


# BMJ Open Predictors of burnout among US healthcare providers: a systematic review

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## ABSTRACT

**Objective** One potential barrier to optimal healthcare may be provider burnout or occupational-related stress in the workplace. The objective of this study is to conduct a systematic review to identify the predictors of burnout among US healthcare providers.

**Design** Systematic review using in-depth critical appraisal to assess risk of bias and present the quality of evidence in synthesised results from the prognostic studies.

**Data sources** We searched 11 databases, registries, existing reviews and contacted experts through 4 October 2021.

**Eligibility criteria for selecting studies** We included all studies evaluating potential predictors and documenting the presence and absence of associations with burnout assessed as a multidimensional construct. We excluded studies that relied solely on a single continuous subscale of burnout. Data were abstracted from eligible studies and checked for accuracy by a content expert and a methodologist.

**Data extraction and synthesis** Two reviewers independently screened citations and full-text publications using predetermined eligibility criteria.

**Results** The 141 identified studies evaluated a range of burnout predictors. Findings for demographic characteristics were conflicting or show no association. Workplace factors, such as workload, work/life balance, job autonomy and perceived support from leadership, had stronger associations with risk for burnout. Mental health factors, such as anxiety, and physical health risks may increase the risk, although the direction of these associations is unclear as few prospective studies exist to address this question. Factors such as social support appear to have a protective effect.

**Conclusion** We found the most evidence for workplace, mental health and psychosocial factors in predicting burnout but limited evidence for other potential predictors. However, more prospective studies are needed to improve our understanding about how to prevent provider burnout. **PROSPERO registration number** CRD4202014836.

## INTRODUCTION

The health and well-being of the healthcare workforce is critical for providing quality patient care. One barrier to optimising mental healthcare may be provider burnout in the workplace. Broadly, burnout relates to chronic emotional and interpersonal stress

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This systematic review incorporates a broad range of predictors of burnout including both individual-level variables and work context variables.
- ⇒ The target population is US healthcare providers, including medical providers and behavioural health providers.
- ⇒ Our information sources were 11 research databases, research registries, previous systematic reviews from inception through 4 October 2021.
- ⇒ We included both individual-level and organisational-level predictors.
- ⇒ We used in-depth critical appraisal to determine risk of bias and synthesised the findings by type of predictors.

stemming from one's work environment. Burnout<sup>1</sup> has now been widely explored across a range of professional settings from human resources to information technology and is most readily associated with so-called 'helping professions', particularly among healthcare providers.<sup>2</sup>

The term burnout was first used in the 1970s to describe the predictable exhaustion, cynicism and the reduced professional efficacy that psychologists experienced shortly after beginning their careers.<sup>3</sup> Since then, core symptoms of burnout have been intense emotional exhaustion, depersonalisation or cynicism and lower job performance.<sup>4 5</sup> Existing research has identified a range of potential professional, environmental and personal factors believed to be associated with developing burnout.<sup>6</sup>

As expected, burnout has also been linked to indicators of low job satisfaction for professionals, such as turnover, attrition, job loss, absenteeism and early retirement.<sup>6–8</sup> Given these potential downstream effects of burnout on individuals and their work,<sup>9–11</sup> it is critical to understand predictors in order to potentially mitigate or prevent burnout.

Burnout has become an important point of discussion among healthcare personnel. Even the US American Medical Association<sup>12</sup> offers



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a range of resources, from weekly emails to podcasts, to help clinicians manage burnout and improve workplace satisfaction. Calls have been made to address the ‘crisis of burnout’ among US-based clinicians, to which some attribute the high suicide rate observed in this population.<sup>13</sup> Despite this push for collective action to address provider burnout,<sup>13</sup> understanding which populations are at a differential risk for burnout remains unclear.

Our primary objective of this review was to identify the predictors that can reliably predict burnout in US healthcare providers. In this article, we contribute to the evidence base on the complex topic of burnout through a systematic review of predictors of burnout among US healthcare workers.

This review builds on existing systematic reviews that have addressed specific areas of potential predictors such as adverse childhood experiences of providers or futile or potentially inappropriate care.<sup>9 14–20</sup> For example, although the review by Abraham *et al*<sup>14</sup> also looked at predictors of burnout among US primary care providers, it used a more narrowly defined set of eligibility criteria that included only personal or organisational predictors, which resulted in only one-fifth of the articles included in this review. We included both individual-level variables (eg, marital status) as well as work context aspects (eg, electronic health record use requirement). Some of the other recent systematic reviews restricted the provider definition to surgeons<sup>21</sup> or were more focused on prevalence rather than predictors of burnout.<sup>22</sup> One study<sup>23</sup> that included a variety of provider types and predictors covered defining and measuring burnout; who is harmed by burnout; incidence of burnout; causes of burnout and interventions and remediation strategies for mitigating burnout. However, this review did not present the data in the standard style of a systematic review; rather, it was used to develop a framework for action and identified two strategies shown to be highly effective for restoring provider well-being: (1) aligning personal and organisational values and (2) enabling physicians to carve out one-fifth of practice time that is of special important and valuable personally. Our review contributes uniquely to the burnout literature by incorporating a broader range of predictors and determinants of burnout.

## METHOD

This systematic literature review was part of a series of literature reviews on burnout. The review is registered in PROSPERO. Throughout, a description of burnout as an outcome refers to self-reports of burnout or burnout based on accepted burnout measures and scales. The targeted population is US healthcare providers including medical providers (physicians, physician assistants, nurse practitioners (We included nurse practitioners because, in the USA, they may prescribe treatments, order tests and diagnose patients. We excluded other types of nurses such as registered nurses and licenced practical nurses who may not independently

manage patients.)), and behavioural health providers (psychologists, mental health counsellors and social workers).

## Search strategy

The RAND librarian and content experts developed and tailored the search strategies to this literature review in a series of five total for the broader project. However, since we anticipated considerable overlap in search results across reviews, we used a central citation database for all reviews (see online supplemental material 1).

