

# BMJ Open Systematic review of the factors and the key indicators that identify doctors at risk of complaints, malpractice claims or impaired performance

Elizabeth E Austin <sup>1</sup>, Vu Do,<sup>1</sup> Ruqaiya Nullwala,<sup>1</sup> Diana Fajardo Pulido,<sup>1</sup> Peter D Hibbert <sup>1</sup>, Jeffrey Braithwaite <sup>1</sup>, Gaston Arnolda <sup>1</sup>, Louise K Wiles,<sup>1,2</sup> Tahlia Theodorou,<sup>1</sup> Yvonne Tran,<sup>1</sup> Reidar P Lystad <sup>1</sup>, Sarah Hatem,<sup>1</sup> Janet C Long <sup>1</sup>, Frances Rapport <sup>1</sup>, Annette Pantle,<sup>3</sup> Robyn Clay-Williams <sup>1</sup>

**To cite:** Austin EE, Do V, Nullwala R, *et al*. Systematic review of the factors and the key indicators that identify doctors at risk of complaints, malpractice claims or impaired performance. *BMJ Open* 2021;**11**:e050377. doi:10.1136/bmjopen-2021-050377

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online. (<http://dx.doi.org/10.1136/bmjopen-2021-050377>).

Received 18 February 2021  
Accepted 05 August 2021



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>Australian Institute of Health Innovation, Macquarie University, Sydney, New South Wales, Australia

<sup>2</sup>Australian Centre for Precision Health, University of South Australia, Adelaide, South Australia, Australia

<sup>3</sup>Medical Council of New South Wales, Sydney, New South Wales, Australia

## Correspondence to

Dr Elizabeth E Austin;  
[elizabeth.austin@mq.edu.au](mailto:elizabeth.austin@mq.edu.au)

## ABSTRACT

**Objective** To identify the risk factors associated with complaints, malpractice claims and impaired performance in medical practitioners.

**Design** Systematic review.

**Data sources** Ovid-Medline, Ovid Embase, Scopus and Cochrane Central Register of Controlled Trials were searched from 2011 until March 2020. Reference lists and Google were also handsearched.

**Results** Sixty-seven peer-reviewed papers and three grey literature publications from 2011 to March 2020 were reviewed by pairs of independent reviewers. Twenty-three key factors identified, which were categorised as demographic or workplace related. Gender, age, years spent in practice and greater number of patient lists were associated with higher risk of malpractice claim or complaint. Risk factors associated with physician impaired performance included substance abuse and burn-out.

**Conclusions** It is likely that risk factors are interdependent with no single factor as a strong predictor of a doctor's risk to the public. Risk factors for malpractice claim or complaint are likely to be country specific due to differences in governance structures, processes and funding. Risk factors for impaired performance are likely to be specialty specific due to differences in work culture and access to substances. New ways of supporting doctors might be developed, using risk factor data to reduce adverse events and patient harm.

**PROSPERO registration number** PROSPERO registration number: CRD42020182045.

Medical practitioners have a responsibility to ensure the delivery of high quality and safe patient care. At times, the care provided may not be considered satisfactory or result in poor patient outcomes and a complaint may be lodged against a practitioner. Practitioners may receive complaints directly from patients, or through employers or organisations that do not have regulatory or licensing powers. Complaints about a clinician's conduct can

## Strengths and limitations of this study

- Comprehensive search terminology and rigorous review methodology to identify studies from a range of academic databases and grey literature sources.
- A large number of factors associated with doctors at risk of malpractice claims, complaints or impaired performance were identified.
- High levels of heterogeneity precluded conducting pooled analyses.
- Differences in healthcare culture and governance between countries may limit the generalisability of the findings.

also be lodged with practitioner licensing boards.<sup>1</sup> Some practitioner licensing boards carry out investigations into practitioner conduct, largely relying on complaints and claims from patients, peers and employers to identify potential instances of misconduct and impaired performance (ie, impairment in ability to practice).<sup>2</sup> In contrast, claims are lawsuits or statements that have been filed for compensation for injuries caused by alleged negligence or omission.<sup>3 4</sup> However, not all impaired performance results in, or justifies a complaint or claim. Impaired performance, therefore, may provide insights into quality and safety-related problems before they result in poor patient outcomes and subsequent formal complaints or malpractice claims. Factors that interfere with a doctor's ability to function pose a risk to patient safety, whether they result in complaints, claims or impaired performance.

The identification of practitioners at higher risk of complaints and subsequent claims has been examined in previous studies.<sup>5-7</sup> Several predictive factors have been identified,

and these can be categorised as system or personal risk factors. Examples of system factors include country of initial training, clinical workload and practice setting or sector (eg, solo vs group practice, private vs public health sector).<sup>8</sup> Personal, or ‘demographic’, risk factors are specific to the individual; characteristics that have been reported to affect risk of complaints include age, sex, mental state, medical specialty and number of prior complaints.<sup>7</sup> Given the increasing volume and complexity of patient care needs, as well as technical changes in clinical practice, it is necessary to gain a better insight into the factors which may lead to complaints, malpractice claims or impaired performance.

Understanding the factors contributing to risk will allow practitioner boards to make more objective assessments of doctors on receipt of a complaint and allow for better targeted monitoring of higher risk medical practitioners with imposed conditions or restrictions on their registration.<sup>9</sup> Therefore, the purpose of this systematic review was to examine the research evidence provided in peer-reviewed and grey literature, to identify the risk factors associated with complaints, malpractice claims and impaired performance in medical practitioners.

## METHODS

The published protocol (Prospero registration number: CRD42020182045) guided the review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA).<sup>10</sup>

### Search strategy

A comprehensive search strategy was developed in consultation with a research librarian to search Ovid-Medline, Ovid Embase, Scopus and the Cochrane Central Register of Controlled Trials for peer-reviewed literature and Google for grey literature. Databases were searched on 27 March 2020 for English language articles published between 2011 and 2020. This was accompanied by hand-searching the reference lists of relevant review articles. The full search strategy for all databases is shown in online supplemental appendix A.

An example, illustrating the search strategy for Scopus, is as follows:

TITLE-ABS-KEY("Doctor\*" OR "physician\*" OR "medical officer\*") AND TITLE-ABS-KEY("malpractice" OR "negligen\*" OR "impair\*") AND TITLE-ABS-KEY("risk\*")

### Eligibility criteria

Original peer-reviewed research studies and grey literature articles were included in the systematic review if they met the following additional criteria: (1) involving doctors; (2) identifying risk factors for impaired performance and malpractice claims or complaint; (3) providing disaggregated demographic characteristics about the doctors in the sample. For this review, the terms ‘physician’, ‘doctor’ and ‘medical practitioner’

are used interchangeably to refer to registered medical doctors. Articles were excluded if they were: (1) systematic reviews, reviews of reviews (umbrella reviews) and other research syntheses; (2) grey literature opinion, letters to the editor, commentary or case report; involved student doctors or patients; (3) reported aggregated sample characteristics; (4) published before 2011; (5) published in a language other than English and (6) focused on system breakdown factors (eg, informed consent processes, organisational use of medical device or treatment, management processes) defensive medicine or litigation.

### Screening and data extraction

The results of the searches were entered into EndNote citation management software (V.8.2; Thompson Reuters, New York, New York, USA), and duplicates were removed. The study titles and abstracts were entered into Rayyan, a free web and mobile application screening tool.<sup>11</sup> For each study, title and abstract were independently screened by pairs of reviewers for inclusion according to the prespecified criteria. Disagreements were resolved via discussion. Abstracts flagged as potentially relevant by reviewers underwent full-text review, again by independent pairs of reviewers.

The data were extracted independently by pairs of reviewers into a form specifically designed for the review and piloted for usability prior to data extraction. The extraction form included author(s) name, year of publication, country where the study was conducted, study design, characteristics and risk factors of doctors and related data (eg, measures of relative risk such as OR, rate ratios, HRs), study limitations and study results. Where disaggregated data were reported for multiple professions, only data reported for doctors were extracted.

### Risk of bias

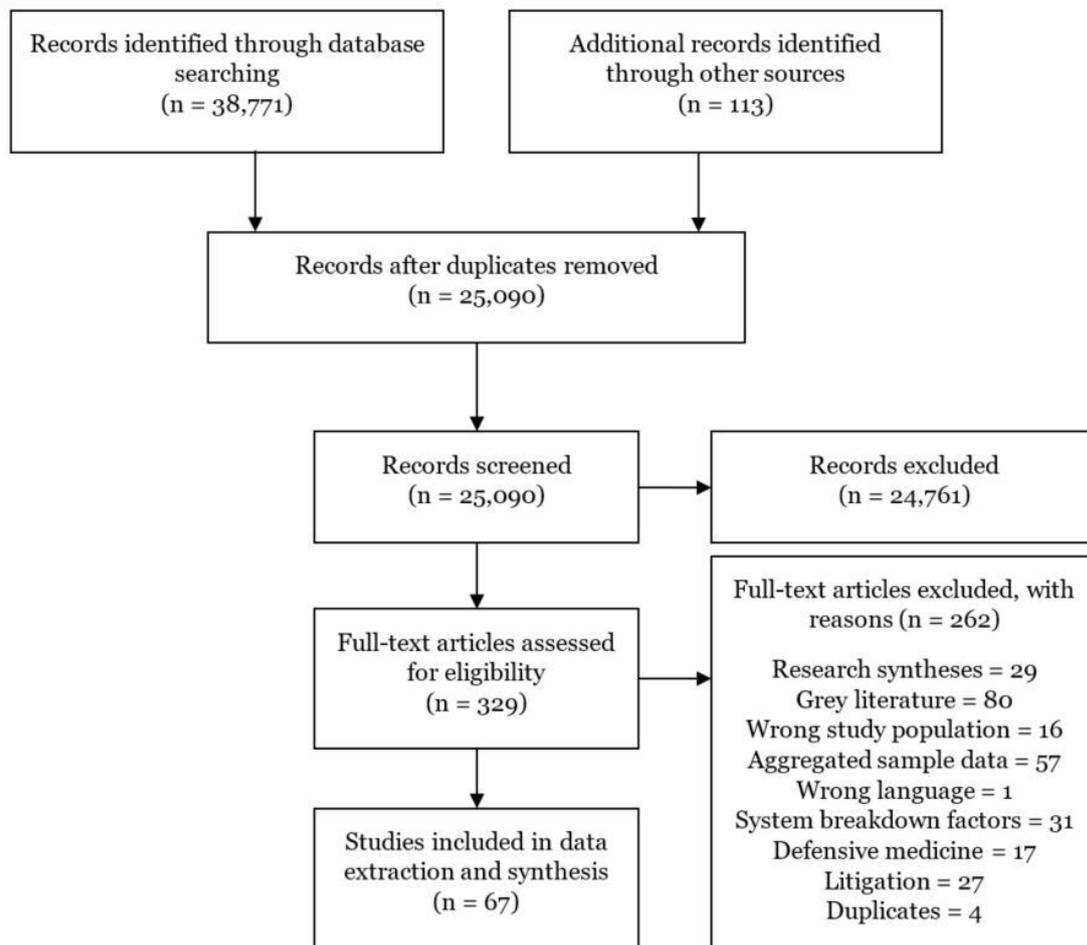
Methodological quality of the included peer-reviewed studies was assessed using the following The Joanna Briggs Institute critical appraisal tools: Checklist for Cohort Studies, Checklist for Analytical Cross-Sectional Studies, Checklist for Randomised Controlled Trials, Checklist for Quasi-Experimental Studies and the Checklist for Case-Control Studies.<sup>12 13</sup> Tools were selected based on study design and piloted on a sample of six research papers. Study quality was appraised by pairs of independent reviewers, with disagreements resolved via discussion.

### Data processing and analysis

A narrative synthesis was performed for this review. Synthesis included numerical statistical summaries, textual commentaries, and tabular and graphical representations.

### Patient and public involvement

Patients and the public were not involved in the design and conduct of this review.



**Figure 1** PRISMA flow diagram for study selection. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.

## RESULTS

### Literature search

The combined searches yielded 38 884 articles. Following removal of 13 794 duplicates, 25 090 abstracts and 329 full-texts were reviewed, with 67 articles meeting inclusion criteria. **Figure 1** presents the PRISMA diagram for the identification, screening, and inclusion processes. The grey literature search identified 11 reports, with three meeting the inclusion criteria.

### Description of the included studies

Characteristics of the included studies are in [table 1](#). Publication years of included studies (2011–2020) are provided in [figure 2](#). Most studies were conducted in the USA (60%, n=40), followed by Australia (12%, n=8). Two studies were conducted each in Canada, Denmark, Japan, Taiwan and the UK. One study was conducted in each of Chile, Columbia, Egypt, France, India, Iran, Italy, The Netherlands and Spain.

### Quality assessment

Most studies were assessed as having considerable or potential flaws or limitations in their design, conduct or analysis that could distort the results (see [table 2](#)).

### Key factors

The included 67 articles identified 23 factors associated with doctors at risk of malpractice claims, complaints and/or impaired performance. The 23 factors, categorised as either demographic or workplace related, are shown in [figure 3](#). Due to the variety of different settings and methods, it was deemed that the methodological heterogeneity was too broad to permit the calculation of pooled results. The results from studies are therefore reported in the form of a narrative synthesis.

