Associations of physician burnout with career engagement and quality of patient care: systematic review and meta-analysis

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ABSTRACT

OBJECTIVE
To examine the association of physician burnout with the career engagement and the quality of patient care globally.

DESIGN
Systematic review and meta-analysis.

DATA SOURCES
Medline, PsycINFO, Embase, and CINAHL were searched from database inception until May 2021.

ELIGIBILITY CRITERIA FOR SELECTING STUDIES
Observational studies assessing the association of physician burnout (including a feeling of overwhelming emotional exhaustion, feelings of cynicism and detachment from job defined as depersonalisation, and a sense of ineffectiveness and little personal accomplishment) with career engagement (job satisfaction, career choice regret, turnover intention, career development, and productivity loss) and the quality of patient care (patient safety incidents, low professionalism, and patient satisfaction). Data were double extracted by independent reviewers and checked through contacting all authors, 84 (49%) of 170 of whom confirmed their data. Random-effect models were used to calculate the pooled odds ratio, prediction intervals expressed the amount of heterogeneity, and meta-regressions assessed for potential moderators with significance set using a conservative level of P<0.10.

RESULTS
4732 articles were identified, of which 170 observational studies of 239 246 physicians were included in the meta-analysis. Overall burnout in physicians was associated with an almost four times decrease in job satisfaction compared with maintained job satisfaction (odds ratio 3.79, 95% confidence interval 3.24 to 4.43, I²=97%, k=73 studies, n=146 980 physicians). In the presence of increased burnout, career choice regret increased by more than threefold compared with being satisfied with career choice (3.49, 2.43 to 5.00, I²=97%, k=16, n=33 871). Turnover intention also increased by more than threefold compared with retention (3.10, 2.30 to 4.17, I²=97%, k=25, n=32 271). Productivity had a small but significant association with burnout (1.82, 1.08 to 3.07, I²=83%, k=7, n=95 811) and burnout also affected career development (3.77, 2.77 to 5.14, I²=0%, n=341). Overall physician burnout doubled patient safety incidents compared with no patient safety incidents (2.04, 1.69 to 2.45, I²=67%, k=35, n=41 059). As burnout increased, low professionalism was twice as likely compared with maintained professionalism (2.33, 1.96 to 2.70, I²=96%, k=40, n=32 321), as was patient dissatisfaction compared with patient satisfaction (2.22, 1.38 to 3.57, I²=75%, k=8, n=1002). Burnout and poorer job satisfaction was greatest in hospital settings (1.88, 0.91 to 3.86, P=0.09), physicians aged 31-50 years (2.41, 1.02 to 5.64, P=0.04), and working in emergency medicine and intensive care (2.16, 0.98 to 4.76, P=0.06); burnout was lowest in general practitioners (0.16, 0.03 to 0.88, P=0.04). However, these associations did not remain significant in the multivariable regressions. The association between burnout and patient safety incidents was greatest in physicians aged 20-30 years (1.88, 1.07 to 3.29, P=0.03), and people working in emergency medicine (2.10, 1.09 to 3.56, P=0.02). The association of burnout with low professionalism was smallest in physicians older than 50 years (0.36, 0.19 to 0.69, P=0.003) and greatest in physicians still in training or residency (2.27, 1.45 to 3.60, P=0.001), in those who worked in a hospital (2.16, 1.46 to 3.19, P=0.001), specifically in emergency medicine specialty (1.48, 1.01 to 2.34, P=0.042), or situated in a low to middle income country (1.68, 0.94 to 2.97, P=0.08).

CONCLUSIONS
This meta-analysis provides compelling evidence that physician burnout is associated with poor function...
and sustainability of healthcare organisations primarily by contributing to the career disengagement and turnover of physicians and secondarily by reducing the quality of patient care. Healthcare organisations should invest more time and effort in implementing evidence-based strategies to mitigate physician burnout across specialties, and particularly in emergency medicine and for physicians in training or residency.

**SYSTEMATIC REVIEW REGISTRATION**
PROSPERO number CRD42021249492.

**Introduction**

Burnout is defined as a syndrome related to work that involves three key dimensions. Firstly, emotional exhaustion, which represents the basic individual stress dimension of burnout and refers to feelings of being overextended and depleted of emotional and physical resources. Secondly, depersonalisation, which is the cynicism component and represents a motivational, interpersonal distancing dimension of burnout and refers to a negative, callous, or excessively detached response to various aspects of the job. Finally, a sense of reduced personal accomplishment, which represents the self-evaluation dimension of burnout and refers to feelings of incompetence and inadequate achievement and productivity at work. Burnout is rampant and reaching global levels among physicians. In the US, four in 10 physicians report at least one symptom of burnout, and in the UK, a third of trainee doctors report that they experience burnout to a high or very high degree.

In a recent review of low and middle income countries the overall single-point prevalence of burnout ranged from 2.5% to 87.9% among 43 studies. Moreover, the covid-19 pandemic has created new causes for stress with unsafe working conditions and higher workloads, which have further exacerbated burnout in physicians. Physicians with burnout often report poor work-life balance and career dissatisfaction. However, previous systematic reviews that focused on the potential effects of physician burnout on healthcare efficiency have overlooked the association of burnout with career engagement of physicians. Healthcare provider burnout was associated with lower quality patient care in a recent systematic review. However, no pooled estimates of these associations were provided due to high heterogeneity, which was partly caused by analysing mixed samples of healthcare providers and studies with little to no flexibility of the quality metrics used for patient outcome subgroups.

