | Self-reported non-optimal communication | n/r | 1 |
| Balch et al. ²⁸ 2011 | US | Surgeons, members of the American College of Surgeons (hospitals) | Cross-sectional | 7164 | 85% | 53 years | MBI | 2-item Primary Care Evaluation of Mental Disorders | n/r | Self-reported malpractice claims | n/r | 1 |
| Bourne et al. ²⁹ 2015 | UK | Physicians registered to the British Medical Association | Cross-sectional | 7926 | 54% | n/r | n/r | General Health Questionnaire | n/r | Self-reported patient complaints | n/r | 0 |
| Brazeau et al. ³⁰ 2010 | US | Faculty and resident physicians in 1 hospital | Cross-sectional | 125 | 52% | n/r | MBI | n/r | n/r | Self-reported professionalism | n/r | 2 |
| Brown et al. ³¹ 2009 | Australia | Interns or residents in 1 hospital | Cross-sectional | 24 | 60% | 42 years | MBI | n/r | n/r | Self-reported non-optimal communication | n/r | 1 |

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|--|-----------|--|-----------------|------|-----|----------|---|--|--|---|----------------------|---|
| Chen et al. ³² 2013 | Taiwan | Physicians registered in several medical associations | Cross-sectional | 839 | 79% | 36 years | MBI | n/r | n/r | Self-reported malpractice claims | n/r | 2 |
| Cooke et al. ³³ 2013 | Australia | General practitioners in primary care | Cross-sectional | 128 | 33% | 35 years | 1-item for emotional exhaustion subscale of MBI | n/r | n/r | Self-reported non-optimal communication | n/r | 1 |
| de Oliveira et al. ³⁴ 2013 | US | Anesthesiology residents in hospitals | Cross-sectional | 1508 | 54% | 33 years | MBI | n/r | Self-reported medical errors | Self-reported safety practice scores | n/r | 1 |
| Dollarhide et al. ³⁵ 2014 | US | Physicians in 4 hospitals | Cross-sectional | 185 | 46% | 30 years | n/r | Emotional stress using the Diary of Ambulatory Behavioral States | Self-reported medication errors | n/r | n/r | 1 |
| Eckleberry-Hunt et al. ³⁶ 2017 | US | Physicians registered in American Academy of Family Physicians | Cross-sectional | 449 | 54% | 42 years | MBI | n/r | n/r | Self-reported quality of patient care | n/r | 1 |
| Frahenkopf et al. ³⁷ 2008 | US | Residents in pediatric residency hospitals | Prospective | 123 | 30% | 29 years | MBI | Harvard depression scale | Medication errors identified by surveillance | n/r | n/r | 1 |
| Garrouste-Orgeas et al. ³⁸ 2015 | France | Physicians in 31 Intensive Care Units | Prospective | 540 | 58% | 33 years | MBI | CES-Depression scale | Self-reported medical errors | n/r | n/r | 3 |
| Halbesleben et al. ³⁹ 2008 | US | Primary care physicians of hospitalized patients in 1 hospital | Cross-sectional | 178 | 47% | 46 years | MBI | n/r | n/r | n/r | Patient satisfaction | 1 |