### Demographic characteristics

#### Age

#### Complaints

Older doctors were found to be at 1.4 times greater risk of complaints when compared with younger doctors.<sup>9</sup> One study found older doctors (aged 61–70 years) to have the lowest complaint rates.<sup>14</sup>

#### Claims

Older doctors were generally found to be at 1.1–1.4 times greater risk of malpractice claims or complaints when compared with younger doctors<sup>15 16 17</sup>. (One study investigating the predictive impact of age on claims

**Table 1** Characteristics of the included peer reviewed and grey literature publications

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
AbuDagga <i>et al.</i> , 2016, USA <sup>67</sup>	Cross-sectional study	2003–2013	1039 doctors	Age, 9.6% of doctors with sexual-misconduct-related reports were aged between 20 and 39 years, while this age group makes up 23.3% of the US doctor population ( $p<0.001$ ). 28.6% of the physicians with sexual-misconduct-related reports (ie, 1039) were in the 40–49 age group vs the 24.9% US physician population in this age group ( $p=0.006$ ). The 50–59 age group made up 35.2% of the physicians with sexual-misconduct-related reports during that 10-year period, despite this age group making up 24.8% of the US physician population ( $p<0.001$ ). Clinical setting or sector. Most sexual-misconduct-related malpractice-payment reports related to incidents in the outpatient setting, and this proportion was significantly greater than that for malpractice-payment reports related to other offences (83.8% vs 39.5%, $p<0.001$ ). Conversely, far fewer sexual-misconduct-related malpractice-payment reports concerned incidents in the inpatient setting compared with malpractice-payment reports related to other offences (8.4% vs 44.9%, $p<0.001$ ). Smaller proportions of sexual-misconduct reports concerned both inpatient and outpatient setting in both report types (3.0% and 9.1% in sexual-misconduct and malpractice-payment reports related to other offences, respectively, $p=0.01$ ). Claims History 12.9% of the doctors with sexual-misconduct-related reports had multiple reports of the same type.
Alamet aler <i>et al.</i> , 2011, Canada <sup>16</sup>	Cohort study	2000–2009	606 doctors	Gender. Most of the doctors disciplined by professional colleges in Canada were male (92%) Specialty. The most common specialties of doctors subject to disciplinary action were family medicine (62%), psychiatry (14%) and surgery (9%). These specialties comprise 51%, 7% and 10% of the total doctor population in Canada, respectively. Time in practice. For disciplined doctors, the average no of years from medical school graduation to disciplinary action was 28.9 (SD=11.3). Clinical practice setting or sector. Most of the doctors disciplined by professional colleges in Canada were independent practitioners (99%). Geographical location. The highest proportions of doctors were disciplined in British Columbia (0.25%) and, collectively, in the Eastern provinces (0.26%). Medical training location. A trend for more internationally trained doctors to be the subject of claims. While 23% of Canadian doctors were trained internationally, 33% of doctors subject to claims were trained internationally. Claims history. Fifty-one of the disciplined doctors committed 64 repeat offences, accounting for a total of 113 (19%) offences. The median time between the first and second offences was 2 years (IQR 1–4 years).
Anderson <i>et al.</i> , 2012, USA <sup>49</sup>	Prospective cohort study	2002–2004	34 postgraduate year 1 internal medicine resident	Cognitive performance. Residents' PVT response times deteriorated over a single 24–30hours shift ( $p<0.001$ ). Performance on the fifth and sixth shift was significantly worse than on the first shift ( $p<0.01$ ). There was a significant acute (ie, time on shift) and chronic (successive EDWS) interaction on PVT response times ( $p<0.05$ ).
Azab, 2013, Egypt <sup>17</sup>	Cross-sectional study	2008–2009	91 medical malpractice claims	Gender. Doctors who were defendants in malpractice claims were more frequently male than female. Specialty. 73% of the claims were against specialists. Obstetrics/gynaecology was the most frequent specialty of the defendant doctors of the claims (40.7%), followed by surgery (24.2%) and internal medicine (8.8%). Geographical location. Regarding the locations of the events of malpractice claims, urban areas were more frequent than rural areas. Clinical practice setting or sector. The private healthcare sector was a more frequent location than the public healthcare sector. Also, claims that occurred in inpatient healthcare settings were more frequent than those in outpatient healthcare settings. $\chi^2$ test showed no significant differences in the proportions of all outcome categories between inpatient and outpatient groups.
Baker <i>et al.</i> , 2013, USA <sup>36</sup>	Retrospective cohort study	1955–2010	8401 radiologist (2600 radiologist with malpractice claims)	Gender. Male doctors were more likely to be a defendant in a case than female doctors, even when controlling for age and state of residence (OR=1.47; 95%CI 1.23 to 1.65)

Continued

**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Balch <i>et al.</i> , 2011, USA <sup>64</sup>	Cross-sectional study	2010	7164 surgeons	Specialty. Those surgical specialties with the highest rate of a recent malpractice were neurologic (31%), cardiothoracic (29%), general (28%), colorectal (28%) and obstetrics and gynaecology (28%), and the lowest rate specialties were otolaryngology (12%), ophthalmology (12%), and breast surgery (14%). Breast surgeon 0.389 (0.267–0.567), ophthalmologic surgeon 0.365 (0.219–0.606), otolaryngology surgeon 0.368 (0.267–0.508), plastic surgeon 0.583 (0.437–0.777), transplantation surgeon 0.465 (0.277–0.779), urological surgeon 0.691 (0.511–0.933), vascular surgeon 0.713 (0.556–0.915). Compared with general surgery as a specialty, seven subspecialties had a lower risk of recent malpractice, and none had a higher risk. Clinical workload. The no of hours worked per week and no of nights on call per week were associated with recent malpractice suit involvement after controlling for other factors. Hours worked per week: 14.5%–40 hours, 24%, 40–49, 22.4%, 50–59, 26%, 60–69, 26.1%, 70–79, 29.1 >80 hours weeks; OR 1.006 (95% CI 1.002 to 1.009). Clinical practice setting or sector. Surgeons in active military practice or at a Veteran's Affairs hospital had a lower risk of experiencing recent malpractice, but there was no difference between those in a private or academic practice setting. Geographical location. The per cent of doctors with a malpractice suit in the last 2 years: and the size of the community they practice in: 26% of doctors practice in communities with fewer than 5000 people, 24.8% practice in communities of 5001–20 000 people, 27.5% practice in communities of between 20 001 and 50 000, 26.8% practice in communities of between 50 001 and 100 000, 23.8% practice in communities of between 100 001 and 500 000, and 24% practice in communities of over 500 000.
Rainer/Bernauer <i>et al.</i> , 2019, Chile <sup>1</sup>	Cross-sectional study	2014–2015	110 malpractice cases	Gender. 83.1% of the defendants in Chilean Supreme Court rulings in medical malpractice cases were male, while only 16.9% were female. Specialty. The specialty of the respondent doctor was reported in 57 cases, and 60 specialists were involved. Gynaecologists faced suits more frequently than any other type of specialist. Clinical practice setting or sector. In terms of malpractice rulings there were 81 in the public health system, including primary care centre, hospital(70), hospital and medical professional(9), public health institute(1). There were 28 rulings regarding the private health system including clinics(6), clinic and medical professional(19), medical professional alone(4).
Birkeland and Bogh 2019, Denmark <sup>39</sup>	Retrospective cross-sectional study	2007	3930 GPs; Of which 298 involved in a patient complaint	Clinical practice setting or sector. Litigation was less frequent in settings with higher income patient populations (OR 0.65) Clinical workload. Larger patient list size was associated with higher rates of malpractice litigation (OR, 1.05 per 100 patients) when adjusting for GP output in terms of patient encounters per time unit, the association between GP list size and patient complaint cases were no longer statistically significant (due to collinearity). However, the significant association with tax figures persisted.
Bishop <i>et al.</i> , 2011, USA <sup>75</sup>	Cross-sectional study	2005–2009	10 739 claims	Clinical practice setting or sector. Events in the outpatient setting were similar to the no in the inpatient setting.
Bismark <i>et al.</i> , 2011, Australia <sup>51</sup>	Case-controlled study	2000–2009	384 doctors (96 doctors with 4 or more complaints (exp), 288 doctors with a single complaint (control))	Gender. Univariate analyses showed that male doctors were more likely to be the subject of four or more complaints than doctors with only one complaint. Claims history. Among doctors in private practice in Victoria, 20.5% (95% CI 19.7% to 21.3%) experienced at least one complaint about the decade. A small group of doctors in private practice in Victoria account for nearly 18% of complaints. Specialty. Multivariate analyses showed that surgeons (OR, 8.90; 95% CI 3.69 to 21.50) and psychiatrists (OR, 4.59; 95% CI 1.46 to 14.43) had higher odds of being in the complaint-prone group than GPs. Geographical location. There was no significant difference between complaint prone doctors and control doctors for practice location. The adjusted OR for practice location was not significant (rural: 7% complaint prone doctor, 14% control doctors; urban: 93% complaint prone doctor, 86% control doctor; 2.51 (0.88–7.12). Medical training location. Doctors trained internationally had lower odds of being complaint-prone than those trained in Australia (OR, 0.31; 95% CI 0.13 to 0.72). Time in practice. Univariate analyses showed that doctors with four or more complaints were more likely than doctors with only one complaint to have been in practice for at least 30 years.
Black <i>et al.</i> , 2019, USA <sup>70</sup>	Cohort study	1992–2016	863 767 doctors	Claims history. A single paid claim in the prior 5 years nearly quadruples the likelihood of a paid claim in the next 5 years, and dramatically increases the likelihood of two future paid claims. More generally, the no of prior paid claims strongly predicts both the likelihood of having future paid claims and the expected no of future claims.

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Boyll <i>et al</i> , 2018, USA <sup>63</sup>	Cross-sectional study	2017	129 plastic surgeons	Gender. In a survey of aesthetic plastic surgeons, 92% of those self-reporting to have been involved in medical malpractice claims were male (81/88). Time in practice. Doctors who self-report being involved in a malpractice claim have been in practice longer: 4.6% of doctors reporting malpractice experience have been in practice 10 years or less; 36.4% have been in practice between 11 and 25 years; 59% report over 25 years in practice. Skills. The use of procedure-specific brochures was associated with a significant reduction in the likelihood of being sued (OR (95% CI) 0.02 (0.002 to 0.29); p=0.004). It is notable, however, that only 50% of respondents who provide educational brochures follow-up to determine that the patient has read and understood them before surgery. Insurance. Aesthetic plastic surgeons whose insurance providers required periodic educational courses were less likely to be sued (OR (95% CI) 0.40 (0.17 to 0.96); p=0.04).
Brooks <i>et al</i> , 2012, USA <sup>29</sup>	Cohort study	1995–2001	Colorado n=72, national n=730	Claims history. 10% of the Colorado sample had a history of disciplinary action, while 14% of the national sample had a history of disciplinary action. 6% of the Colorado sample had a history of malpractice claims and 7% of the national sample had a history of malpractice claims. Substance use. For doctors in PHPs, alcohol is the primary drug used (49%–56%), followed by opioids (32%–34%) and stimulants (7%–8%). The subsample (single state) abused more than one substance ( $\chi^2=13.929$ , p<0.001) to a greater extent than the national sample of doctors.
Brookset al <i>et al</i> , 2012, USA <sup>25</sup>	Retrospective cohort study	1986–2005	120 physicians monitored for boundary violations	Age. PHP clients with boundary violations were between the ages of 40 and 49 years (48% of the sample), higher than the health programme's general population, in which 33% fell into the 40–49 years old age range ( $\chi^2=9.778$ ; df=4; p<0.002). Gender. 93% of doctors monitored for boundary violations were and 7% were female. Marital status. Approximately 63% of doctors with boundary violations were married. Specialty. Boundary violations varied by specialty, with psychiatrists representing the greatest percentage of violators, followed by family practice and internal medicine doctors (18% and 15%, respectively). The psychiatrists represented a higher percentage than we normally see at the health programme (22% vs 7%; 2 32.401; df 1; p<0.000). Claims history. Approximately 18% of doctors with boundary violations had reported some type of prior incident. Substance use. Diagnoses varied considerably among doctors with boundary violations and included mood disorders (22%), adjustment disorder (11%), substance dependence/abuse (12%), personality disorder (8%), anxiety (4%), sexual disorder (5%). The duration of monitoring by the PHP for patients with a SUD spanned up to 4 years. Mental health. Diagnoses varied considerably among doctors with boundary violations, although problems with mood disorders, adjustment disorder and substance dependence/abuse were most common.
Brooks <i>et al</i> , 2013, USA <sup>33</sup>	Retrospective cohort study	1983–2010	682 PHP clients	Age. Doctors with malpractice claim history were more likely to be older: mean age 50 vs mean age 44 (OR=1.06, p<0.01). Gender. Doctors with a malpractice claims history were more likely to be male than female (OR=2.27, p<0.05). Specialty. Several specialties showed an elevated risk for malpractice claims: family practitioners (OR=3.55, p<0.05), anaesthetists (OR=4.25, p<0.05), obstetricians/gynaecologists (OR=17.2, <0.01) and surgeons (OR=15.1, p<0.01).
Brooks <i>et al</i> , 2017, USA <sup>23</sup>	Cross-sectional study	1986–2014	124 doctors	Age. The average age of doctors presenting to a PHP with cognitive impairment was 51 (SD=12.9); age not a good predictor of impairment. Mental health. Of doctors who presented to a PHP, 28% had mood/anxiety disorders or mental health treatment side effects. Substance use. From a PHP database, substance use was a principle reason for impairment for 9% of doctors. Functioning (ie, change in work performance and overall coping) usually worsened for clients with a SUD throughout their involvement in the programme. Cognitive performance. Doctors often presented with non-cognitive issues (eg, substances, performance, mood) although, ultimately, four principal reasons for impairment were identified: (1) diseases of (or in) the brain (48%); (2) mood/anxiety disorders or treatment side effects (28%); (3) substance use (9%) and (4) traumatic brain injury (7%). MoCA scores averaged 27 points (SD=2.8) among 48 clients, just above the suggested cut-off. There was little variability by impairment reason or age. It is likely that doctors demonstrate a ceiling effect with this tool given that most—even impaired—scored high, potentially masking cognitive issues.