## Sources

We searched the databases PubMed, PsycINFO, Web of Science and Business Source Complete for this review specifically, broader searches relevant to multiple topics in the literature series included CINAHL, AMED, DTIC, ERIC, Scopus, CENTRAL, ClinicalTrials.gov and ICTRP. We also screened bibliographies of existing systematic reviews (identified through PubMed and PsycINFO searches) and contacted content experts.

## Eligibility criteria

- ▶ *Participants*: eligible study participants were US healthcare medical providers (physicians, physician assistants, nurse practitioners) and behavioural health providers (psychologists, mental health counsellors, social workers). We included mixed samples as long as more than 50% of the samples were eligible participants. For example, if a study included other types of providers (eg, dentists), it would be included if half of the study participants were medical providers.
- ▶ *Exposure*: studies reporting on potentially associated participant (eg, resiliency, perceived stress, coping mechanism), interpersonal (eg, perceived support from colleagues), workplace (eg, organisation type, setting, provider type), organisational (eg, panel size, lack of control over workload, value conflicts, insufficient reward, work overload, work inefficiency, inadequate staffing, breakdown of community, loss of meaning from work, work–life balance issues, perception of unfairness, call/watch duty, rotation schedule, post-call day off, access to care expectations) or patient (eg, complex or high-risk patients), predictors are eligible.
- ▶ *Outcomes*: studies had to predict burnout to be eligible. Studies exclusively predicting resilience and other related constructs were excluded. Because the literature on burnout is vast, we specifically focused on studies that operationalise burnout using a total burnout score on different measurement tools. For the Maslach Burnout Inventory (MBI),<sup>24</sup> we required the outcome(s) to incorporate at a minimum the concepts of emotional exhaustion and depersonalisation—we did not include studies that were only based on a single MBI component, for example, emotional exhaustion.

- ▶ *Timing*: there were no restrictions regarding the timing of the exposure relative to the burnout outcome. The review is from inception through 4 October 2021.
- ▶ *Setting*: settings included inpatient and outpatient professional healthcare settings in the US
- ▶ *Study design*: eligible studies were restricted to multivariate analyses simultaneously evaluating multiple competing variables and case-control studies.

### Inclusion screening

Two reviewers independently screened each title and abstract of retrieved citations. Full-text publications were retrieved for citations deemed potentially eligible by one or both reviewers. Two independent reviewers applied explicit eligibility criteria to full-text publications; discrepancies were resolved through discussion, including a subject matter expert. Reasons for exclusion were recorded in an electronic database for systematic reviews.

### Data abstraction procedure

The project team created a detailed extraction form to standardise the data collection process. To ensure consistency of interpretation of all fields on the form, reviewers pilot tested the form and discussed revisions. One reviewer abstracted data which were checked by a content expert and an experienced methodologist. We abstracted the study ID and setting, the sample characteristics, the study design and analytic method, the predictor variables, the controlled variables, the outcome definitions and operationalisation and the results in terms of presence or absence of an association between potential predictors and the outcome burnout.

### Risk of bias

We assessed studies with Quality In Prognosis Studies.<sup>25</sup> This critical appraisal tool accounted for the methodological approach (eg, prospective studies) and analytic methods (eg, multivariate analyses).

### Synthesis

We summarised the evidence by predictor type, which enabled us to document the range of predictors that have been assessed in the literature and the research evidence supporting them. The synthesis is limited to predictors that were evaluated in at least five studies.

We rated the quality of the evidence for predictors of burnout across all identified pertinent studies. Based on GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) (guidelines,<sup>26</sup> we categorised the quality of the evidence as follows:

- ▶ *High*: we are very confident that the true effect lies close to that of the estimate of the effect.
- ▶ *Moderate*: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

- ▶ *Low*: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
- ▶ *Very low*: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

We took eight criteria into account to determine the level of evidence quality following an adaptation of the GRADE framework for prognostic factor research.<sup>26</sup> The *Phase of Investigation* criterion was used as a starting point (high or moderate quality of evidence). The criteria *Study Limitations*, *Inconsistency*, *Indirectness*, *Imprecision* and *Publication bias* can decrease the quality of evidence. The criteria *Moderate/Large effect size* and *Exposure-response gradient* could increase the quality of the evidence.

The *Phase of Investigation* differentiates whether the predictor evidence is primarily based on a study that aimed to identify potential prognostic factors (moderate quality) rather than based on studies aiming to confirm identified associations or explanatory research aiming to understand prognostic pathways (high quality). *Study limitations* assess the quality and risk of bias of the identified pertinent studies into account. *Inconsistency* assesses whether the identified association was consistently present across independent studies. *Indirectness* takes into account whether the available research studies do not accurately reflect the review question (eg, reporting only on a selected subgroup). Evidence was downgraded for *Imprecision* if the sample size of included studies was insufficient, the CI for effect estimates was wide, there were few outcome events for each prognostic variable or cases reaching included in the study. *Publication bias* was addressed by critically reviewing results based on only positive associations. Evidence for individual predictors could be upgraded for *moderate/large effects* or an *exposure-gradient response* was identified.

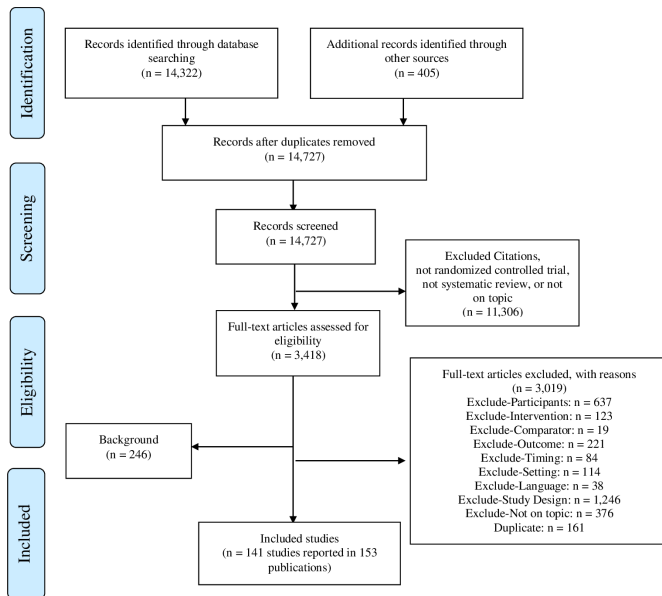
Throughout, we downgraded the quality of evidence for study limitation (eg, all studies are high risk of bias or the result has not been confirmed in a prospective study) or inconsistency (inconsistent results across studies regarding an association, regarding the direction of effect or both); the evidence grade could be downgraded by one or two categories.