A joint synthesis of the links of physician burnout with the career engagement of physicians and the quality of care provided to patients is important because these aspects are complementary of the overall efficiency of healthcare organisations according to existing theoretical frameworks and research evidence. These reciprocal relations should be made available to governments and policy organisations to encourage financial investments and policies to mitigate physician burnout internationally. No previous systematic reviews has taken this approach. For instance, a meta-analysis published in 2022 that assessed the association of burnout with only self-reported medical errors among physicians found an increased risk of self-reported errors. Two further systematic reviews, which assessed the association between physician or healthcare professionals’ wellbeing and burnout with patient safety, did so through a narrative review approach due to large heterogeneity.

Therefore, we aimed to add value through a larger and more robust meta-analysis that controlled for heterogeneity and other possible biases in career engagement (which is currently unknown at the systematic review level) and quality-of-care outcomes. In this systematic review and meta-analysis, we examined the association of physician burnout with the career engagement of physicians focusing on job satisfaction, career choice regret, career development, productivity loss and turnover intention; and the quality of patient care focusing on patient safety incidents, low professionalism, and patient satisfaction. Based on existing frameworks that have studied the relation between occupational distress and impairment related to sleep deprivation in physicians and unsolicited patient complain, a flow diagram of the anticipated associations is presented in figure 1. We also conducted meta-regressions to uncover important moderators of these associations.

**Methods**

This systematic review followed a registered (PROSPERO CRD42021249492) protocol and is reported in accordance with the Reporting Checklist for Meta-analyses of Observational Studies (MOOSE) and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance. A protocol amendment was made in November 2021 to exclude grey literature from this review. The completed checklists are available in appendix 1.

**Search strategy and study eligibility**

We included quantitative observational studies involving physicians working in any healthcare setting. We reported comparative data on the association between burnout and career engagement of physicians (ie, job satisfaction, career choice regret, turnover intention, reduced productivity indicated by presenteeism or absenteeism, and career development) and quality of patient care outcomes (ie, patient safety incidents, low professionalism, and patient satisfaction). Definitions for each of the outcomes are provided in appendix 2. Studies that did not report their sample had this missing information confirmed by contacting authors. Randomised controlled trials were excluded because our study focus is on associations and not interventions, qualitative studies and quantitative studies involving fewer than 70% of responses from physicians were also excluded. This 70% threshold is an arbitrary criterion that we have used in previous
reviews in this area. The reason we adopted this criterion is because we did not want to exclude relevant studies that included only a small number of other health professionals in addition to physicians.

We searched Medline, PsycINFO, Embase, and CINAHL from database inception to May 2021 for citations in English. The searches included combinations of key blocks of terms involving Medical Subject Headings terms and text words. The full search strategies are detailed in the appendix 3. The reference lists of relevant systematic reviews and eligible studies were manually searched to identify additional literature.

Two independent reviewers (AH and AZ or MP and AZ) rated the eligibility of each of the abstracts and full texts in Covidence. Disagreements were resolved by consensus, and we measured inter-rater agreement with the $\kappa$ statistic.

Data extraction and quality assessment
Using a standardised form that was pilot tested, we extracted data for study characteristics (country, recruitment, healthcare setting, and design), physician characteristics (sample size, mean age, sex (percentage of men), specialty, and work experience), burnout (measure characteristics) and the outcome measures including the method of reporting. The outcomes of interest were each assessed against overall burnout and any of the three subscales of burnout including emotional exhaustion, depersonalisation, and personal accomplishment. Where all three subscales were reported and the overall burnout score was not, we calculated burnout by pooling across the three subscale scores. We transformed extracted quantitative data to the uniform log scale and standardised mean difference using the statistical software Comprehensive Meta-Analysis. The formulae for these transformations are provided in appendix 4.

One of six reviewers (AH, MP, JJ, KG, RR, and AZ) completed data extractions and double checked with any disagreements being resolved by consensus.

We emailed all the study authors to confirm the accuracy and validity of their data and to obtain any missing data. 84 (49%) of 170 of the study authors confirmed their data and our extractions were found to be accurate in 96% of these studies (appendix 5).

The Newcastle Ottawa critical appraisal tool was used to assess the quality of the studies. Pairs of reviewers in three groups (AH and AZ, MP and KG, or JJ and RR) appraised the fundamental criteria: (1) representativeness of the sample, (2) sample size, (3) non-respondents, (4) ascertainment of the exposure, (5) controlled for confounding factors, (6) assessment of outcome, and (7) adequate statistical tests. Explanations of how each variable was coded is detailed in the appendix. The total maximum score was 7, and we classified overall scores of 0-2 as high risk, 3-5 as medium risk, and 6-7 as low risk.