Continued

**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Brooks <i>et al.</i> , 2011, UK <sup>27</sup>	Cross-sectional study	2008–2010	200 doctors who are patients of PHP	Gender. Slightly more males (113 patients, 56.5%) presented to the PHP. 71.4% of the patients presented with addiction problems were male. Mental health. From a PHP, 103 patients (51.5%) were diagnosed with mental health problems only; and 52 (26%) were diagnosed with comorbid disorders, that is, two or more of the following: mental health problems, addiction and physical health problems. Seven patients (3.5%) had no specific diagnosis recorded in their notes. Overall, 151 patients (75.5%) were diagnosed with some form of mental health problem (this includes those with a mental health problem only and those with comorbid conditions including a mental health condition). These included depression (46.5% of the original cohort); anxiety (11%); stress (5.5%); bipolar disorder (4.5%) and adjustment disorders (2.5%). Other mental health problems included eating disorders, post-traumatic stress disorder, ADHD, affective psychoses, self-harm and postnatal depression. Specific percentages were not given for confidentiality reasons. Substance use. PHP self-referred patients, 36 (18%) of which were diagnosed with addiction problems only, and 52 (26%) were diagnosed with comorbid disorders, that is, two or more of the following: mental health problems, addiction and physical health problems. Physical health. PHP self-referred patients, 2 (1%) were diagnosed with only a physical health problem and 52 (26%) were diagnosed with comorbid disorders, that is, two or more of the following: mental health problems, addiction and physical health problems.
Buhl <i>et al.</i> , 2011, USA <sup>28</sup>	Retrospective 5-year longitudinal cohort Study	1995–2001	862 (144 surgeons with 636 non-surgeon physicians)	Age. On average, PHP enrollees were in their 40s. Gender. Of the surgeons and non-surgeons enrolled in PHPs, men constituted at least 86% of each group. Specialty. Surgeons were significantly more likely than non-surgeons to enrol in a PHP because of alcohol-related problems (OR, 1.9; 95% CI 1.3 to 2.7; p=0.001). Surgeons were less likely to enrol to a PHP because of opioid use (OR, 0.5; 95% CI 0.3 to 0.8, p=0.002). Substance Use. Surgeons and non-surgeons differed in their primary substance of abuse. The percentage of surgeons (62.2%) enrolled because of alcohol-related problems was significantly higher than the percentage of non-surgeons (46.9%) (OR, 1.9; 95% CI 1.3 to 2.7; p=0.001). Surgeons (23.1%) were significantly less likely than their non-surgeon peers (36.6%) to enrol in a PHP because of opioid use (OR, 0.5; 95% CI 0.3 to 0.8; p=0.002). Perhaps because most surgeons enrolled in a PHP because of alcohol dependence, they were less likely to have a history of intravenous drug use (8.1%) than non-surgeons (14.4%) (OR, 0.5; 95% CI 0.3 to 1.0; p=0.05). Similarly, fewer surgeons (43.1%) than non-surgeons (52.8%) had been abusing more than one substance immediately before enrolment (OR, 0.7; 95% CI 0.5 to 1.0; p=0.03). Although these differences were statistically significant, the OR for each indicated a 95% CI with the upper bound at 1.0; therefore, we cannot report with confidence that these differences were significant.
Carlson <i>et al.</i> , 2018, USA <sup>60</sup>	Cross-sectional study	2010–2014	1029 doctors, 96 malpractice claims	Time in practice. Increasing the total no of years in practice (adjusted OR 1.04, per year 95% CI 1.02 to 1.06) and total visits seen as the attending doctor of record (adjusted OR 1.09 per 1000 visits, 95% CI 1.05 to 1.12) were associated with being named in a malpractice claim. When stratified by visit volume, there was a direct relationship between visit volume and malpractice risk that increased with rising years in practice) Clinical Workload. The total no of visits seen and the total no of years in practice were higher among those named in a claim (13787 visits, 15.7 years) vs not named in a claim (7572 visits, 11.8 years). While many providers were new to the practice of EM, the mean (SD) practice duration was 11.8 (9.4) years for those not named in a claim compared with 15.7 (9.2) for those named in a claim. Supplemental analyses published with this article which excluded those early in their career and the extremes of volumes of visits in practice showed that the results did not appreciably change. Of the nine independent variables, only increasing the total no of years in practice (adjusted OR 1.04, per year 95% CI 1.02 to 1.06) and total visits seen as the attending doctor of record (adjusted OR 1.09 per 1000 visits, 95% CI 1.05 to 1.12) were associated with being named in a malpractice claim. When stratified by visit volume, there was a direct relationship between visit volume and malpractice risk that increased with rising years in practice.
Carney <i>et al.</i> , 2016, USA <sup>64</sup>	Cross-sectional study	2013–2014	207 dermatopathologists	Age. Being older is associated with having a malpractice claim. The mean age of doctors reporting past malpractice experience was 57 years of age, compared with those who have never been sued is 48 years of age (p<0.001). Time in em. The greater no of years interpreting melanocytic lesions was associated with having a malpractice claim (>20 years 52.9% vs 20.1%, p<0.0001)
Casali <i>et al.</i> , 2018, Italy <sup>72</sup>	Cross-sectional study	2002–2013	635 orthopaedic malpractice claims	Clinical practice setting or sector. More than 95% of the claims concerned hospital-linked malpractice cases, with general hospitals accounting for 89% and specialised orthopaedic hospitals accounting for only 11% (p<0.001). Weekend hospital procedures were the target in 12% of all the claims. Claims History. The estimated cumulative risk of an orthopaedist in the archive receiving at least one malpractice claim was 19.3%. During the same period, the mean annual risk that an orthopaedist in the archive would be the subject of a malpractice claim was 6%.

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Chen <i>et al.</i> , 2013, Taiwan <sup>44</sup>	Cross-sectional study	2012	839 physicians	burn-out. 36.8% of doctors surveyed reported a moderate level of burn-out, and 13.1% with a high level of burn-out in emotional exhaustion. For depersonalisation, 32.5% of doctors surveyed reported a moderate level of burn-out, and 9.3% reported a high level of burn-out. For the personal accomplishment type, 49.9%, 49.3% and 0.7%, respectively, had high, moderate and low levels of burn-out. Doctors who had medical malpractice experience had a higher risk of high-level burn-out in personal accomplishment than those with no experience (p=0.098). Claims history. Doctors who have had medical malpractice experience had a higher risk of high-level burn-out in personal accomplishment than those with no experience (p=0.098).
Cooper <i>et al.</i> , 2018, USA <sup>21</sup>	Case-controlled study	2014–2016	60 physicians with probable NCD and two comparison groups of 60 physicians each	Age. The doctors with evidence of NCDs (cases, N=15) were on average 72.5 years of age (SD=9.1 years). The age range was 59–90 years of age, with seven doctors (47%) older than 75 years of age. Cognitive performance. Doctors with evidence of NCDs (defined as having a deficit in recent memory, executive functioning, social cognition, global functioning, or visuospatial functioning during the study period) had significantly greater numbers of overall UPC in the previous 4 years than age-matched and sex-matched comparisons. And were 20 times more likely to have at least one complaint containing any word describing NCDs than the two comparison groups combined. Specialty. Six (40%) of participants practised in a surgical specialty. Medical training location. Clinical practice setting or sector. Doctors with evidence of NCDs, 12 (80%) practised in academic settings. Certification and registration status. There were 15 doctors with evidence of NCDs (defined as having a deficit in recent memory, executive functioning, social cognition, global functioning or visuospatial functioning during the study period) of which 3 (20%) lacked board certification. Age-matched and sex-matched comparisons were significantly less likely to lack board certification.
Cottler <i>et al.</i> , 2013, USA <sup>42</sup>	Cross-sectional study	2008–2009	99 physicians referred to PHP due to suspected impairment, 99 matched controls	Mental health. Psychiatric disorders between referred doctors and the matched comparison group. Compared with a matched comparison group of doctors, fewer doctors in a PHP met the criteria for DSM-IV major depressive episode (OR 0.50, 95% CI (0.28 to 0.90)) specific phobia (OR 0.21, 95% CI (0.06 to 0.75)), and obsessive-compulsive disorder (OR 0.04, 95% CI (0.01 to 0.29)), with doctors meeting criteria at lower rates compared with their matched comparison group.
Dallal <i>et al.</i> , 2014, USA and Columbia <sup>61</sup>	Cross-sectional study	2011	330 physicians, 156 reported medical malpractice claim	Time in practice. The likelihood of having at least one bariatric-related professional liability lawsuit was independently predicted by the no of years in practice (OR=1.03; p=0.03). Clinical workload. The likelihood of having at least one bariatric-related professional liability lawsuit was independently predicted by a career volume of over 1000 procedures (OR 8.5; p=0.01).
Del Bene and Brandt, 2020, USA <sup>22</sup>	Cross-sectional study	NR	69 doctors (30 physicians, 39 urologists)	Age. Doctors referred for neuropsychological evaluations were on average 64.27 years of age (SD=12.53). The average age of the impaired doctors was about 14 years older than that of the ambiguous doctors. Gender. The doctors with evidence of NCDs (cases, N=15) were predominantly male. Most of the doctors referred for neuropsychological evaluations were male; 26 male and 4 female. Specialty. Clinically referred group consisted of 20% GP/family medicine/ internal medicine, 23% psychiatry, 7% urology, 50% other. Time in practice. The contemporaneous work status of the doctors in the two subgroups of referred doctors differed markedly (likelihood v2 ¼ 12.20, p ¼ 0.016). Only two (16%) of the doctors categorised as impaired were currently working at either full or reduced capacity. Most of them were either on a medical leave of absence or suspended (38%) or retired due to age or disability (36%). Among those classified as still ambiguous, 57% were currently working and 31% were suspended or on leave of absence). Clinical workload. The contemporaneous work status of the doctors in the two subgroups of referred doctors differed markedly (likelihood v2=12.20, p=0.016). Only two (16%) of the doctors categorised as impaired were currently working at either full or reduced capacity. Most of them were either on a medical leave of absence or suspended (38%) or retired due to age or disability (36%). Among those classified as still ambiguous, 57% were currently working and 31% were suspended or on leave of absence. Cognitive Performance. Of the doctors clinically referred for neuropsychological assessment, doctors categorised as impaired: 43% had a known neurological disease, 14% known psychiatric (eg, Parkinson's, major depression), 43% suspected cognitive and 0% had an unknown/ other. Doctors categorised as ambiguous: 25% had a known neurological disease, 25% known psychiatric (eg, Parkinson's, major depression), 13% suspected cognitive and 38% had an unknown/ other.

Continued

**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Elkin <i>et al</i> , 2011, Australia <sup>31</sup>	Cross-sectional study	2000–2009	485 doctors	Gender. Male doctors accounted for 91% of the cases disciplined for professional misconduct in Australia and NZ. Male doctors were disciplined at over four times the rate of female doctors (ie, 91 vs 22 cases per 100 000 registered doctor-years). Specialty. Nearly two-thirds of the cases were against GPs, who had the third-highest case rate (131 per 100 000 registered doctor-years), behind obstetrician-gynaecologists (224) and psychiatrists (178). Time in practice. Disciplined doctors gained their primary medical qualification a mean of 21.4 years before committing the misconduct (range, -4 to 55 years; SD, 9.8 years), which is identical to the estimated mean years since qualification for the wider doctor population in the relevant jurisdictions. Clinical practice setting or sector. The misconduct at issue occurred in a clinical setting in two-thirds of cases, with most clinical cases (217/293(74%)) occurring in non-inpatient settings. Geographical location. 1/3 of cases (32%) occurred in Victoria and just over 1/4 (27) occurred in NSW, even though there were more doctors registered to practice in NSW than there were in Victoria. 18% occurred in Western Australia, 8% in Queensland.
Elkin <i>et al</i> , 2012, Australia <sup>33</sup>	Cross-sectional study	2000–2009	485 cases (doctors found guilty of professional misconduct)	Gender. Male doctors accounted for 92% of the professional misconduct cases Specialty. 65% were against GPs. The next most prevalent specialties of the doctors involved were psychiatry (10%), surgery (7%) and obstetrics/gynaecology (6%). Time in Practice. The doctors had qualified in medicine an average of 21.4 years before committing the misconduct at issue. Claims History. 28% of doctors found guilty of misconduct were also involved in a previous misconduct matter
Faisant <i>et al</i> , 2018, France <sup>23</sup>	Cross-sectional study	1986–2011	539 cases	Gender. 76.3% of the defendants in criminal medical malpractice cases were men, 11.6% were women and 12.1% were not gender differentiated Specialty. The majority of defenders were obstetrician-gynaecologists (89, 13%), followed by intensive care anaesthetists (75, 11%), GPs (46, 6.7%), orthopaedic surgeons (36, 5.3%), psychiatrists (33, 4.8%) and visceral surgeons (31, 4.5%). Concerning 203 defendants (29.7%), the specialty of the offender was not specified. Those found guilty: 39.5% of the defendants were doctors, 32.9% surgeons, 0.1% students and 27.5% were not distinguished regarding specialism). Eleven defendants were resident doctors; three were doctors in medicine during the first years after the end of their education: one a locum, another the holder of a nontenured clinical post and another a non-tenured university post Clinical practice setting or sector. Over the events studied in this work, 61.1% occurred in institutions, 15.1% in private practices, 0.2% in environments combining public/private practices and 23.6% in unspecified locations. Concerning the sectoral breakdown of the cases, 39.2% occurred in the private sector, 25.9% occurred in the public sector, 0.3% in a combined private/public environment and 34.6% were not described regarding a sector.
Fathy <i>et al</i> , 2018, USA <sup>14</sup>	Cohort study	2002–2015	1342 doctors	Age. The oldest age band of ophthalmologists (>70 years) had the longest mean time to the first complaint and the lowest complaint rate (ie, 0.71 complaints per 1000 follow-up days vs 1.41 for age 61–70 years, 1.84 for 51–60 years, 2.02 for 41–50 years and 1.88 for 31–40 years). The two youngest age bands were associated with statistically significant shorter time to the first complaint. Medical training location. Training location was a covariate in the analysis; however, no statistically significant differences were found between internationally and locally trained doctors in terms of claims. Geographical location. Ophthalmologists at regional medical centres had a lower hazard rate for time to the first complaint than ophthalmologists at academic medical centres Claims history. Of the sampled ophthalmologists, 42% were associated with at least 1 UPC. The top 5% (n=67) were associated with a mean (SD) of 19.2 (8.3) UPCs over their most recent 4 years in the study
Finkelstein and Zhu 2017, USA <sup>85</sup>	Retrospective cohort study	1991–2010	137 590 claims	Age. Doctors with frequent malpractice claims were involved in their first malpractice claim earlier in their career than doctors who do not have frequent malpractice claims. The mean age in the group of frequent malpractice claims group at the time of the first offence was 40.15±9.00, compared with 41.81±10.78 in the other group. There is a significant difference in the average age between two groups (p<.2e-16). Specialty. The percentage of anaesthesia, medication, monitoring and behavioural health-related allegations was higher in the non-frequent offender group while obstetrics related allegations were higher in frequent offender group. Time in practice. The average time between graduation and first offence among frequent offenders was shorter than among non-frequent offenders (27.63 years vs 28.36 years, p=8.313e-08).