## RESULTS

The literature flow is shown in figure 1. Of 14 322 identified citations, 3418 were obtained as full text. A total of 141 studies met inclusion criteria for this systematic review of predictors of burnout (see the Evidence Table and full list of citations in the online supplemental material 1). These studies were published between 1987 and 2021.

Most of the studies employed concurrent (or cross-sectional) designs, although some used prospective designs, and a few used retrospective designs. All analyses included some form of multivariate analysis (eg, multivariate regression, multivariate intercorrelations,





**Figure 1** Flow diagram.

multivariate  $\chi^2$  tests) given that the goal was to identify associations between one or more predictors and burnout. A wide variety of settings were covered in this set of studies. These included healthcare professional organisations; hospitals and units within hospitals; university medical centres, health departments, the military and veterans' health administration. In these studies, the number of participants ranged from as few as 21 to as many as 40 382 providers.

### Outcome definitions and operationalisation

Most of the studies employed the full 22-item MBI. A few studies combined the scales into phases of low, medium and high burnout. Twenty-five studies (18%) used abbreviated versions of the MBI including 12-item, 6-item, 5-item and 2-item versions. Other instruments used to measure burnout included the Professional Quality of Life V Scale,<sup>27 28</sup> the Mini Z,<sup>29</sup> the Burnout subscale from the Compassion Fatigue and Satisfaction Self-Test for Helpers,<sup>30</sup> the Staff Burnout Scale for Health Professionals,<sup>31</sup> the Stanford Professional Fulfillment Index,<sup>32</sup> and the 16-item Oldenburg Burnout Inventory<sup>33</sup> or a 4-item measure from the Physician Worklife Study.<sup>34</sup> One study used the 19-Item Copenhagen Burnout

Inventory<sup>35 36</sup> and one study used the Expanded Physician Well-Being Index.<sup>37</sup> Finally, one study developed a 6-item measure of COVID-19-related burnout.<sup>38</sup>

Studies assessed variables predicting higher levels of burnout as well as protective factors associated with lower levels of burnout. Most of the documents operationalised burnout as a binary measure as opposed to using the full range of scores with a continuous measure. For example, many studies defined burnout with the MBI if high on the emotional exhaustion subscale (score of 27 or above) or high on the depersonalisation subscale (score of 10 or above).<sup>39</sup> This tendency for using cut scores was in part an artefact of our exclusion criteria since we did not include studies that used just a single continuous MBI subscale measure.

### Risk of bias assessment

Overall risk of bias across the included studies was moderate (see figure 2). The largest source of bias was due to study participation for which the majority of documents were deemed at high risk. This was mostly due to low or unknown response rates. For study attrition, the risk level was moderate for most documents closely mirroring the overall pattern of risk. Ratings for prognostic factor measurement were low risk for a few documents and moderate for most with none rated as high risk. The pattern for outcome measurement was similar to prognostic factor measurement. Study confounding and statistical analysis and reporting were rated as low risk for more than half of the documents with the remainder rated as moderate. Other sources of bias included small sample size or simplistic analysis (eg, used only a two-sample Wilcoxon rank sum test).

### Predictors of burnout

A variety of different types of predictors were explored in the existing studies aiming to predict burnout in healthcare providers. These included: demographic characteristics; professional and clinical practice characteristics; psychological health factors; health risks and health behaviours and psychosocial variables. We summarise the types of predictors by each of these categories in the following narrative and the summary of findings table. The findings are summarised with the quality of evidence in table 1 by predictor. More details about the design, predictors and results are provided in the Evidence Table in the Appendix.

### Demographic characteristics

Almost all studies examined the effect of one or more demographic characteristics (also referred to as personal characteristics) as predictors of burnout. The effect of gender on burnout was examined in 73 studies. While 30 studies found that women had a greater risk than men, four studies found that men were at greater risk for burnout, including two prospective studies.<sup>39–41</sup> Thirty-nine studies did not find gender to be a significant predictor of burnout.