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|-------------------------------------|---------|--|-----------------|------|-----|----------|------------------------------|--|---|---|-----|---|
| Hansen et al. ⁴⁰ 2011 | Denmark | Primary care physicians of a national cohort of cancer patients | Cross-sectional | 334 | 70% | n/r | MBI | n/r | Delayed cancer diagnosis based on patient records | n/r | n/r | 2 |
| Hayashino et al. ⁴¹ 2012 | Japan | Physicians based in hospitals approached by a national survey. | Prospective | 836 | 92% | 46 years | MBI | WHO depression index | Self-reported medical errors | n/r | n/r | 3 |
| Kalmbach et al. ⁴² 2017 | US | Physicians of several specialties in 33 hospitals | Prospective | 1215 | 31% | 28 years | n/r | Patient Health Questionnaire-9 | Self-reported medical errors | n/r | n/r | 3 |
| Kang et al. ⁴³ 2013 | Korea | Interns and residents working in 1 university hospital | Cross-sectional | 86 | 74% | 37 years | MBI | 2-item Primary Care Evaluation of Mental Disorders | Self-reported medical errors | n/r | n/r | 1 |
| Klein et al. ⁴⁴ 2010 | Germany | Surgeons in general hospitals | Cross-sectional | 1311 | 60% | n/r | Copenhagen Burnout Inventory | n/r | Self-reported therapeutic errors | Self-reported quality of patient care | n/r | 1 |
| Krebs et al. ⁴⁵ 2006 | US | Primary care physicians responded to the Physician Worklife Survey | Cross-sectional | 1391 | 77% | 47 years | n/r | One 5-point Likert scale for depression | n/r | Self-reported non-optimal communication | n/r | 1 |
| Kwah et al. ⁴⁶ 2017 | US | 1st year residents in 1 hospital | Prospective | 54 | 50% | 32 years | MBI | n/r | Prescription errors in system records | Professionalism (discharge practices) | n/r | 2 |

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|---|---------|---|-----------------|-----|------|----------|--------------------------------|-----|----------------------------------|---|-----------------------------|---|
| Lafreniere et al. ⁴⁷ 2016 | US | Internal medicine residents in 1 large urban academic hospital | Cross-sectional | 44 | 43% | 51 years | MBI | n/r | n/r | n/r | Patient-reported empathy | 2 |
| Linzer et al. ⁴⁸ 2009 | US | General internists and family physicians in 119 ambulatory clinics | Cross-sectional | 422 | 56% | 43 years | Validated single item from MBI | n/r | Medical errors in system records | Quality of patient care (using system indicators) | | 1 |
| Lu et al. ⁴⁹ 2015 | US | Attending and post-graduate physicians in emergency department | Cross-sectional | 77 | 62% | n/r | MBI | n/r | Self-reported treatment errors | Self-reported professionalism (discharge practices) | n/r | 0 |
| O'Connor et al. ⁵⁰ 2017 | Ireland | Interns in 5 national intern-training hospitals | Prospective | 172 | 44% | 27 years | MBI | n/r | Self-reported medical errors | n/r | n/r | 2 |
| Ozvacic Adzic et al. ⁵¹ 2012 | Croatia | Physicians working in family practices selected randomly using a multistage, stratified proportional study selection design | Cross-sectional | 125 | 18% | 46 years | MBI | n/r | n/r | Professionalism (consultation length) | Patient-reported enablement | 0 |
| Park et al. ⁵² 2016 | Korea | Physicians in 4 university hospitals | Cross-sectional | 317 | 68% | 30 years | MBI | n/r | n/r | Self-reported empathy | n/r | 0 |
| Passalacqua et al. ⁵³ 2012 | US | Residents in internal medicine rotating between 3 hospitals | Cross-sectional | 93 | 70% | 30 years | MBI | n/r | n/r | Self-reported non-optimal communication | n/r | 0 |
| Pedersen et al. ⁵⁴ 2016 | Denmark | General practitioners registered in Regional Registry of Health Providers | Cross-sectional | 129 | 100% | 49 years | MBI | n/r | n/r | Professionalism (test practices) | n/r | 2 |