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Finlayson <i>et al.</i> , 2013, USA <sup>28</sup>	Cohort study	2001–2012	381 doctors	Age. Doctors referred for psychiatric examination with V-CAP were more likely to be middle-aged (63% were 45–64 years old vs 42% 2009 AMA, $p<0.001$ ) compared with general doctor demographic characteristics published for 2009 by the AMA. Gender. V-CAP referrals were more likely to be male compared with general doctor demographic characteristics published for 2009 by the AMA (90% vs 70%, $p<0.001$ ). Ethnicity. The V-CAP referrals (eg, doctors and resident trainees) were more likely to be white compared with general doctor demographic characteristics published for 2009 by the AMA (84% vs 71%, $p<0.001$ ). Mental Health. The no of Axis I psychiatric disorders diagnosed for each subject was typically one or none (67%). The diagnosis made most frequently was SUD (35.2%) followed by unipolar depression (19.4%). The group of doctors who were referred for disruptive behaviour problems had statistically significantly lower overall rates of primary psychiatric (Axis I) diagnosis than among the other referral groups (48% vs 79%–96%, $p<0.001$ ). Approximately half of the referrals received an axis II diagnosis, most common personality traits. The group of doctors who were referred for disruptive behaviour problems had increased frequency of axis II personality diagnoses (90% vs 48%–66%, $p<0.001$ ). Specialty. In comparison with published distributions of specialties in the 2009 AMA tables, family medicine (16% vs AMA 11%) and surgery (21% vs AMA 14%) tended to be over-represented in the V-CAP referrals, while internal medicine (28%) tended to be under-representative of the general US doctor population in 2009 (41%) ( $p<0.001$ ). Medical training location. V-CAP referrals for fitness-to-practice were more likely to have been trained in the US compared with general doctor demographic characteristics published for 2009 by the AMA (83% vs 74%, $p=0.002$ ).
Gaitan-Duarte <i>et al.</i> , 2019, Columbia <sup>6</sup>	Case-control study	1999–2014	322 obstetricians (64 cases, 258 controls)	Clinical practice setting or sector. Malpractice claims were more likely to stem from adverse events in private institutions (OR=2.26, 95% CI 1.13 to 4.50).
Gómez-Duran <i>et al.</i> , 2017, Spain <sup>18</sup>	Cross-sectional study	2005–2014	725 paid claims against 808 physicians	Age. Doctors' age was not associated with recurrent malpractice claims (HR 1.01 (95% CI 0.99 to 1.03), $p=0.119$ ). Gender. Doctor's gender was not associated with recurrent malpractice claims (HR=0.93 (95% CI 0.53 to 1.63), $p=0.822$ ). Specialty. Obstetrics and gynaecology (20.4%), traumatology and orthopaedic surgery (17.5%), plastic surgery (10%) and general surgery (9.7%). Compared with the risk of recurrence among no-surgery-related specialties, the risk of recurrence was approximately double among plastic surgeons, general surgeons and traumatology and orthopaedic surgeons. Claims history. Doctors' risk of future paid claims was increased if they had more than one previous paid claim (OR: 1.87, 95% CI 1.67 to 2.1)
Hamasaki and Haghigahara 2011, Japan <sup>4</sup>	Retrospective cross-sectional study	1990–2009	366 cases	Gender. In 90.7% of the medical malpractice litigation cases in Japan, the doctor was male and in 9.3% the doctor was female. Clinical practice. Setting or sector. Regarding the location of the doctors explanation, 21% occurred in a clinic, 78% in a hospital (inpatient ward) ( $p<0.001$ ).
Makowskiet <i>et al.</i> , 2019, USA <sup>20</sup>	Cross-sectional study	2016	245 community physicians	Age. Being younger than 50 years of age was associated with higher SRI score. Gender. There was no association with between gender and SRI. Fatigue. A survey of community doctors completed a survey. Based on the PROMIS guidelines for interpretation of SRI raw scores, the raw score of SRI (16.3) in this sample is slightly higher than those in PROMIS reference populations (the 2000 General US Census and a clinical sample; raw score=16) Diet. After adjusting for other variables known to be related to SRI, every increase of 1 SD in the plant-based dietary pattern score was associated with a statistically significant 0.72-point decrease in the SRI score ( $\beta = -0.71$ ; SE=0.32; $p=0.027$ ; 95% CI -1.35 to -0.08; effect size (standardised $\beta$ )= -0.15). Every increase of 1 SD in the high saturated fat and high sugar dietary pattern score, was associated with a statistically significant 0.77-point increase in the SRI score ( $\beta = 0.77$ ; SE=0.32; $p=0.015$ ; 95% CI 0.15 to 1.39; effect size (standardised $\beta$ )=0.16). There was no significant association between the high protein diet and SRI.
Huizinga <i>et al.</i> , 2018, Netherlands <sup>6</sup>	Randomised control trial	NR	18 surgical residents	Fatigue. No significant within-subject correlation between subjective and objective measures of alertness was found. Performance of postcall surgeons was similar to, or even worse than, the performance of intoxicated surgeons. Substance use. High alcohol levels (0.6g/L–1) impaired adaptive tracking, reduced objective and subjective alertness and increased slowness. Moreover, laparoscopy depth perception was impaired in the 0.6g/L–one group. Dose-dependent ethanol-induced performance decrement closely resembles the decrease of performance over a 14-hour night shift.

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Jena <i>et al</i> , 2015, USA <sup>88</sup>	Cohort study	2000–2009	24 637 doctors	Specialty. Malpractice rates varied across specialty consistently with previous studies ranging from 1.6% per doctor year in paediatrics to 4.1% per doctor year in general surgery and obstetrics-gynaecology. Physician Spending. Across specialties, greater average spending (ie, visits, tests, procedures) by doctors was associated with reduced risk of incurring a malpractice claim.
Jones <i>et al</i> , 2018, USA <sup>88</sup>	Retrospective Cohort Study	1976–2016	15 500 doctors (surgeons)	Certification/registration status. Surgeons in the lapsed recertification group (HR, 2.61 (95% CI 1.87 to 3.64); p<0.001) or those in the not recertified group (HR, 1.72 (95% CI 1.25 to 2.37); p<0.001) had a significantly higher incidence of licensure loss than surgeons in the on-time recertification group. Surgeons in the lapsed recertification group did not differ significantly from those in the not recertified group (HR, 1.31 (95% CI 0.87 to 1.97); p=0.20).
Keshavarz <i>et al</i> , 2019, Iran <sup>80</sup>	Cross-sectional study	2006–2016	275 medical malpractice cases	Skills. In 50 (18.5%) cases of malpractice were reported as a lack of skills. Specialty. Based on 275 cases of the malpractice, the frequency of different types of specialty and academic degree of doctors who were complained about in the medical commission were recognised as follows: 5 (1.8%) medical interns, 36 (13.1%) GPs, 126 (45.8%) internists, 6 (2.2%) pulmonologists, 6 (2.2%) nephrologists, 4 (1.5%) haematologists, 2 (0.7%) rheumatologists and 38 (13.9%) gastroenterologists. Specialty fields of general surgery (9.4%) and gynaecology (9.1%) and subspecialty fields of thoracic cardiovascular surgery (6.9%) and family general practice (13.1%) were the fields that had been most complained about simultaneously with internal medicine.
Kormmehl <i>et al</i> , 2017, USA <sup>3</sup>	Cross-sectional study	1991–2015	90 743 claims	Age and gender. Male dermatologists aged 50–59 years had the greatest no of closed claims (232 of 1084, 21.4%). Female dermatologists, those aged 40–49 years had the greatest no of closed claims (102 of 1084, 9.4%). Specialty. Dermatologists were responsible for a small proportion of all closed claims (1.2%) over the past decade. Clinical workload. Most closed claims were filed against full-time dermatologists (1035 of 1084, 95.5%), which was similar to the findings among doctors in all specialties (87 271 of 90 743, 96.2%). Clinical practice setting or sector. Those in solo practice (n=600, 55.4%) were more likely to be sued than those in group practices (n=429, 39.6%) and institutions (n=31, 2.9%). Medical training location. Location of training was not significant for dermatologists subject to claims. Most closed claims were filed against dermatologists who received their medical education in the USA (840 of 1084, 77.5%), likely because most dermatologists have been educated in the USA.
Krupat <i>et al</i> , 2020, USA <sup>1</sup>	Case-controlled study	1993–2007	324 doctors (108 exp, 216 controls)	Gender. Male doctors who had made a review board appearance made up 69% (75/108) of the sample, while female doctors made up 31% (33/108) of doctors who had made a review board appearance. Ethnicity. While doctors from underrepresented ethnic status in medicine made up 31% of the review board group and 69% of doctors ethnic statuses not underrepresented, no statistically significant difference between review board and non-review board ethnicity was reported. 28% of RB cases were born outside of the USA, compared with 18% of NB, again, no statistically significant difference was found (p<0.06). Skills. Inspection of the data collected during medical school indicated that NB controls consistently outperformed RB cases, including USMLE step 1 scores, step 2 CK scores and grades for all six clerkships (medicine, neurology, obstetrics-gynaecology, paediatrics, surgery and psychiatry) Claims History. Compared with non-disciplined peers, students who appeared before their schools' review boards were over five times more likely to undergo disciplinary review during residency (16% vs 3%, respectively) and almost four times more likely to require remediation or counselling (35% vs 9%, respectively).
Kynes <i>et al</i> , 2013, USA <sup>39</sup>	Cross-sectional study	2006–2010	120 physicians	Age. The average age of Paediatric doctors with complaints was 45 years of age. <sup>14, 18, 20, 22, 28, 31, 42, 44, 46, 53, 55, 56, 61, 65, 66, 67, 74, 76, 80</sup> The average age of doctors with complaints who only treat adult patients was age 51 years of age <sup>14, 15, 18, 20, 22, 28, 29, 31, 35, 39, 42, 44, 46, 53, 55, 56, 61, 65, 66, 67, 74, 76, 77, 80</sup> Gender. Of the sample of female paediatric doctors, 44% had a complaint (not sig OR, p=0.02) The OR were not reported by the authors. Ethnicity. Non-Caucasian paediatric doctors received 8% of paediatric complaints and 19% of adult complaints were non-Caucasian providers. No statistical differences between Caucasian and non-Caucasian providers were found. (OR 0.81 (95% CI 0.42 to 1.56); OR 1.20 (95% CI 0.77 to 1.85), respectively. Time in practice. For paediatric doctors with a complaint, there was no significant association between years in practice (per 10-year change) OR: 1.18 (95% CI 1.01 to 1.38) There was a significant OR for adult patient doctors with a complaint (per 10-year change for adult patient). Clinical workload. Paediatric doctors with complaints had a caseload on average of 79 (43–161) per month, whereas paediatric doctors with no complaint had a caseload of 81 (43–158). Adult patient doctors with complaint had an average caseload of 75 (39–124) per month, while those with no complaint had a caseload of 80 (36–121) per month. *Not significant

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Liuaud Hyman, 2019, USA <sup>45</sup>	Retrospective cohort study	1975–2015	29 939 physician records	Gender. There were more male doctors with both a medical malpractice claim (paid or unpaid) and a disciplinary complaint (with or without actual sanctions) and more male doctors with both a paid claim and a disciplinary sanction than among all doctors (89% and 94% vs 75%, $Z=5.74$ and $4.96$ , $p<0.0001$ ). Medical training location. US trained doctors were slightly more likely to have a malpractice claim only, or both a paid claim and disciplinary action (79% for each vs 74% general medical population who were counted as the US trained in this study). Specialty. Psychiatry is high in disciplinary complaints but low in medical malpractice claims. Obstetricians-gynaecologists have a high risk of both mal claims and disciplinary complaints. Surgeons have a high med mal claiming risk, but relatively lower risk of a disciplinary complaint. Substance use. For doctors with both a claim and a disciplinary complaint, the most common reason for a disciplinary complaint was drug/alcohol abuse (80 cases), followed by drug diversion (70 cases).
Lyu <i>et al.</i> , 2011, Taiwan <sup>65</sup>	Cross-sectional Study	2001–2009	6888 patients, 43 with a medical dispute; 35 surgeons	Time in practice. Medical disputes normally occur during the first few years of a doctor's practice, when the doctor is still relatively young in the field. The seniority of doctors had a significant influence on patients with medical disputes ( $p=0.001$ ) but not on the probability of lawsuits (OR, 1.44, 95% CI 0.29 to 7.01). Claims history. Regarding medical disputes, 11.8% have experience with medical litigation in hospitals vs 88.2% no experience. Whereas in the clinic, 22.2% experience with medical litigation vs 77.8% no experience. Insurance. Almost all of the surgeons with medical disputes in Taiwan have no medical insurance (4.5% yes vs 95.5% no).
Millbank 2019, Australia <sup>35</sup>	Cross-sectional Study	2010–2017	301 doctors	Gender. Males make up 59.8% of all registered doctors. Males make up 85.5% of doctors with misconduct complaints.
Mozeika <i>et al.</i> , 2019, USA <sup>77</sup>	Retrospective cohort study	1913–2016	69 cases	Specialty. Decision as a function of injury type, defendant specialty, and reason for malpractice claim was not statistically relevant. The most common providers involved as defendants were plastic surgeons (17.4%), EM doctors (14.5%), OMSs (11.6%), otolaryngologists (10.1%), radiologists (8.7%), general surgeons (7.2%), ophthalmologists (5.8%), primary care doctors (4.3%), nurses (2.9%), anaesthesiologists (1.4%), orthopaedic surgeons (1.4%), and hospital administrators (1.4%); of the remaining cases, the defendant was unknown (13.0%). Geographical location. Decision as a function of geographical location was statistically significant, with the Midwest favouring upholding the complaint (40%; $p=0.007$ ) and the South favouring dismissing the complaint (91.4%; $p=0.027$ ).
Myers <i>et al.</i> , 2019, USA <sup>55</sup>	Case-controlled study	2012–2016	581 case claims	Specialty. Cases were statistically more likely than controls to be in specialties such as oral surgery/dentistry and obstetricians-gynaecologists than general surgery (OR=7.99, 95% CI 2.93 to 21.83, $p<0.001$ and OR=1.85, 95% CI 1.24 to 2.66, $p<0.001$ , respectively). Time in practice. Medical malpractice cases had a statistically significant higher rate of having a trainee named as defendants than controls (184, 32% vs 233, 9%, $p<0.001$ ). Clinical practice setting or sector. Malpractice cases were statistically more likely than controls to occur in the emergency department versus the inpatient setting (OR=1.65, 95% CI 1.43 to 1.91, $p<0.001$ ). Cases were more likely to take place in the inpatient setting (378, 65% vs 1428, 55%, $p<0.001$ ) than controls. Cases were more likely to have an allegation that was related to surgical treatment (185, 32% vs 708, 27%, $p=0.02$ ) or obstetrical/gynaecological treatment (63, 11% vs 103, 4%, $p<0.001$ ).
Nikoghosyan-Bossen <i>et al.</i> , 2012, Denmark <sup>25</sup>	Cross-sectional study	1998–2008	497 malpractice complaints filed against ENT specialty professionals	Clinical practice setting or sector. Malpractice complaints were related to the public hospital setting (60%), private hospital (1%), ENT practising clinic (36%), ENT practising clinic and ENT department (3%). Complaints that resulted in criticisms were related to the Public hospital setting (15%), private hospital (33%), ENT practising clinic (24%), ENT practising clinic and ENT department (8%). Geographical location. There was a significant difference in the no of complaints between regions with the Capital region having the highest rate ( $\chi^2=106$ , $df=4$ , $p<0.001$ ).