**Figure 2** Summary of risk of bias assessment by source.

**Table 1** Summary of findings and quality of evidence

Predictors	Number of studies	Reasons for quality rating	Findings	Grade
<b>Demographic Characteristics</b>				
Gender	73 studies	Inconsistency (mixed findings across studies; 34 studies found an effect; 39 did not; of 9 prospective studies, 2 found a negative association between burnout and being female, 4 found a positive association, 3 found no association)	Women may be more likely to report burnout, but most studies do not find any association with gender	Low
Age	53 studies	Inconsistency (mixed findings across studies with 17 negative effect, 11 positive effect, 25 no association and 5 prospective studies (2 no association, 2 negative effect, 1 positive effect))	Younger participants may be more likely to report burnout	Low
Race/ethnicity	17 studies	Inconsistency (only 4 studies found an effect; lower burnout among Asians and other race/ethnicity and other minority compared with non-Hispanic white; the 3 prospective studies found no effect)	Ethnicity is likely not associated with burnout	Low
Children	29 studies	Inconsistency (only 6 studies found an effect, of these, 4 found lower burnout in participants with children, 2 found higher burnout), only 2 prospective studies (1 found a negative effect; 1 no effect)	Having children is likely not associated with burnout	Low
Marital status	24 studies	Inconsistency (only 2 studies found a negative effect and no prospective study)	Marital status is likely not associated with burnout	Medium
<b>Professional and practice characteristics</b>				
Workload and job stress	56 studies	Inconsistency, study limitation (32 studies found a positive effect, 22 did not; 3 of 5 prospective studies found an effect, the others did not; studies used different operationalisations of workload)	Burnout may be associated with workload and job stress; workplace engagement and experience may be protective.	Low
Years in practice	45 studies	Inconsistency (16 studies found an effect, 29 did not; of these, 10 found a negative effect, 4 found a positive effect, in 2 studies the direction was unclear; of 5 prospective studies, 2 found a negative effect, 2 no effect, 1 positive effect)	Years in practice may be negatively associated with burnout (fewer years in practice is associated with more reported burnout)	Low
Specialty/subspecialty	34 studies	Inconsistency (13 found an association with subspecialty, 21 found no effect; of 5 prospective studies, 2 found an effect)	Subspecialty may be associated with burnout (but which specialties is unclear)	Very low
Practice setting	35 studies	Inconsistency (only 8 studies found an effect, 27 found no effect; of 2 prospective studies, 1 found providers in private practice vs academic and veteran hospital settings had lower burnout than providers in active military practices; 1 found that surgeons in community-based practices had more burnout vs academic)	Practice setting is likely not associated with burnout	Low
Leadership support	20 studies	Inconsistency (15 studies found a negative effect, of 2 prospective studies, 1 found an effect, 1 reported no association)	Stronger leadership is associated with less burnout	Medium
Job autonomy	25 studies	Inconsistency (16 studies found an effect, 9 did not; 6 of 7 prospective studies found an association)	Job autonomy is associated with less reported burnout	Moderate
Work/life balance	31 studies	Inconsistency (20 studies found a negative effect 11 studies found no association; all 3 prospective studies reported a positive association)	Inadequate work/life balance is associated with more burnout reporting	Moderate
Compensation method and reimbursement	10 studies	Inconsistency (5 studies found an effect (1 protective); 5 no effect); no prospective study was identified, different operationalisations and unclear direction)	Possibly no effect of compensation method with burnout but some inconsistency	Very low
Salary	6 studies	Inconsistency (1 study found an association, 5 did not; no prospective study reported on the predictor)	Likely no effect of salary on burnout	Low
<b>Psychological health factors</b>				
Depression	14 studies	Inconsistency (9 studies found an effect, 5 found none; the only prospective study found an effect; unclear whether studies addressed potential conceptual overlap)	Depression may be associated with burnout	Low
Anxiety	5 studies	Consistency (3 studies reported an association including the only prospective study, 2 did not)	Anxiety is likely associated with burnout	Moderate
<b>Health risks and health behaviour factors</b>				
Physical health problems	12 studies	Inconsistency (6 studies found an effect, 6 did not; no prospective study)	Physical health problems may be associated with burnout	Low
Substance use	12 studies	Inconsistency (4 positive effects of which 3 address alcohol vs 8 no effect; no prospective study)	Substance abuse is probably not associated with burnout exception for alcohol use	Very low

Continued

**Table 1** Continued

Predictors	Number of studies	Reasons for quality rating	Findings	Grade
Sleep problems	9 studies	Inconsistency (6 studies found an association, 3 did not; of the 3 prospective studies, 2 found an association, 1 did not; it is unclear whether sleep is a result of burnout)	Lack of sleep may be associated with increased burnout	Low
Exercise	11 studies	Inconsistency (5 studies found a protective effect, 6 found no association; 1 prospective study also found a protective effect)	Exercise may be negatively associated with burnout indicating a protective effect	Low
Mindfulness and meditation	8 studies	Inconsistency (3 studies found an effect, 5 did not; of the 3 prospective studies, only 1 found an association)	Mindfulness indicates a protective effect	Low
Psychosocial variables				
Perceived control	17 studies	Inconsistency (10 studies found an effect with 9 protective, 1 unclear; and 7 reported no association; 3 of 4 prospective studies reported an association; studies did not address conceptual overlap)	Perceived control may be negatively associated with burnout indicating a protective effect	Moderate
Coping	8 studies	Inconsistency (3 studies found a protective effect, 5 found no association; no prospective study)	We cannot say with certainty whether coping has a protective effect	Very low
Social support	25 studies	Inconsistency (12 studies found a protective effect, 13 did not; 2 of 6 prospective studies found an effect)	Social support may indicate a protective effect in burnout	Moderate

A total of 53 studies assessed age as a predictor. Twenty-eight studies found an association with burnout while 25 found none. Of those with an association, 17 studies found that younger age was a significant predictor of burnout while 11 found older age was a significant predictor. Five studies used prospective designs, which provide the strongest evidence. However, those studies reported mixed results ranging from a negative association of age with burnout, that is, younger providers have higher burnout levels,<sup>42–44</sup> a positive relationship<sup>45</sup> and no relationship.<sup>39 46</sup>

Race or ethnicity as a predictor was evaluated in 17 studies (including three prospective studies). However, this factor was a statistically significant predictor in only four studies and the three prospective studies found no effect.<sup>47–49</sup>

Other variables included having children, which was examined in 29 studies (3 that used a prospective design). Only 6 studies that addressed having children found this demographic characteristic to statistically significantly predict burnout and the direction of effects varied (some indicating that having children is associated with lower burnout levels, whereas others found having children was associated with greater burnout. In addition, another study found that having additional caregiving responsibilities (eg, caring for very ill children, spouses, parents or others) was associated with higher burnout rates.

A total of 24 studies examined marital status as a predictor of burnout. Of those, only two found a significant effect (being unmarried was significantly associated with burnout). None of these studies was prospective.

#### Professional and clinical practice characteristics

These characteristics included specialty, years in practice, type and size of practice setting, management support (ie, staffing, training resources), compensation or reimbursement. Other variables were job stress, autonomy,

flexibility, work–life balance, workload/caseload (time spent on patient care, number of patients seen per week, hours worked, nights worked on call per week, charting or paperwork, electronic health record or computerisation) and team functioning.

Workload or job stress, as assessed by longer work hours, more shifts per month, on-call time and overall higher ‘busyness’ (eg, higher patient volume or per cent of time in direct patient care) was a consistent predictor of burnout. Of 56 studies, most found that workload was a significantly associated predictor for burnout. One study found that multiple workload factors including more hours worked, more nights on call, higher outpatient volume and higher percent of time in clinical practice were associated with higher burnout risk. One study found that working more than 60 hours per week, another for more than 70 hours per week and two of more than 80 hours a week was associated with a greater likelihood of burnout. In addition, working more than a one-night shift per week was associated with more burnout in a study of paediatric department Chairs.<sup>50</sup> Five prospective studies provide the strongest evidence for workload—resident duty hours and shift type provides evidence that fatigue leads to increased burnout and workload among a sample of psychiatrists was significantly associated with higher rates of burnout. Alternatively, satisfaction with workload, control over workload, workplace engagement were protective factors for burnout.