Data synthesis
We used DerSimonian-Laird random effects while pooling the log odds, then exponentiated these results to odds ratio and presented the data in forest plots. A fixed effect method of pooling was considered in meta-analysis with fewer than five studies and varied sample and effect sizes. Heterogeneity in the meta-analysis was quantified using the $I^2$ statistic with its 95% confidence intervals. Because of the high level of heterogeneity, Hartung-Knapp method of pooling and estimating 95% confidence intervals were used to account for uncertainty in the variance estimate. Overall burnout and its three subscales (emotional exhaustion, depersonalisation, and personal accomplishment) were synthesised individually and presented as so within the forest plots. In total, 32 possible meta-analysis comparisons were found.
subgroup meta-analysis was performed to assess for differences between the four burnout measures (full 22-item Maslach Burnout Inventory, abbreviated (shortened) version of the Maslach Burnout Inventory, Copenhagen burnout inventory, and use of another inventory). Differences between these groups were assessed using the statistic ratio of odds ratio. In a meta-analysis involving 10 or more studies, funnel plots and Egger’s test were used to assess for publication bias, and prediction intervals were calculated to express the amount of heterogeneity.

We used univariable and multivariable meta-regressions using the following variables: region (US, UK/European Union, Commonwealth, South East Asia/other); setting (primary care, hospital, mixed); design (cross sectional, prospective cohort or longitudinal); age (≤30, 31-50, and ≥51 years); sex (female, male, mixed); specialty or position of profession ((1) physician or internal medicine, (2) general practitioners (GPs), (3) surgery including neurosurgery, (4) emergency medicine and intensive care, (5) cancer or oncology, (6) intern or resident, (7) paediatrics, (8) psychiatry, (9) mixed, (10) neurology, and (11) other); work experience (experienced with over 6 years, less experienced intern/resident ≤6 years, mixture of experience), and burnout measure (Maslach Burnout Inventory, any iteration, or other classified burnout inventory or mixed and other). Variables from the univariable regressions with a more conservative level of significance of P<0.10 rather than P<0.05 were used in the multivariable model. The variables were added by using forward selection process. Sensitivity analyses for risk of bias was done based on the three categories for the total score of the Newcastle Ottawa assessment (low, medium, and high). All meta-analyses were conducted in R version 4.0.5 (R Foundation for Statistical Computing) using the meta and metafor packages.

Patient and public involvement
We consulted five GPs in the Greater Manchester region who were members of an established patient and public involvement group about the appropriateness of our research questions and classification of outcomes and appropriateness of wellbeing measures used. These GPs also advised on the interpretation of our findings and will help with the dissemination strategy.

Fig 2 | Study selection. *See references in appendix 6
Our search strategy identified 4732 articles, of which 684 met the criteria for full text review (fig 2). A total of 170 studies involving 239246 physicians (150 cross sectional studies including 231964 physicians and 20 prospective or longitudinal studies including 7282 physicians) met the eligibility criteria. The characteristics of the included studies are summarised in appendix 6, and citations are provided in appendix 7. Agreement between reviewers for study inclusion was high (κ 0.89, 95% confidence interval 0.81 to 0.96).
(45%) of the 170 studies were conducted in the US, 48 (28%) in European countries, four (2%) of which were in the UK, two (1%) in the African Region, eight (5%) in the Region of the Americas, two (1%) in the South-East Asian Region, 29 (17%) in the Eastern Mediterranean Region, 29 (17%) in the Western Pacific Region, and one (1%) multinational study. 38-44 107 (63%) of the studies were based in a hospital setting, 33 (19%) involved mixed settings, 29 (17%) were based in primary care setting, and one study 45 was unclear but involved medically qualified academics. We aimed to exclude studies with fewer than 70% of responses from physicians, however, in reality, only three (2%) of 170 studies with a mixed sample of physicians (70% and over) were included in our analyses.

The median number of physicians across studies was 312 (interquartile range 162-1015 ) with a median age of 42 years (32-48) and where data for sex were reported, 112 (66%) studies involved mostly male physicians. The physician specialty varied across studies: 42 (25%) mixed specialties, 32 (19%) internal medicine, 21 (12%) surgery (ie, trauma, plastic, and neurosurgical), 19 (11%) emergency medicine and intensive care, 11 (6%) general practitioners, eight (5%) interns or residents, eight (5%) paediatrics, seven (4%) oncology (ie, gynaecologist, radiation, or palliative care), six (4%) neurology, three (2%) psychiatry, and 13 (8%) involving other specialties. Physicians had more than seven years of experience in 52 (31%) studies, a mixture of experience was reported in 47 (28%) studies, and 38 (22%) studies involved residents, junior doctors, or interns with fewer than seven years of experience.

The most common measure of burnout was the full 22-item Maslach Burnout Inventory (81 (48%) of 170 studies). An abbreviated version of the Maslach Burnout Inventory was used in 50 (29%) studies, other types were used in 34 (20%) studies and only five