Continued

**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Oreskovich <i>et al</i> , 2015, USA <sup>28</sup>	Cross-sectional study	2011	7206 physicians completed surveys	Age. Alcohol abuse or dependence was more likely in those who were younger ( $p<0.001$ ). Alcohol abuse or dependence was strongly and independently associated with age (for each year older) (OR=0.99; $p<0.001$ ). Gender. Alcohol abuse or dependence was strongly and independently associated with gender such that female doctors showed more symptoms of alcohol abuse or dependence than male doctors (21.4% vs 12.9%; OR=0.597; $p<0.001$ ). (OR=0.597; $p<0.001$ ). Marital status. Alcohol abuse or dependence was more likely in those who were partnered ( $p<0.0001$ ). Being dissatisfied with the relationship with a spouse or partner and not having children was more common in the presence of abuse or dependence ( $p=0.0025$ ; $p<0.001$ ). Alcohol abuse or dependence was strongly and independently associated with married vs single (OR=1.296; $p=0.0424$ ), partnered vs single (OR=1.989; $p=0.0003$ ), having children (OR=0.745; $p=0.0049$ ). Specialty. Alcohol abuse or dependence was strongly and independently associated with specialty choice: dermatology versus internal medicine (OR=1.902; $p=0.008$ ), orthopaedic surgery versus internal medicine (OR=2.071; $p=0.0008$ ) and other (miscellaneous) specialty vs internal medicine (OR=1.757; $p=0.006$ ). Geographical location. There was no association with the size of the practice community and alcohol abuse/dependence. Time in practice. The longer doctors were in practice, the less likely they were to have symptoms of alcohol abuse or dependence ( $p<0.001$ ). Clinical workload. There was an association with hours worked ( $p<0.001$ ) where the longer the hours the lower the prevalence of abuse or dependence. Nights on call and practice setting were not associated with abuse or dependence but doctors with alcohol abuse or dependence were more likely to report a medical error in the previous 3 months ( $p=0.0011$ ). Alcohol abuse or dependence was strongly and independently associated with hours worked (for each additional hour) (OR=0.994; $p=0.0094$ ). Substance use. From the same data reported in the Oreskovich, 2012 paper, alcohol abuse co-occurred with cannabis for 2.7% of participants, 1.3% of doctors did acknowledge the abuse of opiates (opioids) either illicitly or as the abuse of a medication prescribed by a doctor for a legitimate purpose.
Oreskovich <i>et al</i> , 2012, USA <sup>30</sup>	Cross-sectional study	2010	7197 physicians	Age. Alcohol abuse or dependence was more likely in those who were younger ( $p<0.001$ ). Gender. Female surgeons had almost twice the rates of abuse or dependence as male surgeons ( $p<0.001$ ). Marital status. Alcohol abuse or dependence was more likely in those partnered ( $p<0.001$ ) being dissatisfied with the relationship with a spouse or partner and not having children was more common in the presence of abuse or dependence ( $p=-0.003$ and $p<0.001$ , respectively). Time in practice. The longer surgeons were in practice, the less likely they were to have symptoms of alcohol abuse or dependence ( $p<0.001$ ). Clinical workload. There was an association with hours worked ( $p=0.02$ ) and nights on call ( $p<0.001$ ), for which longer hours and more nights on call lowered the prevalence of abuse or dependence. Burn-out. A greater frequency of the symptoms of emotional exhaustion resulted in higher percentages of alcohol abuse or dependence ( $p<0.001$ ). Substance use. AUDIT-C was completed anonymously by surgeons. 15.4% of the 7197 respondents had an AUDIT-C score consistent with alcohol abuse or dependence. Alcohol abuse or dependence was strongly and independently associated with burn-out (OR, 1.25; $p=0.01$ ), depression (OR, 1.48; $p<0.001$ ), and recent major medical errors (OR, 1.45; $p<0.001$ ) after we controlled for other personal or professional characteristics. The same was true for relationship status designated as a partner vs single (OR, 2.29; $p<0.001$ ).
OshelandLevitt 2016, USA <sup>81</sup>	Cross-sectional study	1990–2015	560000 doctors	Claims history. Doctors with three or more payments, 2.27% of the total, were responsible for US\$1 263 003 248 in malpractice payments each year. Licensure and clinical privileges actions against any of the doctors in the 1.8% group were unusual. Only 2836 (12.6%) had ever had even one adverse licensure action reported to the NPDB. Only 1417 of the doctors in the group (6.3%) had any adverse clinical privileges action reported to the NPDB. However, there were differences among the doctors within the group based on the no of paid cases. The no of license and privilege actions go up continuously until the level of 20 paid claims is reached. For example, for one paid claim, 6.53% had licensure action and 2.14% had clinical privileges action. The corresponding figures for 5 claims are 15.08 and 8.76
Otaki <i>et al</i> , 2017, Japan <sup>4</sup>	Retrospective Cross-sectional study	2004–2014	38 cases	Time in practice. Twenty-three claims (60.5%) involving 31 doctors included the no of years of experience held by doctors (mean: 17.0±1.3 years). Of the 31 doctors, 6 (19.4%) had less than 5 years of experience, whereas only 3 of 31 doctors (9.7%) had less than 2 years of experience.

Continued



**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Qureshi <i>et al.</i> , 2014, USA <sup>41</sup>	Cross-sectional study	2010–2011	1691 plastic surgeons	<p>Marital status. The most significant personal risk factor for burn-out among study participants was having a spouse who is also employed (OR, 1.43; p&lt;0.001).</p> <p>Specialty. Risk dependent on subspecialty choice (OR, 2.01; p&lt;0.001, greater risk among microsurgery and aesthetic surgery).</p> <p>Clinical workload. The professional characteristics with high associated overall risk for burn-out include working more than 70 hours per week (OR=2.42; p&lt;0.001) and being on call more than two nights per week (OR=1.95; p&lt;0.001).</p> <p>Time in Practice. Junior academic rank was associated with overall risk for burn-out (OR, 1.27; p=0.026).</p> <p>Burn-out. 15% of doctors surveyed reported being physically or emotionally impaired at work. Doctors experiencing burn-out were more than twice as likely to have a self-reported impairment (OR, 2.20; p&lt;0.001) compared with doctors not suffering from burn-out.</p> <p>Substance Use. Approximately 8% of the plastic surgeons who completed the survey screened positive for alcohol abuse and 5% of participants screened positive for substance abuse.</p>
Salmirago-Blotcher <i>et al.</i> , 2016, USA <sup>24</sup>	Cross-sectional study	2014	138 doctors	<p>Age. There were no associations between doctors age and self-report burn-out.</p> <p>Gender. There were no associations between gender and burn-out.</p> <p>Ethnicity. There was no association between burn-out and race/ethnicity.</p> <p>Clinical Practice Setting or Sector. There was no association between burn-out and type of institution (community vs teaching hospital).</p> <p>Clinical workload. The no of hours the Emergency doctors surveyed reported to be directly involved in patients' care each week, the no of hours each doctor was on call each week, and the no of shifts per month was associated with burn-out.</p> <p>Time in practice. There was no association between burn-out and duration (years) of work in EM doctors.</p>
Schaffer <i>et al.</i> , 2020, USA <sup>19</sup>	Cohort study	2010–2014	11020 doctors	<p>Clinical workload. The rate of increase in the annual percentage of doctors facing a claim with increased volume was significantly greater for the procedural group compared with all the other groups of specialties nonprocedural, mixed, and all groups combined; p&lt;0.001). The rate of increase was greater for the mixed procedural group compared with the nonprocedural group (p=0.003).</p> <p>Claims History. 9.9% of doctors who faced a claim had more than one claim.</p>
Spittal <i>et al.</i> , 2015, Australia <sup>9</sup>	Retrospective cohort study	2000–2011	13 849 complaints in the analytical sample, and a total of 8424 doctors	<p>Age. 9% of doctors who were the subject of complaints were aged between 22 and 34 years, 80% were aged between 35 and 65 years, and 14% did not report their age (OR=1.41 (95% CI 1.10 to 1.82)).</p> <p>Gender. 79% of the doctors complained against were male, 20% female. There was missing data for 0.8%.</p> <p>Specialty. Nearly half (49%) of the doctors complained against were GPs and 15% were surgeons, 11% internal medicine, 5% obstetrics-gynaecology, 6% psychiatry, 4% anaesthetics, 2% ophthalmology, 2% radiology, 2% dermatology, 4% other.</p> <p>Geographical location. 23% of practitioners who were the subject of complaint practised in a rural location, whereas 77% in an urban location.</p>
St Hilaire <i>et al.</i> , 2019, USA <sup>47</sup>	Quasi-experimental study	2002–2004	34 PGY-1 resident physicians	<p>Fatigue. In the current study, resident doctors remained substantially impaired even after &gt;4 hour of sleep: 50% of PVT sessions within this sleep duration bin had &gt;3.21 attentional failures, a threshold that represents the average no of attentional failures observed among these same resident doctors during an intervention schedule. The odds of incurring more than one attentional failure (the median no of attentional failures observed during the non-EDWS sessions) was 2.40 times higher (95% CI 1.72 to 3.34) overall (ie, across all spontaneous overnight sleep durations) on post-call PVT sessions compared with matched sessions completed during non-EDWS, and 2.72 times higher (95% CI 1.19 to 6.20) among PGY-1 resident doctors who obtained &gt;4 hour of spontaneous sleep overnight during EDWS.</p>

Continued

Table 1 Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Studdert <i>et al.</i> , 2016, USA <sup>82</sup>	Cross-sectional study	2005–2014	66 426 claims, 54 099 doctors	<p>Age. The risk of recurrence among doctors younger than 35 years of age was approximately one third the risk among their older colleagues (ie, 35 years and older).</p> <p>Gender. Male doctors had a 38% higher risk of recurrence in malpractice claims than female doctors (HR, 1.38; 95% CI 1.30 to 1.46).</p> <p>Specialty. Risks of recurrence also varied widely according to specialty—for example, the risk among neurosurgeons was four times as great as the risk among psychiatrists. More than half the claims were accounted for by doctors in four specialty groups—internal medicine (15%), obstetrics-gynaecology (13%), general surgery (12%) and general practice or family medicine (11%). The lowest risks of recurrence were seen among psychiatrists (HR, 0.60; 95% CI 0.43 to 0.82) and paediatricians (HR, 0.71; 95% CI 0.59 to 0.85).</p> <p>Geographical location. From a sample of doctors with one or more claims 87% practised in metropolitan areas. Medical training location. A total of 92% of the doctors subject to claims were medical doctors, and 77% were trained in the USA.</p> <p>Claims history. Among doctors with paid claims, 84% incurred only one during the study period (accounting for 68% of all paid claims), 16% had at least two paid claims (accounting for 32% of the claims), and 4% had at least three paid claims (accounting for 12% of the claims). In adjusted analyses, the risk of recurrence increased with the no of previous paid claims. For example, as compared with doctors who had one previous paid claim, the 2160 doctors who had three paid claims had three times the risk of incurring another (HR, 3.11; 95% CI 2.84 to 3.41); this corresponded in absolute terms to a 24% chance (95% CI 22 to 26) of another paid claim within 2 years).</p>
Studdert <i>et al.</i> , 2019, USA <sup>34</sup>	Cohort study	2008–2015	480 894 doctors	<p>Age. Doctors with three or more claims were more likely than their colleagues to be 50 years of age or older.</p> <p>Gender. Doctors with three or more claims were more likely than their colleagues to be male.</p> <p>Clinical workload. Doctors clinical volume was adjusted for claims before 2008, doctors with four claims and those with five or more claims billed significantly fewer services (relative difference vs doctors with no claims, -7% and -12%, respectively) volume of Medicare patients (doctors with four claims treated 5% fewer Medicare patients than doctors with no claims (relative difference, -5%; 95% CI -9 to -1), and doctors with five or more claims treated 11% fewer (relative difference, -11%; 95% CI -17 to -4)).</p> <p>Claims history. A total of 89% of the doctors in the cohort had no paid malpractice claims and 8.8% had one. The remaining 2.3% of the doctors (10 841), consisting of those with two or more claims doctors with two or more claims and accounted for 38.9% of all claims. The no of claims was positively associated with the odds of leaving the practice of medicine (OR for one claim vs no claims, 1.08; 95% CI 1.06 to 1.11; the OR for ≥5 claims, 1.45; 95% CI 1.20 to 1.74).</p> <p>Clinical practice setting or sector and geographical location. The no of claims was not associated with geographical relocation but was positively associated with shifts into smaller practice settings. For example, doctors with five or more claims had more than twice the odds of moving into solo practice than doctors with no claims.</p>
Tessler <i>et al.</i> , 2012, Canada <sup>82</sup>	Retrospective cohort study	1993–2002	Specialist anaesthesiologists	<p>Age. Anaesthesiologists 65 years of age and older have approximately 1.5 times the risk (after adjusting for exposure) of being found responsible for litigation compared with their younger colleagues (ie, younger than 51): Using the less than 51 age group as a reference, the litigation rate ratio was 1.14 (95% CI 0.99 to 1.32) for cases filed through the CMPA for the 51–64 age group, and 1.50 (95% CI 1.14 to 1.97) for the 65 and older age group.</p>
Tibble <i>et al.</i> , 2018, Australia <sup>32</sup>	Cohort study	2011–2016	3671 complaints about surgeons and 1917 complaints about physicians during the study period	<p>Age. Compared with surgeons aged 35 years or younger, surgeons aged 65 years and older were at the highest risk of complaints (IRR=6.57, 95% CI 4.61 to 9.37).</p> <p>Gender. After adjusting for age, surgical subspecialty, location and clinical hours worked, male surgeons were 1.31 (95% CI 1.09 to 1.57) times more likely to be the subject of a complaint compared with their female peers.</p> <p>Personality. Surgeons were at a substantially increased risk of complaints regarding interpersonal behaviour compared with doctors registered to practice (IRR=1.92, 95% CI 1.59 to 2.32).</p> <p>Specialty. The rate of complaints was 2.3 times higher for surgeons than doctors (112 compared with 48 complaints per 1000 practice years, <math>p &lt; 0.001</math>). At a higher risk of complaints were specialists in orthopaedics, plastic surgery and neurosurgery. Surgeons who specialised in neurosurgery, plastic surgery and orthopaedic surgery were at higher risk of complaint compared with general surgeons (IRR=1.75, 1.74 and 1.30, respectively).</p> <p>Geographical location. Those who practised in regional and rural areas were more likely to be the subject of a complaint compared with their metropolitan peers (IRR=1.22, 95% CI 1.07 to 1.39).</p> <p>Skills. Surgeons were at a substantially increased risk of complaints regarding monitoring and follow-up (IRR=3.58, 95% CI 2.72 to 4.77), reports and certificates (IRR=2.78, 95% CI 2.03 to 3.85), fees and fraud (IRR=2.68, 95% CI 2.01 to 3.59), communication (IRR=1.98, 95% CI 1.54 to 2.56).</p> <p>Substance use. Surgeons were at a substantially increased risk of complaints regarding substance use compared with non-surgeons (IRR=2.10, 95% CI 1.16 to 3.92).</p>