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|--|-------------|--|-----------------|------|-----|----------|---------------------------------|--|------------------------------|--|----------------------|---|
| Prins et al. ⁵⁵ 2009 | Netherlands | Residents receiving training for a referral specialty | Cross-sectional | 2115 | 39% | 32 years | MBI | n/r | Self-reported action errors | n/r | n/r | 1 |
| Qureshi et al. ⁵⁶ 2015 | US | Plastic surgeons members of the American Society of Plastic Surgeons | Prospective | 1691 | 75% | 51 years | MBI | n/r | Self-reported medical errors | n/r | n/r | 2 |
| Ratanawongsa et al. ⁵⁷ 2008 | US | Physicians in 5 primary care practices | Prospective | 40 | 34% | 42 years | Six-item scale derived from MBI | n/r | n/r | Self-reported empathy | Patient satisfaction | 2 |
| Shanafelt et al. ⁴ 2002 | US | Residents in the university of Washington Affiliated Hospitals Internal Medicine Residency program | Cross-sectional | 115 | 47% | 28 years | MBI | n/r | n/r | Self-reported quality of patient care | n/r | 2 |
| Shanafelt et al. ⁵⁸ 2005 | US | Internal medicine residents at Mayo Clinic Rochester | Cross-sectional | 115 | 70% | 28 years | MBI | n/r | n/r | Self-reported empathy | n/r | 2 |
| Shanafelt et al. ⁸ 2010 | US | Surgeons, members of the American College of Surgeons | Cross-sectional | 7905 | 87% | 51 years | MBI | 2-item Primary Care Evaluation of Mental Disorders | Self-reported medical errors | n/r | n/r | 2 |
| Toral-Villanueva et al. ⁵⁹ 2009 | Mexico | Junior doctors in 3 hospitals | Cross-sectional | 312 | 57% | 28 years | MBI | n/r | n/r | Self-reported quality of patient care | n/r | 1 |
| Torres et al. ⁶⁰ 2015 | Spain | Physicians in 22 primary care centers | Cross-sectional | 108 | 46% | 49 years | MBI | n/r | n/r | Professionalism (system-recorded sick leave) | n/r | 0 |

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|--|-------------|--|-----------------|------|-----|----------|---|-----|------------------------------|--|----------------------|---|
| Travado et al. ⁶¹ | Italy | Physicians in cancer centers of 3 hospitals | Cross-sectional | 125 | 46% | 42 years | MBI | n/r | n/r | Self-reported non-optimal communication) | n/r | 1 |
| van der Hombergh et al. ⁶² 2009 | Netherlands | General practitioners in 239 general practices | Cross-sectional | 546 | 61% | 47 years | GP burnout involving experience of inappropriate patient demands, commitment with the job, excessive workload | n/r | n/r | Self-reported quality of patient care | Patient satisfaction | 1 |
| Walocha et al. ⁶³ 2013 | Poland | Physicians working in surgical and non-surgical hospital wards and primary care outpatient departments | Cross-sectional | 71 | 64% | n/r | MBI | n/r | n/r | Self-reported empathy | n/r | 0 |
| Weigl et al. ⁶⁴ 2015 | Germany | Physicians in 1 pediatric hospital | Cross-sectional | 96 | 47% | 38 years | MBI | n/r | n/r | Self-reported quality of patient care | n/r | 2 |
| Welp et al. ⁶⁵ 2014 | Switzerland | Physicians Intensive Care Units | Cross-sectional | 243 | 50% | 39 years | MBI | n/r | Self-reported safety errors | n/r | n/r | 1 |
| Wen et al. ⁶⁶ 2016 | China | Physicians in 44 hospitals providing tertiary, secondary, and 25 primary care | Cross-sectional | 1537 | 56% | 38 years | MBI | n/r | Self-reported medical errors | n/r | n/r | 2 |
| Weng et al. ⁶⁷ 2011 | Taiwan | Internists in 2 hospitals | Cross-sectional | 110 | 85% | 41 years | MBI | n/r | n/r | n/r | Patient satisfaction | 1 |

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|-----------------------------------|----|---|-------------|-----|-----|----------|-----|--|------------------------------------|-----|-----|---|
| West et al. ⁶⁸ 2006 | US | Internal Medicine Residency program in Mayo Clinic in academic years between 2003 to 2006 | Prospective | 184 | 51% | 28 years | MBI | 2-item Primary Care Evaluation of Mental Disorders | Self-reported medical errors | n/r | n/r | 3 |
| West et al. ⁶⁹ 2009 | US | Internal Medicine Residency program in Mayo Clinic between July 2003 and February 2009 | Prospective | 380 | 62% | 28 years | MBI | 2-item Primary Care Evaluation of Mental Disorders | Self-reported medical errors | n/r | n/r | 3 |

715 MBI= Maslach Burnout Inventory; N= sample size; n/r=not reported.