| Study          | TE     | seTE   | Odds ratio (95% CI) | Odds ratio (95% CI) |
|----------------|--------|--------|---------------------|---------------------|
| Burnout        |        |        |                     |                     |
| Attenello 2018 | 1.51   | 0.27   | 4.54 (2.69 to 7.67) | 4.54 (2.69 to 7.67) |
| Baghdadi 2020  | 1.13   | 0.39   | 3.09 (1.43 to 6.64) | 3.09 (1.43 to 6.64) |
| Dominguez 2019 | 1.40   | 0.28   | 4.05 (2.36 to 6.96) | 4.05 (2.36 to 6.96) |
| Duan 2019      | 1.69   | 0.11   | 5.44 (4.36 to 6.79) | 5.44 (4.36 to 6.79) |
| Estryn-Behar 2011 | 0.36   | 0.17   | 1.43 (1.02 to 2.01) | 1.43 (1.02 to 2.01) |
| Goldberg 1996  | 0.97   | 0.15   | 2.64 (1.96 to 3.57) | 2.64 (1.96 to 3.57) |
| Hamidi 2018    | 0.88   | 0.28   | 2.40 (1.38 to 4.18) | 2.40 (1.38 to 4.18) |
| Hartwell 2010  | 1.49   | 0.41   | 4.44 (1.98 to 9.93) | 4.44 (1.98 to 9.93) |
| Huang 2019     | 1.40   | 0.13   | 4.05 (3.13 to 5.25) | 4.05 (3.13 to 5.25) |
| Karayurek 2021 | 0.33   | 0.16   | 1.40 (1.02 to 1.92) | 1.40 (1.02 to 1.92) |
| Kassam 2021    | 4.16   | 1.08   | 64.00 (7.71 to 531.60) | 64.00 (7.71 to 531.60) |
| Khalafallah 2020 | 1.52   | 0.62   | 4.57 (1.35 to 15.41) | 4.57 (1.35 to 15.41) |
| Khorfan 2021   | 0.82   | 0.17   | 2.26 (1.62 to 3.17) | 2.26 (1.62 to 3.17) |
| Lali 2020      | 1.65   | 0.18   | 5.20 (3.68 to 7.35) | 5.20 (3.68 to 7.35) |
| O'Connor 2019  | 2.79   | 0.59   | 16.24 (5.08 to 51.91) | 16.24 (5.08 to 51.91) |
| Pantenburg 2016 | 0.05   | 0.03   | 1.05 (1.00 to 1.10) | 1.05 (1.00 to 1.10) |
| Rabatin 2016   | 1.60   | 0.24   | 4.94 (3.10 to 7.86) | 4.94 (3.10 to 7.86) |
| Shanafelt 2009 | 0.82   | 0.36   | 2.28 (1.13 to 4.60) | 2.28 (1.13 to 4.60) |
| Shanafelt 2014 | 0.77   | 0.18   | 2.17 (1.53 to 3.09) | 2.17 (1.53 to 3.09) |
| Sinsky 2017    | 0.77   | 0.09   | 2.16 (1.81 to 2.58) | 2.16 (1.81 to 2.58) |
| Soler 2007     | 0.61   | 0.28   | 1.83 (1.05 to 3.20) | 1.83 (1.05 to 3.20) |
| Sun 2021       | 2.31   | 0.15   | 10.07 (7.53 to 13.47) | 10.07 (7.53 to 13.47) |
| Voultsos 2020  | 0.98   | 0.57   | 2.67 (0.87 to 8.16) | 2.67 (0.87 to 8.16) |
| Willard-Grace 2019 | 0.45   | 0.22   | 1.57 (1.02 to 2.41) | 1.57 (1.02 to 2.41) |
| Zhang 2011     | 0.68   | 0.14   | 1.98 (1.52 to 2.59) | 1.98 (1.52 to 2.59) |
| Fixed effects model | 1.44 | 1.38 to 1.50 | 1.44 (1.38 to 1.50) | 1.44 (1.38 to 1.50) |
| Random effects model | 3.10 | 2.30 to 4.17 | 3.10 (2.30 to 4.17) | 3.10 (2.30 to 4.17) |

Fig 3 | Association of physician burnout with turnover intention. TE=log odds ratio; seTE=standard error of log odds ratio; OR=odds ratio; CI=confidence interval
(3%) studies used the Copenhagen burnout inventory (see appendix 8 in supplement for breakdown of the measures used). Thirty one (18%) studies reported secondary measures of depression and 24 (14%) studies reported emotional distress, which were analysed separately. In terms of career engagement for physicians, 81 (48%) studies reported on decreased job satisfaction compared with increased job satisfaction, 19 (11%) on career choice regret compared with being satisfied with career choice, three (2%) studies used the Copenhagen burnout inventory (see appendix 8 in supplement for breakdown of the measures used). Thirty one (18%) studies reported secondary measures of depression and 24 (14%) studies reported emotional distress, which were

### Study

| Study                  | TE   | seTE | Odds ratio (95% CI) | Odds ratio (95% CI) |
|------------------------|------|------|---------------------|---------------------|
| Emotional exhaustion   |      |      |                     |                     |
| Blanchard 2010         | 1.01 | 0.27 | 2.75 (1.64 to 4.64) |                     |
| Campbell 2001          | 2.09 | 0.17 | 8.12 (5.77 to 11.42)|                     |
| Golub 2008             | 0.70 | 0.20 | 2.02 (1.37 to 2.97) |                     |
| Gyorffy 2016, 2018     | 0.46 | 0.05 | 1.58 (1.44 to 1.74) |                     |
| Hewitt 2020            | 0.33 | 0.04 | 1.39 (1.28 to 1.52) |                     |
| Karayurek 2021         | 0.17 | 0.20 | 1.19 (0.80 to 1.77) |                     |
| Khan 2018              | 0.78 | 0.15 | 2.18 (1.62 to 2.94) |                     |
| Khorfan 2021           | 1.09 | 0.10 | 2.98 (2.45 to 3.63) |                     |
| Makara-Studzinska 2020| 0.07 | 0.20 | 1.08 (0.72 to 1.61) |                     |
| Moreno-jimenez 2012    | 2.46 | 0.20 | 11.69 (7.90 to 17.28)|                     |
| Ochoa 2018             | 1.69 | 0.27 | 5.44 (3.22 to 9.18) |                     |
| Pantenburg 2016        | 0.09 | 0.00 | 1.09 (1.08 to 1.10) |                     |
| Pit 2014               | 0.90 | 0.49 | 2.45 (0.93 to 6.45) |                     |
| Salles 2019            | 2.94 | 0.36 | 18.97 (9.32 to 38.61)|                     |
| Soler 2007             | 1.21 | 0.03 | 3.36 (3.14 to 3.59) |                     |
| Zhang 2011             | 0.85 | 0.10 | 2.35 (1.94 to 2.84) |                     |
| Fixed effects model    |      |      | 1.13 (1.12 to 1.14) |                     |
| Random effects model   |      |      | 2.81 (1.80 to 4.40) |                     |
| Heterogeneity: I²=99% (99-99%), τ²=0.67 |