Continued

Table 1 Continued

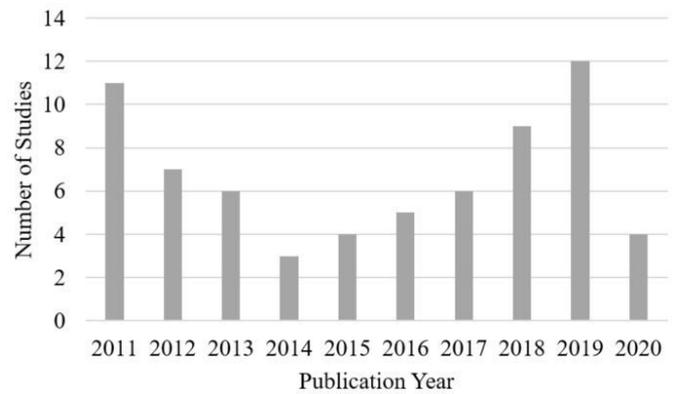
Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Tiffin <i>et al.</i> , 2017, UK <sup>62</sup>	Cohort study	2000–2011	27 330 international medical graduates, 210 doctors who had been sanctioned in relation to at least one FFP issue	Gender. Gender was a significant predictor of being censured for FFP issues (compared with no censure, no referral or referral only) (HR, 2.88; 95% CI 2.01 to 4.13) with males more likely to be censured than females. Skills. Significant predictors of being censured for FFP issues (compared with no censure, no referral or referral only) were higher IELTS speaking score (HR, 1.28; 1.04 to 1.57) and multiple attempts at PLAB part 1 (HR, 1.49; 1.12 to 1.97) or part 2 (HR, 1.57; 1.16 to 2.13).
Tseng <i>et al.</i> , 2019, USA <sup>48</sup>	Prospective cohort study	2016–2018	19 surgical trainees	Fatigue. In regression models adjusted for sex, age, postgraduate year, and technical complexity of the procedure, there was a statistically significant inverse association between ESS scores and attending doctor-rated technical skill for both SGAT (–0.41; 95% CI –0.55 to –0.27; p<0.001) and the visual analogue scale (–0.75; 95% CI –1.40 to –0.07; p=0.03). The association between ESS scores and technical skill was not statistically significant for trainee self-rated SGAT (0.04; 95% CI –0.17 to 0.24; p=0.73) and the self-rated visual analogue scale (0.19; 95% CI –0.79 to 1.2; p=0.70).
Walton <i>et al.</i> , 2020, Australia <sup>38</sup>	Retrospective cohort study	2012–2013	12 616 complaints	Age. The risk of complaint increased with age, with those aged >45 years being over 400% as likely to have a complaint than those under 35 years of age. Gender. Males were twice (100%) as likely to be the subject of a complaint than females. Ethnicity. There was a 46%, 31% and 18% higher risk of complaint if a doctor was born in the Middle East, Africa or Asia, respectively. Geographical location. There was some variation between states, but Queensland as the principle state or territory of practice had a 32% higher risk of complaint).
Wile <i>et al.</i> , 2011, Australia <sup>27</sup>	Cross-sectional study	2001–2008	115 physicians participating in the health programme	Age. Participants enrolled in the VDHP with SUD and mental illness. The age range of participants was from 20 to 75 years with a mean and median age of 41 years, and a modal age of 32 years. Gender. Males accounted for 86 (75%) participants enrolled in the VDHP with SUD and mental illness. Specialty. One-third were GPs (n=45, 39%). The next largest group were specialists (n=30, 26%) with anaesthetists, psychiatrists and surgeons being the main groups recorded. The remainder included 19 (17%) doctors in training, six (5%) medical officers, five (4%) interns and two (2%) were unknown. Mental health. In an Australian PHP, 25 participants were reported to have mental health issues: 18 (72%) had axis 1 mood disorders (including bipolar disorder, major depression and schizoaffective disorder) and seven (28%) had axis 2 personality disorders (including borderline, narcissistic, antisocial and mixed personality disorders). Substance use. Of the 90 participants on CAMP agreements for SUD, alcohol was the most commonly identified substance (n=44, 49%) followed by prescription drugs (n=28, 31%) pethidine (n=27, 30%), illicit drugs (n=20, 22%), opioids (n=16, 18%) and 'other' (n=4, 4%). A total of 33% <sup>37</sup> of SUD participants reported using two or more substances.
Yadav and Rastogi, 2015, India <sup>43</sup>	Cohort study	2009–2014	48 Negligence cases	Specialty. Chances of proof of allegations of medical negligence against diagnostic speciality (radiology, pathology, biochemistry, etc) were highest at 50% cases, followed by surgery & allied speciality with 34.48%, dentistry with 25% and with least chances of proving in medicine & allied speciality with only 18.18%, respectively.
<b>Grey literature</b>				
Australian Institute of Health and Welfare, 2014, Australia <sup>57</sup>		2012–2013		Specialty. General surgery (11%) and EM (10%) made up the most new claims between 2012 and 2013. Nine other specialities made up between 2% and 7% of new claims: orthopaedic surgery, obstetrics/gynaecology, clinical practice setting or sector. 22% of new claims were reported as occurring in a public setting. Most new public sector claims were related to public hospital or day surgery. 27% of new claims were reported for private sector settings.
Wilson <i>et al.</i> , 2015, Canada <sup>50</sup>		1999–2014		Gender. Male doctors have more formal complaints than females. Specialty. GPs had twice the risk of complaints as plastic surgeons. Medical Training Location. Results are contradictory. One study found doctors trained in the same location as they were practising in had four or more separate complaints, whereas, another study observed international graduates were 25% more likely to have a complaint filed against them.

Continued

**Table 1** Continued

Author, year, Country	Study design	Period of study	No participants/cases	Characteristics and risk factors reported
Yen and Thakkar <sup>43</sup> Canada		1975–2018		<p>Age. Most studies found age to be a risk factor. For example, physical and cognitive performance declines with age, problems with psychological wellness increases with age, younger doctors perform better on knowledge tests and adhere to guidelines.</p> <p>Gender. Most studies found being male was associated with increased complaints. Being male was also predictive of disciplinary action.</p> <p>Specialty. Surgery, plastic surgery, dermatology, psychiatry, obstetrics/gynaecology, and family doctors found to have more complaints.</p> <p>Time in practice. Doctors with more years had less factual knowledge, were less likely to adhere to standards, and had poorer patient outcomes.</p> <p>Clinical practice setting or sector. Doctors in solo practice were more likely to order fewer tests, perform less well on assessments and recertification exams.</p> <p>Clinical workload. All five studies found increased workload was associated with complaints, prescribing errors, decreased test ordering and poor performance on assessments.</p>

ADHD, attention deficit hyperactivity disorder; AMA, American Medical Association; AUDIT-C, Alcohol Use Disorders Identification Test, version C; CAMP, Case Management, Aftercare and Monitoring Programme; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; EDWS, extended-duration work shifts; EM, emergency medicine; ENT, ear, nose and throat; ESS, Epworth Sleepiness Scale; FP, general practitioner; IELTS, International English Language Test System; IRR, incidence rate ratio; MoCA, Montreal Cognitive Assessment; NB, non-medical board cases; NCD, neurocognitive disorders; NPDB, National Practitioner Data Bank; NR, not reported; NSW, New South Wales; NZ, New Zealand; OMS, oral and maxillofacial surgeon; PGY-1, Postgraduate-year 1; PHP, Physician Health Programme; PLAB, Professional and Linguistic Assessment Board; PROMIS, patient-reported outcomes measurement information system; PVT, psychomotor vigilance task; RA, rheumatoid arthritis; RB, medical board cases; SGAT, Septoplasty Global Assessment Tool; SRI, sleep-related impairment; SUD, substance use disorder; UPC, unsolicited patient complaints; USMLE, US Medical Licensing Examination; V-CAP, Vanderbilt Comprehensive Assessment Program; VDHP, Victorian Doctors Health Programme.


**Figure 2** Publication year of included studies.

reported age to have no effect.<sup>18</sup> The extent to which age is confounded with patient volumes is unclear and potentially important, as detailed examination has shown that the number of claims per 1000 patient encounters is higher for clinicians with lower numbers of patient encounters.<sup>19</sup>

### Impairment

Younger doctors at risk of impaired performance were more likely to be affected by environmental factors (eg, work induced fatigue),<sup>20</sup> while older doctors (eg, 59–90 years of age) were at greater risk of impaired performance due to cognitive disorders.<sup>21–22</sup> According to two studies, age was not a good predictor of impaired performance<sup>23</sup> or burn-out.<sup>24</sup> Three studies reported the average age of doctors enrolled in physician health programmes (PHPs) was 40–49 years of age<sup>25–27</sup> and doctors referred for assessment of substance use or psychiatric were also more likely to be 45–64 years old.<sup>28</sup> Finally, alcohol abuse or dependence was more likely in those who were younger.<sup>29–30</sup>

### Gender

#### Complaints

Compared with females, males made up 91%–92% of disciplined doctors,<sup>16–31</sup> were 1.3 times more likely to be the subject of a complaint,<sup>32</sup> and have a history of complaint.<sup>33–34</sup> Similarly, doctors presenting to PHP were predominantly male,<sup>25–27</sup> making up 85% of the misconduct doctor population.<sup>35</sup>

#### Claims

Compared with females, males were 1.4–2.3 times more likely to be the primary defendant in a malpractice case.<sup>33–36</sup> Gómez-Durán *et al*<sup>18</sup> reported no gender difference concerning recurrent paid malpractice claims. Similar to age, there is potential for confounding association with differences in the number of complaints or claims per 1000 patient encounters, and due to differences in the gender composition of different clinical specialties.<sup>19</sup>

#### Impairment

Two studies reported no gender differences in self-reported sleep-related impaired performance<sup>20</sup> or