A large number of studies assessed the number of years in practice, many among medical residents comparing, for example, first year residents to others. Of the 45 studies, 16 found that practice duration was a predictor of burnout. One study identified the number of years in practice as a positive predictor of burnout in a sample of surgeons and another found that neurosurgery residents and postgraduate neurosurgeons experienced

significantly higher burnout. However, other studies found that years in practice was negatively associated with burnout. One study among breast surgeons found that higher postgraduate year level was significantly associated with lower burnout, and one found that residents had more burnout than faculty. Among the five prospective studies, two found that more years in practice predict less burnout, one found that more practice years lead to more burnout, and two found no association.

A total of 34 studies examined specialty or subspecialty as a predictor of burnout but only 13 found an effect. One large study of all specialties observed wide variation in burnout across them. The highest rates were among front-line primary care physicians (ie, family medicine, general internal medicine and emergency medicine physicians). Studies of surgeons have found trauma surgeons to have higher burnout than other specialties. Five studies used prospective designs. One found that second-year residents in urology, neurology, emergency medicine and general surgery were at higher risk of burnout compared with internal medicine or dermatology.<sup>48</sup> Another study found that primary care providers were more burned out than most of the other specialties studies.<sup>51</sup> The other three studies<sup>47 51 52</sup> found no effect.

Practice setting was also assessed in 35 studies; 26 found no effect. Among the eight studies that found positive effects, one study of hospice and palliative care providers identified smaller organisations as a factor associated with greater burnout. Working in profit-oriented clinical settings was also associated with more burnout in a study comparing physicians in end-of-life care compared with other general specialties. One found that practicing in a university or academic medical setting (vs non-university) was a significant predictor of higher burnout. A study of occupational and environmental physicians found that burnout was highest among physicians in government practice settings compared with physicians in private medical centre groups, occupational medicine employers, hospitals or medical centre groups or consulting groups. There were two prospective studies—one found that providers in private practice compared with academic and veteran hospital settings had lower burnout than providers in active military practices.<sup>44</sup> The other found that community-based surgeons were more likely to experience burnout compared with surgeons in academic settings.<sup>53</sup>

Twenty studies addressed support from management, organisational leadership or mentors, and of these, 15 found an effect. One study found that feeling unsupported by leadership was linked with higher burnout. In another study, surgical trainees who did not have a self-identified mentor were significantly more likely to report burnout and residents that had a structured mentorship had lower burnout risk.<sup>54</sup> High-quality supervisor leadership was also correlated with lower burnout among physicians and scientists in a large healthcare organisation. Unfavourable physician evaluations of supervisors and lower perceptions of meaningful feedback and

professional development were associated with a greater degree of burnout, while feeling that faculty cared about the medical oncology fellows' educational success was protective against burnout. Finally, alignment with leadership values was also associated with lower burnout. Of the two prospective studies, one found that leadership support was associated with higher burnout, whereas the other found no effect.

Job autonomy, including increased flexibility in work schedule, was evaluated in 25 studies, 16 with an association. For example, reported autonomy served as a protective factor while perceived lack of control over work conditions and dissatisfaction with clinical autonomy were associated with greater burnout. One of the studies of military providers found that staying beyond the initial active duty service obligation was a protective factor for burnout.<sup>55</sup> Among the seven prospective studies, six suggested that flexibility and clinical autonomy may protect providers against future burnout.

Problems with work–life balance including work-home conflicts and dissatisfaction with work–life integration were a common predictor of burnout across the 31 studies. The studies reported positive associations with burnout, including three studies with a prospective design<sup>46 52 56</sup> adding strength to findings for this predictor.

Of the 10 studies that looked at the effect of compensation and reimbursement as a burnout predictor, 5 found an effect. In one study, additional compensation for consult calls was a significant protective factor for burnout. Another study found that concern about reimbursement was a factor associated with higher burnout. Having compensation based entirely on billing was associated with greater burnout. However, method of compensation was not a significant predictor of burnout in four studies. The other two studies found no effect.<sup>57 58</sup> Similarly, only one of six studies reported an association between salary and burnout; all other studies found no effect.

Salary was identified as burnout predictors in six studies. Only one had a significant association. None of the studies used a prospective design.

### Psychological health factors

Several studies examined provider psychological health factors associated with burnout. These factors included overall distress, depression, anxiety, suicidal ideation, personality disorders and personality traits.

Out of 14 studies that assessed depression as a predictor, 9 found that depression was significantly associated with higher burnout, including one prospective study. In addition, two studies found that providers who had suicidal ideation had higher burnout scores.

Anxiety was examined in five studies and was identified as a statistically significant predictor in three of these,<sup>48 59 60</sup> including one prospective study.<sup>48</sup> One study found that, among surgery residents, post-traumatic stress disorder was associated with high risk for professional burnout.<sup>61</sup>



### Health risks and health behaviour factors

Among 12 studies, none of which were prospective, that examined physical health problems as a predictor, 7 identified low back pain, physical inactivity and distress from the physical work environment, including those attributed to electronic health record use as contributing to burnout. Two studies looked at the effect of physical quality of life but only one found it to be protective against burnout.

Twelve studies included substance use as a potential predictor, eight found no association with burnout. Of those that looked at alcohol use, higher alcohol consumption was identified as a predictor; the studies reported that consuming >5 drinks per week, alcohol consumption more than once per week and a high score on an alcohol abuse screener were associated with higher odds of burnout. Two studies addressed tobacco use, one looked at cannabis use and two at general substance use but did not find effects on burnout. Several studies looked at additional individual problems that adversely affect burnout. Three studies identified poor access to mental healthcare services or reluctance to seek mental healthcare as burnout predictors.

Three of nine studies found that sleep deprivation was associated with greater burnout; six had no association. Of the three prospective design studies, two found an association.<sup>62 63</sup>

Some studies looked at health behaviours that have potential to protect against or minimise burnout. Among the 11 studies of exercise and physical activity, 5 found it to be a protective factor,<sup>62–66</sup> while the others found no effect. One study found that reporting good to excellent health<sup>67</sup> was also protective.