### Depersonalisation

| Study                  | TE   | seTE | Odds ratio (95% CI) | Odds ratio (95% CI) |
|------------------------|------|------|---------------------|---------------------|
| Blanchard 2010         | 0.33 | 0.26 | 1.39 (0.84 to 2.30) |                     |
| Campbell 2001          | 1.18 | 0.16 | 3.26 (2.39 to 4.45) |                     |
| Gyorffy 2016, 2018     | 0.34 | 0.21 | 1.40 (0.93 to 2.11) |                     |
| Hewitt 2020            | 0.30 | 0.04 | 1.35 (1.24 to 1.47) |                     |
| Karayurek 2021         | 0.01 | 0.20 | 1.01 (0.68 to 1.51) |                     |
| Khan 2018              | 0.51 | 0.15 | 1.67 (1.24 to 2.24) |                     |
| Khorfan 2021           | 0.87 | 0.10 | 2.39 (1.96 to 2.91) |                     |
| Pantenburg 2016        | 0.01 | 0.01 | 1.01 (0.99 to 1.03) |                     |
| Salles 2019            | 1.98 | 0.32 | 7.28 (3.88 to 13.65)|                     |
| Soler 2007             | 0.53 | 0.02 | 1.70 (1.63 to 1.77) |                     |
| Zhang 2011             | 0.78 | 0.10 | 2.19 (1.81 to 2.65) |                     |
| Fixed effects model    |      |      | 1.14 (1.12 to 1.16) |                     |
| Random effects model   |      |      | 1.82 (1.26 to 2.62) |                     |
| Heterogeneity: I²=99% (98-99%), τ²=0.27 |

### Personal accomplishment

| Study                  | TE   | seTE | Odds ratio (95% CI) | Odds ratio (95% CI) |
|------------------------|------|------|---------------------|---------------------|
| Karayurek 2021         | 0.46 | 0.20 | 1.58 (1.06 to 2.36) |                     |
| Khorfan 2021           | 0.46 | 0.13 | 1.59 (1.23 to 2.05) |                     |
| Pantenburg 2016        | 0.04 | 0.01 | 1.04 (1.02 to 1.06) |                     |
| Soler 2007             | 0.08 | 0.04 | 1.08 (1.00 to 1.16) |                     |
| Zhang 2011             | 0.42 | 0.10 | 1.52 (1.26 to 1.83) |                     |
| Fixed effects model    |      |      | 1.05 (1.03 to 1.07) |                     |
| Random effects model   |      |      | 1.28 (0.98 to 1.68) |                     |
| Heterogeneity: I²=86% (70-94%), τ²=0.04 |

Fig 4 | Association of emotional exhaustion, depersonalisation, and personal accomplishment of physicians with turnover intention. TE=log odds ratio; seTE=standard error of log odds ratio; OR=odds ratio; CI=confidence interval
poor career development compared with good career development, nine (5%)\textsuperscript{47 48-59} on reduced productivity compared with sustained productivity, and 36 (21%) on turnover intention compared with retention. Concerning quality of patient care outcomes, 39 (23%) studies reported patient safety incidents compared with no patient safety incidents, 43 (25%) reported indicators of low professionalism compared with maintained professionalism, and eight (5%) studies reported measures of patient dissatisfaction compared with satisfied patients. Nineteen (11%) studies reported more than one of these outcomes.

Of the 119 (70%) studies reporting career engagement, all were self-reported by the physician. Physicians self-reported across most of the studies for patient safety incidents (31 (79%) of 39) and professionalism (37 (80%) of 46 studies), whereas the remaining studies used patient record reviews and surveillance systems. Patient satisfaction was based on self-reports by patients.