**Table 2** Results of the critical appraisal

<b>Randomised controlled trials</b>													
Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Huizinga <i>et al</i> , 2018, Netherlands <sup>46</sup>	U	U	U	U	N	N	Y	Y	N	Y	U	U	Y
<b>Cohort studies</b>													
Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11		
Alam <i>et al</i> , 2011, Canada <sup>16</sup>	Y	Y	Y	N	N	N	Y	Y	Y	NA	Y		
Anderson <i>et al</i> , 2012, USA <sup>49</sup>	Y	Y	Y	U	U	Y	Y	Y	N	N	Y		
Baker <i>et al</i> , 2013, USA <sup>36</sup>	Y	Y	U	Y	Y	Y	Y	Y	NA	NA	Y		
Black <i>et al</i> , 2019, USA <sup>70</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y		
Brooks <i>et al</i> , 2013, USA <sup>33</sup>	Y	Y	U	Y	Y	Y	Y	Y	N	NA	Y		
Brooks <i>et al</i> , 2012, USA <sup>25</sup>	Y	Y	Y	N	NA	Y	Y	N	N	N	Y		
Brooks <i>et al</i> , 2012, USA <sup>79</sup>	Y	Y	U	Y	Y	U	U	Y	N	Y	U		
Buhl <i>et al</i> , 2011, USA <sup>26</sup>	Y	U	U	N	N	U	U	Y	Y	Y	Y		
Fathy <i>et al</i> , 2018, USA <sup>14</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y		
Finkelstein and Zhu 2017, USA <sup>65</sup>	Y	Y	U	Y	Y	Y	Y	Y	U	NA	Y		
Finlayson <i>et al</i> , 2013, USA <sup>28</sup>	U	U	Y	N	N	N	Y	Y	Y	Y	NA		
Jena <i>et al</i> , 2015, USA <sup>68</sup>	NA	Y	Y	Y	Y	U	Y	Y	U	U	U		
Jones <i>et al</i> , 2018, USA <sup>58</sup>	Y	Y	Y	U	U	Y	Y	Y	U	NA	Y		
Kornmehl <i>et al</i> , 2017, USA <sup>3</sup>	Y	Y	Y	N	N	U	Y	Y	U	NA	Y		
Liu and Hyman 2019, USA <sup>45</sup>	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y		
Mozeika <i>et al</i> , 2019, USA <sup>77</sup>	NA	Y	U	Y	Y	Y	Y	Y	Y	NA	U		
Schaffer <i>et al</i> , 2020, USA <sup>19</sup>	Y	Y	Y	N	N	U	Y	Y	Y	NA	Y		
Spittal <i>et al</i> , 2015, Australia <sup>9</sup>	NA	Y	U	Y	Y	Y	Y	Y	Y	NA	Y		
Studdert <i>et al</i> , 2019, USA <sup>34</sup>	NA	Y	Y	Y	Y	U	Y	Y	Y	NA	Y		
Tessler <i>et al</i> , 2012, Canada <sup>82</sup>	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y		
Tibble <i>et al</i> , 2018, Australia <sup>32</sup>	Y	Y	Y	Y	Y	U	U	Y	U	NA	Y		
Tiffin <i>et al</i> , 2017, UK <sup>62</sup>	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y		
Tseng <i>et al</i> , 2019, USA <sup>48</sup>	NA	Y	U	Y	Y	U	Y	U	U	NA	Y		
Walton <i>et al</i> , 2020, Australia <sup>38</sup>	Y	Y	U	Y	Y	Y	Y	Y	N	NA	Y		
Yadav and Rastogi 2015, India <sup>83</sup>	NA	Y	Y	U	U	U	U	Y	Y	NA	Y		
<b>Case-control studies</b>													
Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
Bismark <i>et al</i> , 2011, Australia <sup>51</sup>	Y	Y	Y	Y	Y	N	N	Y	Y	Y			
Cooper <i>et al</i> , 2018, USA <sup>21</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
Del Bene and Brandt 2020, USA <sup>22</sup>	N	N	N	Y	Y	N	N	Y	Y	Y			
Gaitan-Duarte <i>et al</i> , 2019, Columbia <sup>76</sup>	Y	Y	Y	Y	Y	Y	Y	Y	U	Y			
Krupat <i>et al</i> , 2020, USA <sup>1</sup>	Y	Y	Y	Y	Y	N	N	Y	Y	Y			
Myers <i>et al</i> , 2019, USA <sup>55</sup>	Y	Y	Y	Y	Y	N	N	Y	Y	Y			
<b>Quasi-experimental studies</b>													
Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9				
St Hilaire <i>et al</i> , 2019, USA <sup>47</sup>	Y	Y	Y	N	N	U	Y	U	Y				
<b>Cross-sectional studies</b>													
Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8					
AbuDagga <i>et al</i> , 2016, USA <sup>67</sup>	Y	U	Y	U	N	N	Y	Y					
Azab 2013, Egypt <sup>17</sup>	Y	Y	Y	Y	N	N	Y	Y					
Balch <i>et al</i> , 2011, USA <sup>54</sup>	Y	Y	U	U	Y	Y	Y	U					
Raineri Bernain <i>et al</i> , 2019, Chile <sup>71</sup>	U	U	Y	Y	N	N	U	U					
Birkeland and Bogh 2019, Denmark <sup>59</sup>	Y	Y	U	Y	Y	Y	U	Y					

Continued

Table 2 Continued

Bishop <i>et al</i> , 2011, USA <sup>75</sup>	Y	U	Y	U	N	N	Y	Y
Boyll <i>et al</i> , 2018, USA <sup>63</sup>	Y	Y	N	N	Y	Y	U	U
Brooks <i>et al</i> , 2017, USA <sup>23</sup>	Y	U	Y	Y	N	N	Y	Y
Brooks <i>et al</i> , 2011, UK <sup>37</sup>	Y	Y	Y	Y	N	N	Y	Y
Carlson <i>et al</i> , 2018, USA <sup>60</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Carney <i>et al</i> , 2016, USA <sup>64</sup>	Y	Y	N	N	Y	Y	N	Y
Casali <i>et al</i> , 2018, Italy <sup>72</sup>	Y	Y	Y	Y	N	N	Y	Y
Chen <i>et al</i> , 2013, Taiwan <sup>44</sup>	Y	Y	Y	Y	N	N	Y	Y
Cottler <i>et al</i> , 2013, USA <sup>42</sup>	Y	Y	Y	Y	N	N	Y	Y
Dallal <i>et al</i> , 2014, USA and Columbia <sup>61</sup>	Y	U	N	N	Y	Y	N	Y
Elkin <i>et al</i> , 2012, Australia <sup>53</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Elkin <i>et al</i> , 2011, Australia <sup>31</sup>	Y	Y	Y	Y	Y	N	Y	Y
Faisant <i>et al</i> , 2018, France <sup>73</sup>	Y	U	Y	Y	N	N	U	Y
Gomez-Duran <i>et al</i> , 2017, Spain <sup>18</sup>	Y	Y	U	Y	U	U	U	Y
Hamasaki & Hagihara 2011, Japan <sup>74</sup>	Y	Y	Y	U	U	U	Y	Y
Makowski <i>et al</i> , 2019, USA <sup>20</sup>	N	Y	Y	Y	Y	Y	Y	U
Keshavarz <i>et al</i> , 2019, Iran <sup>80</sup>	Y	Y	Y	Y	N	N	Y	Y
Kynes <i>et al</i> , 2013, USA <sup>39</sup>	Y	Y	U	N	N	N	Y	Y
Lyu <i>et al</i> , 2011, Taiwan <sup>66</sup>	Y	Y	U	Y	U	N	U	Y
Millbank 2019, Australia <sup>35</sup>	Y	Y	Y	Y	N	N	Y	Y
Nikoghosyan-Bossen <i>et al</i> , 2012, Denmark <sup>15</sup>	Y	U	U	Y	N	N	Y	Y
Oreskovich <i>et al</i> , 2012, USA <sup>30</sup>	Y	Y	Y	Y	N	N	Y	Y
Oreskovich <i>et al</i> , 2015, USA <sup>29</sup>	Y	Y	N	Y	Y	Y	Y	Y
Oshel and Levitt 2016, USA <sup>81</sup>	U	U	Y	Y	Y	N	Y	Y
Otaki <i>et al</i> , 2017, Japan <sup>4</sup>	Y	Y	U	U	N	N	Y	Y
Qureshi <i>et al</i> , 2014, USA <sup>41</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Salmoirago-Blotcher <i>et al</i> , 2016, USA <sup>24</sup>	Y	Y	U	U	Y	Y	U	Y
Studdert <i>et al</i> , 2016, USA <sup>52</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Wile <i>et al</i> , 2011, Australia <sup>27</sup>	Y	Y	Y	Y	N	N	Y	Y

N, no; NA, not available; U, unclear; Y, yes.

burn-out.<sup>24</sup> While males represented over half (57%–86%) the doctors presenting to PHPs,<sup>26 37</sup> one study reported female surgeons had almost twice the rates of alcohol abuse or dependence as male surgeons.<sup>30</sup> Doctors with evidence of neurocognitive disorders or referred for psychiatric examination were predominantly male (90% vs 70%).<sup>21 22 28</sup>

### Ethnicity Complaints

One Australian study reported an 18%, 31% and 46% higher risk of complaint if a doctor was born in Asia, Africa or the Middle East, respectively.<sup>38</sup> In contrast, two studies from the USA reported no statistical differences between Caucasian and non-Caucasian doctors.<sup>1 39</sup>

### Impairment

One study reported referrals for assessment of Caucasian doctors were proportionately higher (84% vs 71%) when compared with general doctor characteristics

group published by the American Medical Association.<sup>28 40</sup> Whereas a second study did not find an association between ethnicity and burn-out, as a predictor of impaired performance.<sup>24</sup>

### Marital status Claims

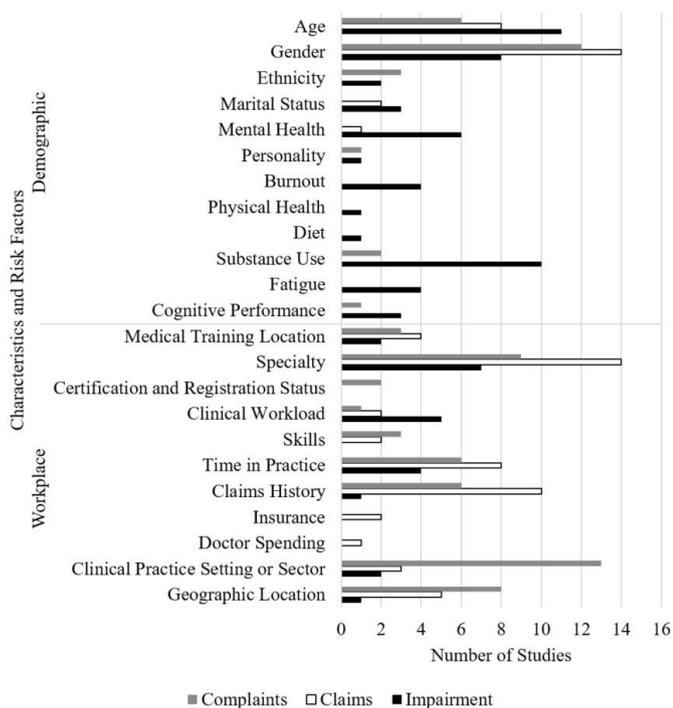
No association was found between doctor malpractice and marital status.<sup>25 33</sup>

### Impairment

Partnered doctors were 1.3–2 times more likely to suffer alcohol abuse or dependence, and doctors whose spouse was also employed were 1.43 times more likely to suffer burn-out-related impaired performance.<sup>29 30 41</sup>

### Mental health, personality and burn-out Complaints

One study reported that surgeons were 1.9 times more likely than physicians to have complaints attributed to



**Figure 3** The number of publications for each factor associated with doctors at risk of malpractice claims and/or complaints, or impaired performance.

interpersonal behaviour problems (eg, complaints about bullying, discrimination).<sup>32</sup>

### Claims

One study reported that doctors with malpractice claims had a variety of mental health diagnoses with the most common being mood disorders (12%) and substance abuse (12%).<sup>25</sup>

### Impairment

A small number of studies addressed mental health,<sup>23 27 28 37 42 43</sup> personality<sup>23</sup> and burn-out.<sup>30 41 44</sup> A higher proportion of doctors with impaired performance had mental health issues including bipolar disorder, depression and anxiety<sup>23 27 37</sup> and problems with mental health increased with age.<sup>43</sup> Doctors and their peers were often aware of the presence of an underlying issue with one-third of doctors self-referring for cognitive assessment.<sup>23</sup> Higher levels of burn-out (eg, depersonalisation) related impaired performance was reported by three of four studies<sup>30 41 44</sup> and associated with more hours of direct patient care, more hours on-call and more shifts per month.<sup>24</sup> Doctors with emotional exhaustion also showed greater alcohol use or dependence.<sup>30</sup>

### Physical health and diet

#### Impairment

While physical health declined with age,<sup>43</sup> one study found that, for doctors self-referring to a PHP, mental health problems were more common than physical (26% vs 1%).<sup>37</sup> Doctors with diets that were high in plant-based

foods and low in saturated fat and added sugars had less sleep-related impaired performance.<sup>20</sup>

### Substance use

#### Complaints

In Australia, compared with physicians, surgeons were at 2.1 times higher risk of complaints regarding substance use.<sup>32</sup> In Indiana, USA, drug or alcohol abuse and drug diversion were the most common reasons for a disciplinary complaint.<sup>45</sup>

#### Claims

One study found no relationship between either malpractice or maladaptive behaviours for a sample of emergency medicine doctors, reporting that doctors who attended worship services had an odds of 0.4 of maladaptive behaviours including smoking (10%), marijuana or cocaine use (10%) and alcohol use.<sup>24</sup>

#### Impairment

Data from PHPs in multiple jurisdictions found alcohol was the most commonly used substance, with reports between 8% and 15% of medical practitioners screened positive for alcohol abuse.<sup>37</sup> The secondary consequences of alcohol use were reported to include addiction problems,<sup>37 46</sup> mental and physical impaired performance (eg, reduced alertness, impaired adaptive tracking)<sup>30 46</sup> and recent major medical errors.<sup>30</sup>

### Fatigue

#### Impairment

In general, community doctors have a slightly higher sleep-related impairment score compared with reference populations (ie, the 2000 General US Census).<sup>20</sup> Surgeons' performance post-on-call shift (ie, when a clinician is able to be contacted to provide care if necessary, but not formally on duty) was similar to, or worse than, the performance of intoxicated surgeons to a degree where dose-dependent ethanol-induced performance closely resembled the decrease of performance over a 14-hour night shift.<sup>46</sup> Similarly, a study from the USA<sup>47</sup> reported that doctors remained impaired (eg, attentional failures) even after over 4 hours of sleep. This study also reported an inverse relationship between fatigue and technical skill.<sup>48</sup>

### Cognitive performance

#### Complaints

One study found doctors with neurocognitive disorders (defined as having a deficit in recent memory, executive functioning, social cognition, global functioning or visuospatial functioning during the study period) had more unsolicited patient complaints compared with age-matched and sex-matched comparators.<sup>21</sup>

#### Impairment

Cognitive performance is affected by age<sup>43</sup> and deteriorates throughout the course of successive shifts, being significantly worse in the fifth and sixth shift, and/or

longer shift length.<sup>49</sup> Doctors presented to PHPs with four principal reasons for impaired performance: (1) brain disease (48%); (2) mood/anxiety disorders or treatment side effects (28%); (3) substance use (9%) and (4) traumatic brain injury (7%).<sup>23</sup> Of the doctors clinically referred for neuropsychological assessment, impaired doctors were referred predominantly with known neurological disease, known psychiatric (eg, Parkinson's disease, major depression) or suspected cognitive diagnoses.<sup>22</sup>