Meditation and mindfulness specifically were assessed in eight studies. Five studies that examined the effect of mindfulness on burnout found that it was a protective factor. Three of these were based on prospective data. One of the three<sup>68</sup> found an association while the other three did not.

### Psychosocial variables

The last category of predictors included social and psychological mechanisms such as perceived control, coping and social support. Factors associated with higher burnout included social stress outside of work. The role of coping strategies was unclear as studies reported conflicting results. On the other hand, several predictors had protective effects. Among all 17 studies that looked at perceived control, 10 found significant effects, all but one indicating that more perceived control is a protective factor. Four studies used prospective designs.<sup>47 52 56 69</sup>

Coping was a predictor in eight studies. Across studies, findings were inconsistent with only three studies reporting a protective effect and no effect. None of these studies used a prospective design.

Twenty-five studies identified social support as a factor associated with burnout. Of these studies, 12 found it to be a protective effect, but 13 did not. Of the six prospective studies, only two reported an association.

### DISCUSSION

This review of predictors associated with burnout revealed a large number of studies spanning a wide array of different types of predictors. How predictors and burnout measures were operationalised also varied across studies. Age and gender were the most commonly studied demographic characteristics with the balance of findings pointing to younger age and female gender associated with more burnout, but more studies found no association and there were some conflicting results.

Among professional and clinical practice characteristics, unsupportive leadership, workload, job autonomy and poor work–life balance stand out as being important predictors of burnout while supportive leadership, perceived autonomy and adequate time spent outside of work are protective factors. Psychological health problems, such as anxiety, may be associated with greater burnout. Poor physical health and health behaviours such as lack of sleep were also predictors of greater burnout while exercise and meditation appear to have a protective effect. Finally, while social and psychological perceptions and experiences such as lack of control and social stress were found to increase burnout, other psychosocial factors were found to decrease or ameliorate burnout such as social support.

While we did identify several predictors of burnout, the body of evidence also shows that many predictors showed inconsistent and conflicting results across individual studies. Despite the large research volume, prospective studies that measure potential predictors to predict burnout at a later date are still sparse. The existing literature is dominated by studies documenting concurrent associations, that is, predictors and the outcome burnout are measured at the same time or are retrospectively assessed. These study designs do not allow definitive statements regarding predictors of burnout. In particular, in some cases, it is unclear whether burnout exacerbates health issues such as sleep problems or vice versa with burnout exacerbating sleep problems. More prospective studies are urgently needed.

Drawing attention to the differential impacts of workplace stressors leading to burnout and the consequences of having burnout across different demographic groups remains important. Consistent with West *et al*, both organisational-level interventions such as adequate staffing, supportive leadership and individual-level interventions such as training providers to recognise the signs of burnout and ways to address those signs are needed to lessen the onset of this growing problem among busy healthcare providers.<sup>70</sup> Of note, we also identified seven studies that examined the association of COVID-19-related predictors of burnout and six found effects. Two studies found that caring for patients with COVID-19 increased burnout (#15263 & 15074). Another study found that exposure to patients being tested for COVID-19 was associated with burnout (#15206). Two studies found that providers experiencing COVID-19-related stress and challenges were more likely to report burnout (#15364



& # 15026). Another study looked at burnout specifically related to COVID-19 and found that women reported more burnout but older providers and providers with more years in practice reported less burnout (#15120). One of these studies did not find that COVID-19 surge or case rate were associated with burnout.

This study has several strengths. It incorporates a broader range of predictors (both individual level and organisational level) and uses a wider definition of healthcare providers than have previous systematic reviews to identify predictors of burnout. However, there are a few limitations that need to be considered when interpreting the findings. We did not include studies that exclusively predicted those other constructs such as resilience and excluded studies that reported on only a single component of burnout (eg, emotional exhaustion). By doing so, we may have under-represented some predictors that are linked to subscales. We also narrowed our sample to only medical and behavioural health providers whom may independently manage patients. Therefore, we do not represent potential burnout that may be faced by other types of providers such as nurses and medical assistants. These limitations limit the generalisability of findings across diverse outcomes and types of providers.

The challenges faced by healthcare professionals, particularly during the ongoing pandemic, underscore the need for system-level strategies for keeping the workforce healthy. This includes organisational factors that contribute to burnout of the workforce that is so critical to our healthcare system. Healthcare organisations should embrace compassionate leadership styles that trickle down throughout organisations to frontline healthcare workers and evaluating the impact of training initiatives, so that they may be scaled-up and replicated broadly.

## CONCLUSION

Our systematic review to identify the predictors of burnout with a specific focus on burnout among healthcare providers in the USA found several individual-level and organisational-level factors associated with an increased risk for burnout. Factors such as supportive leadership and job autonomy were found to be protective against burnout, but questions remain as how to systematically operationalise such complex phenomenon to successfully prevent or reduce burnout. Many predictors showed inconsistent results, sometimes showing an association, sometimes not, and even documenting conflicting findings regarding the direction of associations. Going forward, interrogating and refining our understanding of burnout as well as actively and prospectively measuring burnout will be critical. In addition, studies of burnout among healthcare providers will have to remain in step with the rapidly shifting context of healthcare in the USA.