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|}
\hline
\textbf{Study} & \textbf{TE} & \textbf{seTE} & \textbf{Odds ratio (95% CI)} \\
\hline
Burnout & & & \\
Baer 2017 & 1.96 & 0.65 & 7.10 (1.98 to 25.50) \\
Brunsberg 2019 & 0.03 & 0.19 & 1.03 (0.71 to 1.49) \\
Coombs 2019, 2020 & 0.75 & 0.31 & 2.12 (1.16 to 3.89) \\
Dirvar 2020 & 0.31 & 0.08 & 1.36 (1.17 to 1.59) \\
Faiivre 2018 & 2.19 & 0.96 & 8.90 (1.35 to 58.79) \\
Fahrenkopt 2008 & -0.32 & 0.38 & 0.72 (0.35 to 1.52) \\
Garroute-Orgeas 2015 & 0.73 & 0.25 & 2.07 (1.27 to 3.38) \\
Grover 2018 & 0.17 & 0.24 & 1.18 (0.75 to 1.88) \\
Hansen 2011 & -0.19 & 0.20 & 0.83 (0.56 to 1.22) \\
Hayashino 2012 & 0.52 & 0.11 & 1.69 (1.36 to 2.10) \\
Huang 2019 & 1.68 & 0.14 & 5.36 (4.11 to 6.99) \\
Kang 2013 & 0.91 & 0.23 & 2.48 (1.57 to 3.92) \\
Kassam 2020 & 0.73 & 0.73 & 2.08 (0.50 to 8.66) \\
Kemper 2020 & 0.94 & 0.14 & 2.55 (1.94 to 3.36) \\
Klein 2010 & 0.66 & 0.17 & 1.94 (1.39 to 2.70) \\
Kwah 2017 & -1.05 & 0.95 & 0.35 (0.05 to 2.23) \\
Linzer 2009 & 0.06 & 0.20 & 1.06 (0.72 to 1.57) \\
Linzer 2017 & 0.36 & 0.22 & 1.44 (0.93 to 2.22) \\
Lu 2015 & 1.06 & 0.48 & 2.89 (1.13 to 7.42) \\
Nwosu 2020 & 1.83 & 0.14 & 6.22 (4.70 to 8.24) \\
O’Connor 2017 & 1.01 & 0.22 & 2.75 (1.78 to 4.24) \\
Prins 2010 & 0.66 & 0.05 & 1.93 (1.76 to 2.11) \\
Qureshi 2015 & 0.64 & 0.10 & 1.89 (1.56 to 2.28) \\
Shanafelt 2010 & 0.09 & 0.19 & 1.10 (0.76 to 1.58) \\
Sulaiman 2017 & 0.64 & 0.13 & 1.90 (1.47 to 2.46) \\
Tawfiq 2018 & 1.18 & 0.09 & 3.25 (2.70 to 3.92) \\
Trockel 2018 & 1.06 & 0.24 & 2.88 (1.80 to 4.62) \\
Vanhaecht 2019 & 1.03 & 0.12 & 2.81 (2.21 to 3.56) \\
Voultsos 2020 & 1.43 & 0.80 & 4.16 (0.87 to 19.84) \\
Watson 2018 & 0.68 & 0.20 & 1.97 (1.33 to 2.91) \\
Welp 2015 & 0.73 & 0.14 & 2.07 (1.58 to 2.71) \\
Wen 2016 & 0.82 & 0.17 & 2.28 (1.63 to 3.18) \\
West 2006 & 0.89 & 0.17 & 2.44 (1.77 to 3.37) \\
West 2009 & 0.94 & 0.12 & 2.56 (2.02 to 3.24) \\
Williams 2007 & 0.48 & 0.18 & 1.61 (1.14 to 2.28) \\
Fixed effects model & & & \\
Random effects model & & & \\
\hline
\end{tabular}
\caption{Association of burnout with patient safety incidents. TE=log odds ratio; seTE=standard error of log odds ratio; OR=odds ratio; CI=confidence interval}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig5}
\caption{Fig 5 | Association of burnout with patient safety incidents. TE=Log odds ratio; seTE=standard error of log odds ratio; OR=odds ratio; CI=confidence interval}
\end{figure}
Fig 6 | Association of emotional exhaustion, depersonalisation, and personal accomplishment with patient safety incidents. TE=Log odds ratio; seTE=standard error of log odds ratio; OR=odds ratio; CI=confidence interval
Quality assessment

One hundred and 30 studies provided a representative sample of the target population (76% met criterion 1); 103 studies provided an ample sample size of physicians (61% met criterion 2); 58 studies reported a response rate of 60% or greater (34% met criterion 3); 25 studies satisfied low risk of bias for the ascertainment of exposure mostly due to many of the surveys being self-reported (15% met criterion 4); 100 of the studies adequately adjusted for confounding factors (59% met criterion 5); 165 reported a low risk of bias due to assessment of outcome (97% met criterion 6); and 118 studies had used adequate statistical tests and measures to report their findings (69% met criterion 7). Overall, 32 (19%) of the studies reported low risk of bias (total score 6-7), 23 (14%) reported high risk of bias (total score: 0-2), and 115 (67%) studies reported medium risk of bias (total score 3-5). The full results of the Newcastle Ottawa critical appraisals are presented in appendix 9.

Meta-analysis of association of burnout with career engagement and quality of patient care

The results of all the meta-analyses are provided in table 1. All forest plots for each outcome are available in appendix 10. Only significant results are reported here.