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## REFERENCES

- Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annu Rev Psychol* 2001;52:397–422.
- Schaufeli WB, Leiter MP, Maslach C. Burnout: 35 years of research and practice. *Career Development International* 2009;14:204–20.
- Freudenberger HJ. Staff Burn-Out. *J Soc Issues* 1974;30:159–65.
- Kahill S. Symptoms of professional burnout: a review of the empirical evidence. *Can Psychol* 1988;29:284–97.
- Maslach C. What have we learned about burnout and health? *Psychol Health* 2001;16:607–11.
- Paris M, Hoge MA. Burnout in the mental health workforce: a review. *J Behav Health Serv Res* 2010;37:519–28.
- Meredith LS, Schmidt Hackbarth N, Darling J, et al. Emotional exhaustion in primary care during early implementation of the Va's medical home transformation: Patient-aligned care team (PACT). *Med Care* 2015;53:253–60.
- Han S, Shanafelt TD, Sinsky CA, et al. Estimating the attributable cost of physician burnout in the United States. *Ann Intern Med* 2019;170:784–90.
- Azam K, Khan A, Alam MT. Causes and adverse impact of physician burnout: a systematic review. *J Coll Physicians Surg Pak* 2017;27:495–501.
- Salvagioni DAJ, Melanda FN, Mesas AE, et al. Physical, psychological and occupational consequences of job burnout: a systematic review of prospective studies. *PLoS One* 2017;12:e0185781.
- Rather C, Williams ES, Linhart H. Evidence for the quadruple AIM: a systematic review of the literature on physician burnout and patient outcomes. *Med Care* 2018;56:976–84.

- 12 American Medical Association. Equipping physicians to manage burnout, 2020. Available: <https://www.ama-assn.org/amaone/equipping-physicians-manage-burnout> [Accessed cited To cite. Available from 08 Sep 2020].
- 13 Dzau VJ, Kirch DG, Nasca TJ. To Care Is Human - Collectively Confronting the Clinician-Burnout Crisis. *N Engl J Med* 2018;378:312–4.
- 14 Abraham CM, Zheng K, Poghosyan L. Predictors and outcomes of burnout among primary care providers in the United States: a systematic review. *Med Care Res Rev* 2020;77:1077558719888427.
- 15 Chamberlin P, Lambden J, Kozlov E, et al. Clinicians' perceptions of futile or potentially inappropriate care and associations with avoidant behaviors and burnout. *J Palliat Med* 2019;22:1039–1045.
- 16 De Marchis E, Knox M, Hessler D, et al. Physician burnout and higher clinic capacity to address patients' social needs. *J Am Board Fam Med* 2019;32:69–78.
- 17 Jesse MT, Shkokani L, Eshelman A, et al. Transplant surgeon burnout and marital distress in the sandwich generation: the call for organizational support in family life. *Transplant Proc* 2018;50:2899–904.
- 18 La Mott J, Martin LA. Adverse childhood experiences, self-care, and compassion outcomes in mental health providers working with trauma. *J Clin Psychol* 2019;75:1066–1083.
- 19 Simionato GK, Simpson S. Personal risk factors associated with burnout among psychotherapists: a systematic review of the literature. *J Clin Psychol* 2018;74:1431–56.
- 20 O'Connor K, Muller Neff D, Pitman S. Burnout in mental health professionals: a systematic review and meta-analysis of prevalence and determinants. *Eur Psychiatry* 2018;53:74–99.
- 21 Pulcrano M, Evans SRT, Sosin M. Quality of life and burnout rates across surgical specialties: a systematic review. *JAMA Surg* 2016;151:970–8.
- 22 Rotenstein LS, Torre M, Ramos MA. Prevalence of burnout among physicians: a systematic review. *JAMA: Journal of the American Medical Association* 2018;320:1131–50.
- 23 Rothenberger DA, Burnout P. Physician burnout and well-being: a systematic review and framework for action. *Dis Colon Rectum* 2017;60:567–76.
- 24 Maslach C, Jackson SE, Leitner MP, et al. *Maslach burnout inventory manual*. 3rd ed. CA: Consulting Psychologists Press, 1996.
- 25 Hayden JA, van der Windt DA, Cartwright JL, et al. Assessing bias in studies of prognostic factors. *Ann Intern Med* 2013;158:280–6.
- 26 Huguet A, Hayden JA, Stinson J, et al. Judging the quality of evidence in reviews of prognostic factor research: adapting the grade framework. *Syst Rev* 2013;2:71.
- 27 Stamm BH. *Professional quality of life: compassion satisfaction and fatigue subscales, R-IV (ProQOL)*, 2005.
- 28 Stamm BH. *Professional quality of life measure: compassion, satisfaction, and fatigue version 5 (ProQOL)*, 2009.
- 29 Dyrbye LN, Meyers D, Ripp J. *A pragmatic approach for organizations to measure health care professional well-being. National Academy of medicine perspectives*. Washington, DC: National Academy of Medicine, 2018.
- 30 Figley CR, Stamm BH. Psychometric review of Compassion Fatigue Self Test. In: Stamm BH, ed. Lutherville, MD: Measurement of stress, trauma, and adaptation Sidran Press, 1996: 127–30.
- 31 Jones JW. *The staff burnout scale for health professionals (SBS-HP): preliminary test manual*. London House Press, 1980.
- 32 Trockel M, Bohman B, Lesure E, et al. A brief instrument to assess both burnout and professional fulfillment in physicians: reliability and validity, including correlation with self-reported medical errors, in a sample of resident and practicing physicians. *Acad Psychiatry* 2018;42:11–24.
- 33 Demerouti E, Bakker AB, Vardakou I. The convergent validity of two burnout instruments: a multitrait-multimethod analysis. *Eur J Psychol Assess* 2003;19:12–23.
- 34 Kroth PJ, Morioka-Douglas N, Veres S. Association of electronic health record design and use factors with clinician stress and Burnout. Electronic health record design and use factors and clinician stress and Burnout. Electronic health record design and use factors and clinician stress and burnout. *JAMA network open* 2019;2:e199609–e09.
- 35 Kristensen TS, Borritz M, Villadsen E, et al. The Copenhagen burnout inventory: a new tool for the assessment of burnout. *Work Stress* 2005;19:192–207.
- 36 Kristensen TS, Hannerz H, Hogh A, et al. The Copenhagen Psychosocial Questionnaire--a tool for the assessment and improvement of the psychosocial work environment. *Scand J Work Environ Health* 2005;31:438–49.
- 37 Dyrbye LN, Satele D, Sloan J, et al. Utility of a brief screening tool to identify physicians in distress. *J Gen Intern Med* 2013;28:421–7.
- 38 Yao KA, Attai D, Bleicher R, et al. Covid-19 related oncologist's concerns about breast cancer treatment delays and physician well-being (the crown study). *Breast Cancer Res Treat* 2021;186:625–35.
- 39 Campbell J, Prochazka AV, Yamashita T, et al. Predictors of persistent burnout in internal medicine residents: a prospective cohort study. *Acad Med* 2010;85:1630–4.
- 40 Hillhouse JJ, Adler CM, Walters DN. A simple model of stress, burnout and symptomatology in medical residents: a longitudinal study. *Psychol Health Med* 2000;5:63–73.
- 41 Hyman SA, Shotwell MS, Michaels DR, et al. A survey evaluating burnout, health status, depression, reported alcohol and substance use, and social support of Anesthesiologists. *Anesth Analg* 2017;125:2009–18.
- 42 Mirvis DM, Graney MJ, Kilpatrick AO. Burnout among leaders of department of Veterans Affairs medical centers: contributing factors as determined by a longitudinal study. *J Health Hum Serv Adm* 1999;21:390–412.
- 43 Sliwa JA, Clark GS, Chiodo A, et al. Burnout in Diplomates of the American Board of physical medicine and Rehabilitation-Prevalence and potential drivers: a prospective cross-sectional survey. *Pm R* 2019;11:83–9.
- 44 West CP, Dyrbye LN, Sinsky C, et al. Resilience and burnout among physicians and the general us working population. *JAMA Netw Open* 2020;3:e209385.
- 45 Lindeman B, Petrusa E, McKinley S, et al. Association of burnout with emotional intelligence and personality in surgical residents: can we predict who is most at risk? *J Surg Educ* 2017;74:e22–30.
- 46 Kemper KJ, Schwartz A, Wilson PM, et al. Burnout in pediatric residents: three years of national survey data. *Pediatrics* 2020;145:11.
- 47 Del Carmen MG, Herman J, Rao S, et al. Trends and factors associated with physician burnout at a Multispecialty academic faculty practice organization. *JAMA Netw Open* 2019;2:e190554.
- 48 Dyrbye LN, Burke SE, Hardeman RR, et al. Association of clinical specialty with symptoms of burnout and career choice regret among US resident physicians. *JAMA* 2018;320:1114–30.
- 49 Dyrbye LN, West CP, Herrin J, et al. A longitudinal study exploring learning environment culture and subsequent risk of burnout among resident physicians overall and by gender. *Mayo Clin Proc* 2021;96:2168–83.
- 50 McPhillips HA, Stanton B, Zuckerman B, et al. Role of a pediatric department chair: factors leading to satisfaction and burnout. *J Pediatr* 2007;151:425–30.
- 51 Dyrbye LN, Major-Elechi B, Hays JT, et al. Physicians' Ratings of their Supervisor's Leadership Behaviors and Their Subsequent Burnout and Satisfaction: A Longitudinal Study. *Mayo Clin Proc* 2021;96:2598–605.
- 52 Rabatin J, Williams E, Baier Manwell L, et al. Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health* 2016;7:41–3.
- 53 Lam C, Kim Y, Cruz M, et al. Burnout and resiliency in Mohs surgeons: a survey study. *Int J Womens Dermatol* 2021;7:319–22.
- 54 Marchalik D, C Goldman C, F L Carvalho F, et al. Resident burnout in USA and European urology residents: an international concern. *BJU Int* 2019;124:349–356.
- 55 Summers SM, Nagy CJ, April MD, et al. The prevalence of faculty physician burnout in military graduate medical education training programs: a cross-sectional study of academic physicians in the United States department of defense. *Mil Med* 2019;184:e522–30.
- 56 Cydulka RK, Korte R. Career satisfaction in emergency medicine: the ABEM longitudinal study of emergency physicians. *Ann Emerg Med* 2008;51:714–22.
- 57 Balch CM, Shanafelt TD, Sloan JA, et al. Distress and career satisfaction among 14 surgical specialties, comparing academic and private practice settings. *Ann Surg* 2011;254:558–68.
- 58 Moore LR, Ziegler C, Hessler A, et al. Burnout and career satisfaction in women neurologists in the United States. *J Womens Health* 2019;28:515–25.
- 59 Firulescu L, May RW, Fincham FD, et al. 42 training forgiveness – a novel approach to reducing physician burnout. *CNS Spectr* 2019;24:198–9.
- 60 Kuhn G, Goldberg R, Compton S. Tolerance for uncertainty, burnout, and satisfaction with the career of emergency medicine. *Ann Emerg Med* 2009;54:106–13.
- 61 Jackson T, Provencio A, Bentley-Kumar K, et al. Ptsd and surgical residents: everybody hurts... sometimes. *Am J Surg* 2017;214:1118–24.
- 62 Goldberg R, Boss RW, Chan L, et al. Burnout and its correlates in emergency physicians: four years' experience with a wellness booth. *Acad Emerg Med* 1996;3:1156–64.