Physician burnout was associated with almost fourfold decreases in job satisfaction compared with increased job satisfaction based on measures of overall burnout (3.79, 95% confidence interval 3.24 to 4.43, I²=97%, k=73 studies, n=146 980 physicians), emotional exhaustion (4.81, 3.67 to 6.30, I²=98%, k=33, n=22 699), depersonalisation (2.89, 2.37 to 3.53, I²=92%, k=30, n=22 002) and personal accomplishment (2.88, 2.28 to 3.63, I²=93%, k=32, n=27 374). Burnout was associated with threefold increases in career choice regrets compared with being satisfied with their career choice based on measures of overall burnout (3.49, 2.43 to 5.00, I²=97%, k=16, n=33 871) and emotional exhaustion (4.16, 3.34 to 5.19, I²=90%, k=4, n=2014). Burnout was associated with up to threefold increases in turnover intention compared with retention based on measures of overall burnout (3.10, 2.30 to 4.17, I²=97%, k=25, n=32 271; fig 3), emotional exhaustion (2.81, 1.80 to 4.40, I²=99%, k=16, n=23 625), and depersonalisation (1.82, 1.26 to 2.62, I²=99%, k=11, n=23 257; fig 4) but no effect was seen for personal accomplishment. Burnout was associated with small but significant decreases in productivity compared with sustained productivity based on measures of overall burnout (1.82, 1.08 to 3.07, I²=83%, k=7, n=9581), depersonalisation (1.23, 1.18 to 1.28, I²=96%, k=3, n=2969) and personal accomplishment (1.53, 1.43 to 1.63, I²=97%, k=3, n=2969). Finally, only two studies reported a significant pooled association between overall burnout and career development concerns compared with good career development (3.77, 2.77 to 5.14, I²=0%, k=2, n=3 411).

Physician burnout was associated with double the risk of patient safety incidents compared with no patient safety incidents based on measures of overall burnout (odds ratio 2.04, 95% confidence interval 1.69 to 2.45, I²=87%, k=35, n=41 059; fig 5), emotional exhaustion (2.15, 1.82 to 2.53, I²=73%, k=17, n=20213), depersonalisation (2.44, 1.84 to 3.23, I²=90%, k=14, n=19 616), and personal accomplishment (1.47, 1.20 to 1.80, I²=87%, k=14, n=19 961; fig 6). Burnout was associated with more than twofold decreases in professionalism compared with maintained professionalism based on measures of overall burnout (2.33, 1.96 to 2.70, I²=96%, k=40, n=32 321), emotional exhaustion (2.45, 1.71 to 3.53, I²=94%, k=16, n=11 861), depersonalisation (2.93, 1.93 to 4.46, I²=93%, k=12, n=10 488), and personal accomplishment (2.17, 1.36 to 3.46, I²=92%, k=9, n=2992). Burnout was also associated with up to threefold decreases in patient satisfaction compared with patients being satisfied based on measures of overall burnout (2.22, 1.38 to 3.57, I²=75%, k=8, n=10 002), depersonalisation (3.82, 1.57 to 9.29, I²=81%, k=6, n=571), and personal accomplishment (1.79, 1.44 to 2.81, I²=5%, k=5, n=527). Publication bias was found after visual inspection of funnel plots and the test statistics for most comparisons were significant (appendix 13).

Some studies had used different scales to measure burnout, therefore, we also did analyses using standardised mean difference to account for measures of different length (see forest plots in appendix 11). However, we found no significant differences in this analysis and the results were consistent with those reported when analysed with the odds ratio.

The subgroup meta-analyses for the different measures of burnout used for the outcomes job satisfaction, patient safety incident, professionalism, and turnover intention is provided in appendix 8 in supplement.

For job satisfaction, the abbreviated version of Maslach Burnout Inventory provided the largest association with burnout (odds ratio 4.62, 95% confidence interval 3.21 to 6.65, I²=99%) and smallest with the Copenhagen burnout inventory (2.59, 2.22 to 3.01, I²=95%). The Copenhagen inventory had the highest association of burnout with patient safety incidents (3.59, 2.92 to 4.42, I²=95%) and the abbreviated versions of the Maslach Burnout Inventory had the lowest association (1.68, 1.16 to 2.43, I²=79%). The association between burnout and low professionalism was greatest when using an abbreviated version of the Maslach Burnout Inventory (2.91, 1.65 to 5.13, I²=87%) and lowest when using the Copenhagen inventory (1.89, 1.69 to 2.12, I²=43%). The association between burnout and turnover intention was greatest when other non-specific measures of burnout were used (7.23, 5.93 to 3.18, I²=77%) and lowest when an abbreviated version of Maslach Burnout Inventory was used (2.53, 1.39 to 4.59, I²=98%). No significant differences were noted between the different burnout measures when tested using the ratio of odds ratios (appendix 8).
Principal findings

Discussion

Policy implications
Physician burnout deepens the workforce crisis and undermines a fundamental societal need to be in receipt of safe care. In line with our results, a survey from the US concluded that physicians at the front line of care access are at greatest risk of burnout, work longer hours, and have greater struggles with work-life balance and job satisfaction than other healthcare workers. These factors often unite as a result of burnout, and can lead to higher physician turnover rates, which in itself has substantial costs in terms of both the interruption in continuity of care relationships and high expense associated with recruiting new clinicians and staff.

Effective interventions that can curtail physician burnout are needed now more than ever as health and care systems across the globe are encountering a workforce crisis. A range of effective interventions for reducing burnout in physicians are available, including interventions focusing on improving the culture on healthcare organisations, interventions supporting individual physicians through organisational funded initiatives, and multicomponent interventions.

We found that physicians with high scores of depersonalisation are especially likely to be involved in lower quality of patient care whereas physicians with high scores of emotional exhaustion are especially likely to express intentions to leave their job. Thus, interventions targeting specific dimensions of burnout could be offered to subgroups of physicians with career concerns or adverse patient care experiences taking also into consideration their reciprocal relationships between burnout, career engagement, and quality of patient care. For example, physicians experiencing burnout might have less time or commitment to optimise the care of their patients, can take more unnecessary risks, or might lack accountability. Conversely, exposure to adverse patient events or recognition of poor quality of care can result in burnout, which in turn could force physicians to quit. This process can often be referred to as secondary trauma, particularly in relation to sentinel events or important safety incidents.