- 63 Cull WL, Frintner MP, Starmer AJ, *et al.* Longitudinal analyses of pediatrician burnout. *Acad Pediatr* 2019;19:256–62.
- 64 Doolittle BR. Association of burnout with emotional coping strategies, friendship, and institutional support among internal medicine physicians. *J Clin Psychol Med Settings* 2020.
- 65 Sheno AN, Kalyanaraman M, Pillai A, *et al.* Burnout and psychological distress among pediatric critical care physicians in the United States. *Crit Care Med* 2018;46:116–22.
- 66 Verduzco-Gutierrez M, Larson AR, Capizzi AN, *et al.* How physician compensation and education debt affects financial stress and burnout: a survey study of women in physical medicine and rehabilitation. *Pm R* 2021;13:836–44.
- 67 Starmer AJ, Frintner MP, Freed GL. Burnout, and satisfaction of early career pediatricians. *Pediatrics* 2016;137:1–10.
- 68 Braun SE, Auerbach SM, Rybarczyk B, *et al.* Mindfulness, burnout, and effects on performance evaluations in internal medicine residents. *Adv Med Educ Pract* 2017;8:591–7.
- 69 Mullins CH, Gleason F, Wood T, *et al.* Do internal or external characteristics more reliably predict burnout in resident physicians: a multi-institutional study. *J Surg Educ* 2020;77:e86–93.
- 70 West CP, Dyrbye LN, Erwin PJ, *et al.* Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet* 2016;388:2272–81.