Our results highlight subgroups of physicians with burnout who could be at particularly high risk for career disengagement and provision of unsafe patient care. These physicians are mainly frontline physicians in emergency medicine and intensive care. Unsurprisingly, reports from frontline physicians advocate that the field of medicine is almost reaching crisis point with an increasing number of physicians working part time, resigning from their job, or retiring early in response to excessive workload and symptoms of burnout.

Limitations

The large heterogeneity for some of the outcomes such as, patient safety, professionalism, and job satisfaction, might have been due to variations of outcome definition. Despite this variation, we selected these definitions based on theories and consultations with stakeholders. For example, the outcome job dissatisfaction includes many different aspects such as poor work engagement, dissatisfaction with workload, and poor relationships with patients. This diversity in the outcome definition might lead to overestimating the association with physician burnout, as the prediction intervals (which conveniently express heterogeneity) suggest. Therefore, the results should be interpreted with this potential overestimation in mind. Similarly, patient safety incidents often originate from complex and interchangeable factors including the different nature and types (preventable or not), severity, dispensing stage, and systems used.

Meaning that the observed meta-analytical association with physician burnout might be more attributable to general factors of the whole organisation or work setting in healthcare. Additionally, our definition for the patient safety incidents was broad and captured any of the following incidents; potentially avoidable readmission, prescribing errors, monitoring errors, and potentially avoidable adverse events. Thus, owing to the large variation in the possible cause of a safety incident, we urge some caution when interpreting the pooled effect sizes for patient safety incidents.

The tools or questionnaires used to assess these above outcomes varied considerably and this variation did not allow us to make any meaningful subgroup or sensitivity analyses. Reaching consensus about a gold standard set of tools to assess at least some of these outcomes would be an important step for improving the precision of the effect sizes in future meta-analyses. Moreover, career engagement outcomes have conceptual similarities with the personal accomplishment subscale of burnout but exclusive focus on only the other two subscales of burnout (emotional exhaustion and depersonalisation) could introduce more bias than omitting personal accomplishment would avoid. Our findings call for future studies to examine the causal and temporal relations (eg, structural equation modelling) between the different career engagement outcomes and the three subscales of burnout.

We extracted and analysed the rawest available data in each study where possible, standardised these data using odds ratios (and standardised mean differences), and then performed several meta-regressions and sensitivity analyses to validate the findings. Despite these precautions, some degree of imprecision is still possible in the pooled effect sizes driven by variations in the aggregate data that we used. Accessing individual participant data could considerably improve the precision of the effect sizes, which we strongly recommend in future research.

Although the focus of this investigation was on physicians, this population should still be considered as working in various settings and specialties. We performed meta-regressions, which did explain some of the heterogeneity due to specialty area, but because of the low numbers of participants in some groups, these meta-regressions had to be combined into hierarchical categories of healthcare settings or specialties, which could conflate some findings.
Furthermore, because fewer patient safety incidents were found in studies with response rates above 70%, this might have contributed to possible bias in studies with lower response rates.19

Our protocol amendment resulted in excluding grey literature from this review. Although the exclusion of this type of literature could actually lead to an increase in publication bias20; the sheer high volume of additional grey literature (eg, mostly engagement surveys by medical associations or colleges and universities) were of poor quality and provided limited, if any, association data that could be used in a meta-analysis. Thus, we have captured the highest quality of evidence providing meta-analytical pertinent data. However, peer reviewed literature is likely to be subject to some exaggeration of the association of burnout when assessed against similar patient care outcomes.10 Also, only English language publications were included so other studies could have been missed.

Sensitivity analysis of the reporting method (ie, by physician or patient surveillance system) was not possible because more than 79% of the reports were self-reports by physicians for both patient safety incidents and low professionalism. The design of the self-reports by physicians for both patient safety surveillance system) was not with the same method it can have significant effects method bias is a common problem in cross-sectional studies.21 73 Nevertheless, because fewer patient safety incidents were found in studies with response rates above 70%, this might have contributed to possible bias in studies with lower response rates.19

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Conclusions
Burnout is a strong predictor for career disengagement in physicians as well as for patient care. Moving forward, investment strategies to monitor and improve physician burnout are needed as a means of retaining the healthcare workforce and improving the quality of patient care. Scalable implementation of effective interventions for physician burnout, such as those improving the culture of healthcare organisations, and multicomponent interventions are strongly supported by our findings.21 73

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Ethical approval: Not required in this study.

Data sharing: Because this meta-analysis was based on data extracted from previously published research, most of the data and study materials are available in the public domain. However, the raw data transformations, transformed data sheets and author emails
confirming the data will be made available and will be published on Mendeley.

The lead author AH (the manuscript’s guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Dissemination to participants and related patient and public communities: The results will be presented at this year’s Annual Society of Academic Primary Care (SAPC) Annual Scientific Meeting 2022 (https://sapc.ac.uk/conference/2022) and at the WELL-Med’s 4th International Meeting on Well Being and Performance in Clinical Practice (https://www.well-med.gr). The results will also be shared through press releases through the affiliated universities of the author’s involved, social media including twitter and with funders including the NIHR SPOR.

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