## Workplace characteristics

### Medical training location

#### Complaints

Evidence was mixed on whether locally trained doctors or internationally trained doctors were more subject to complaints.<sup>50</sup> A Canadian study found that 33% of doctors subject to claims were trained internationally, while these doctors make up 23% of the doctor population.<sup>16</sup> An Australian study found doctors trained internationally had lower odds of being complaint-prone than those trained in Australia.<sup>51</sup>

#### Claims

One study found that slightly fewer internationally trained doctors were subject to claims,<sup>45</sup> and two studies found no difference.<sup>14 52</sup>

#### Impairment

Through the complaints process, one study identified a greater percentage of internationally trained doctors with a neurocognitive impairment (33% vs 23%),<sup>21</sup> while another study found that relatively fewer internationally trained doctors (74% vs 83%) were referred for fitness-to-practice concerns.<sup>28</sup>

### Specialty

#### Complaints

General practitioners (GPs) and family medicine specialists comprise a large proportion of total complaints (49%–65%).<sup>9 16 50 53</sup> Other high-risk specialties include psychiatry, surgery, obstetrics and gynaecology.<sup>16 31 51 53</sup> For example, surgeons were noted to be 2.3 times as likely to be subject to complaint compared with GPs.<sup>32</sup>

#### Claims

Overall, general surgery had higher risk of malpractice when compared with other surgical subspecialties,<sup>18 54</sup> however, agreement was not universal.<sup>55</sup> Grey literature and published academic papers reported GPs and family medicine specialists comprise a large proportion of total claims (34%–62%) and were up to three times as likely to be subject to claims.<sup>33 50 55 56</sup> Other high-risk specialties include psychiatry, obstetrics and gynaecology, which were noted to be between four and 17 times as likely to be subject to malpractice claims compared with GPs.<sup>33 57</sup>

#### Impairment

According to the location of the study, specialty as a risk factor varied between countries. In Australia, impaired

performance was less of a risk for specialists,<sup>27</sup> while in the USA two studies found a higher relative risk for surgeons, psychiatrists and family medicine doctors.<sup>28 41</sup> A further study conducted in the USA found that surgeons were 1.9 times more likely than non-surgeons to enrol in a PHP because of alcohol-related problems<sup>26</sup> and 0.5 times less likely because of opioid use.

### Certification status and clinical workload

#### Complaints

Increased workload was associated with increased complaints, medical errors and poor assessment performance.<sup>43 50</sup> One study did not find a relationship between complaints and clinical load.<sup>39</sup>

#### Claims

Licensure loss was associated with lapsed or missed certification.<sup>58</sup> Greater number of hours worked per week,<sup>3 54</sup> greater number of patients seen<sup>19 59–61</sup> and more years in practice<sup>60</sup> were associated with a 1.0–1.1 times higher risk of malpractice claims.

#### Impairment

Doctors with evidence of neurocognitive disorders were more likely than age-matched and sex-matched doctors to lack board recertification.<sup>21</sup> The highest percentage of doctors with impaired performance was found in the GP group (39%), with specialists comprising 26%.<sup>27</sup> Doctors working longer hours and additional nights on call had lower prevalence of alcohol abuse,<sup>29 30</sup> but 2.0–2.4 times higher risk of burn-out.<sup>24 41</sup>

### Skills

#### Complaints

Poor performance on medical knowledge and licensing exams<sup>1</sup> and language assessments<sup>62</sup> were predictors of complaints and fitness to practice issues. There was a 3.6 times greater risk of complaints during patient monitoring and follow-up,<sup>32</sup> however, a 2019 Canadian report found that the majority of complaints were related to the clinical aspects of care, rather than issues with communication and/or unethical or improper behaviour.<sup>43</sup>

#### Claims

The use of procedure-specific patient education brochures reduced the likelihood of surgeons being sued.<sup>63</sup>

### Time in practice

#### Complaints

Frequency of disciplinary cases increased with years in practice<sup>43 50</sup>; it has been postulated that those with more years in practice had less factual knowledge and were less likely to adhere to standards.<sup>43</sup>

#### Claims

Frequency of malpractice claims increased with years in practice.<sup>39 51 60 61 64</sup> In contrast, three studies reported practitioners with fewer years in practice had higher odds of a malpractice claim or medical litigation.<sup>55 65 66</sup>

### Impairment

Junior doctors who spent less time in practice than their senior counterparts were 1.3 times more likely to suffer impaired performance.<sup>41</sup> However, there was no association between duration of practice and impaired performance.<sup>24</sup> Sixteen per cent of doctors clinically referred for neuropsychological assessment and subsequently categorised as impaired were currently working full time or at reduced capacity.<sup>22</sup>

### Claims history, insurance and doctor spending

#### Complaints

Between 14% and 28% of doctors who receive complaints have experienced complaints previously.<sup>16 53 67</sup>

#### Claims

Doctors who were a recipient of a previous claim were reported to be at 1.9 times greater risk of a repeated claim,<sup>18</sup> even when controlling for age, gender and specialty.<sup>18 52</sup> US doctors whose insurance providers required participation in educational courses were less likely to be sued.<sup>63</sup> Greater average doctor spending (eg, visits, tests, procedures) was associated with reduced risk of malpractice claim.<sup>68 69</sup> The likelihood of multiple claims increased with the duration of study coverage, the calendar year and the country.<sup>1 18 34 52 70</sup> The potential confounding effect of doctor activity level was not accounted for in the aforementioned studies.

### Impairment

Previous malpractice experience was associated with greater risk of impaired performance.<sup>44</sup>

### Clinical practice setting or sector

#### Complaints

One study reported complaints were more frequent for inpatient settings,<sup>15</sup> while two studies reported that complaints were more frequent for doctors working in outpatient settings and independent practice.<sup>31 67</sup> Doctors in solo/independent practice were more likely to be disciplined than those in group practices.<sup>16</sup> One study reported a higher percentage of complaints against the private sector compared with the public system.<sup>15</sup>

#### Claims

Seven studies reported claims were more frequent for inpatient settings,<sup>15 17 55 71–74</sup> while two studies reported that claims were more frequent for doctors working in outpatient settings and independent practice.<sup>3 54</sup> One study reported a similar number of claims regarding inpatient and outpatient settings.<sup>75</sup> Doctors in solo/independent practice were more likely to be sued or have recent claims than those in group practices,<sup>3 54</sup> they were also more likely to do less well on assessments and recertification exams.<sup>43</sup> Conversely, those with five or more claims were more likely to move into solo practice than doctors with no claims.<sup>34</sup>

Three studies reported a higher percentage of<sup>15</sup> claims<sup>73 76</sup> against the private sector compared with

the public system, with only one study reporting the opposite.<sup>71</sup>

### Impairment

No relationship was found between burn-out and the type of institution the doctor practised in.<sup>24</sup> Of doctors with evidence of neurocognitive disorders, 80% practised in academic settings.<sup>21</sup>

### Geographical location

#### Complaints

While three studies reported that doctors practising in metropolitan areas were at greater risk of complaint than doctors practising in regional and remote areas,<sup>9 15 32</sup> one study reported no relationship between geographical location and frequency of claims.<sup>51</sup> Conversely, doctors (ophthalmologists) in regional medical centres had a longer time to the first complaint than those practising at academic medical centres.<sup>14</sup> In the USA, complaints were more likely to be upheld in the Midwest than in the South.<sup>77</sup> In Australia, doctors practising in Queensland or Victoria had a higher risk of a complaint than in other states.<sup>31 38</sup>

#### Claims

While two studies reported that doctors practising in metropolitan areas were at greater risk of malpractice claim than doctors practising in regional and remote areas,<sup>17 52</sup> two studies reported no relationship between geographical location and frequency of claims.<sup>34 54</sup>

### Impairment

No relationship was found between the size of a doctor's practice community and the rate of alcohol abuse/dependence.<sup>29</sup>

## DISCUSSION

We examined the research evidence provided in peer-reviewed and grey literature identifying and characterising high-risk practitioners. This systematic review found older age, males, longer time in practice, having a history of claims, specialty and heavier clinical workload to be most frequently cited as risk factors for malpractice claims or complaints. The issue of risk factors and predicting complaints and claims is far more complex and context specific than a list of factors suggests. For example, in some countries, it may not be possible to pursue lawsuits for compensation, rather compensation for poor outcomes maybe settled through non-legal means. Differences in settlement practices may explain differences in the rate of complaints and claims between countries. The evidence examining risk factors for impaired performance was limited and likely subject to bias due to analysis primarily based on self-reported measures.<sup>24 30 41 44</sup> For example, studies that used objective measures to record burn-out found fatigue and substance use to impair clinical practice,<sup>30 46</sup> whereas studies using self-reported measures of burn-out found impaired performance stemming from

burn-out manifested in exhaustion, depersonalisation of patients, and reduced sense of personal accomplishment.<sup>24 30 41 44</sup>

Factors associated with higher risk of malpractice claims or complaint are multifactorial and likely interdependent. For example, one contributing factor to a doctor experiencing burn-out may be higher clinical workload.<sup>41</sup> High patient load or workload was associated with complaints, medical errors and poor performance on assessment.<sup>43 50</sup> High workload and fatigue go hand in hand, with fatigue consistently linked to impaired performance (eg, diminished technical skills).<sup>20 46–48</sup> For example, cognitive performance was found to deteriorate throughout a work shift, and cumulatively worsen over the course of successive shifts.<sup>49</sup> Impaired performance such as attentional failures can remain even after a period of rest.<sup>47</sup> Crucially, the decrease in performance/skill due to fatigue is similar to, or greater than performance impairments seen with alcohol intoxication.<sup>46</sup> While the included studies did not directly link impaired performance with malpractice claims or complaint, it is likely that a diminishment or loss of ability plays a role in a doctor's risk for malpractice claim or complaint.

Medical governance and regulatory bodies (eg, Medical Board of Australia, Federation of State Medical Boards—America) typically collect standard information on doctors (eg, age, gender, specialty).<sup>78</sup> It is not practical or ethical for governance or regulatory bodies to collect and apply all 23 factors identified by the review. Instead, factors that are not currently collected by medical governance and regulatory bodies could perhaps be collected by employers, medical defence insurers and doctor health programmes which target high risk members. The need to collect information needs to be balanced and justified against registrants' right to privacy. While no single factor was a strong predictor of risk of claims, complaint or impaired performance, collection of data on all factors would establish the extent to which each factor contributes to a doctor's risk within the local context.

The findings highlight the need to include medical practitioner voices in the discourse on risk and prevention and the contribution of a context-informed perspective that includes awareness of demographic, workplace, social and legal effects. New ways of supporting doctors might be developed, using risk factor data to reduce adverse events and patient harm. For example, widespread education, peer support, mentoring and early intervention for factors associated with complaints, malpractice and impaired performance may facilitate early identification of at-risk doctors, including identification by colleagues, supervisors and patients. It may also help doctors recognise the factors in their own practice that elevates their risk of complaints, malpractice or impaired performance and encourage behavioural change. For instance, understanding that high patient load is a risk factor, medical practitioners might make strategic decisions around the volume of work they choose to take on. Similarly, employers might use the understanding that high patient

volume puts medical practitioners and patients at risk to establish safe and effective workload policies and organisational culture practices. To provide a clearer picture on a doctor's risk, baseline data for the normal population should also be reported alongside doctor population data. Reporting data from both populations would enable absolute rather than relative risk to be determined and facilitate pooling of data for analysis.

### Strengths and limitations

A comprehensive search and rigorous review processes was used to search and appraise studies from a range of academic databases and grey literature sources. We were unable to pool data for analyses due to the heterogeneity of data collection and analysis methods. The majority of studies investigating risk of malpractice claim or complaint were descriptive and involved no comparator groups, limiting the ability to generalise study findings to the wider population of doctors. Furthermore, few studies adjusted statistical analyses to account for factors (eg, workload) likely to impact the risk of malpractice claim or impaired performance. Finally, the research regarding characteristics and risk factors for malpractice and/or impaired performance predominantly comes from the USA. It is possible that differences in healthcare culture (eg, attitudes towards healthcare, spending and responsibility) and governance (eg, malpractice legislation) are country specific, thereby, limiting the generalisability of the review findings.

### CONCLUSION

We identified 23 risk factors for doctors at risk of malpractice claims, complaint and/or impaired performance. The risk factors include demographic factors such as age and gender, as well as work-based characteristics such as clinical workload and the geographical location in which a doctor practices. No single factor was a strong predictor of risk of claims, complaint or impaired performance, therefore, a range of workplace and demographic information should be collected to establish risk profiles.

**Twitter** Elizabeth E Austin @DrLilAustin, Diana Fajardo Pulido @DFajardoPulido, Peter D Hibbert @peter\_hibbert, Jeffrey Braithwaite @JBraithwaite1, Louise K Wiles @wileslouise79, Reidar P Lystad @RLystad, Janet C Long @JanetCLong, Frances Rapport @frapport and Robyn Clay-Williams @RClaywilliams

**Acknowledgements** Mary Simons contributed to the development of the search strategy and Catalin Tufanaru provided guidance on the selection of risk of bias tools for critical appraisal.

**Contributors** EEA, VD, RN, DFP, AP and RC-W conceived the review, RN conducted the search. EEA, VD, RN, DFP, RC-W, GA, YT, RPL, TT, SH, JCL and FR screened titles and abstracts. EEA, VD, RN, DFP, RC-W, GA, PDH, LKW and TT screened full texts. EEA, VD, RN, DFP and RC-W extracted data and undertook the critical appraisal. EEA, VD, DFP and RC-W undertook the qualitative analysis. EEA and VD wrote the introduction, EA and RC-W wrote the discussion. RC-W, PDH and JB revised the first draft of the paper. All members of the team revised the final draft paper.

**Funding** This work was supported by The Medical Council of New South Wales.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as online supplemental information.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Elizabeth E Austin <http://orcid.org/0000-0002-8438-2362>

Peter D Hibbert <http://orcid.org/0000-0001-7865-343X>

Jeffrey Braithwaite <http://orcid.org/0000-0003-0296-4957>

Gaston Arnolda <http://orcid.org/0000-0003-4948-7633>

Reidar P Lystad <http://orcid.org/0000-0003-0506-0902>

Janet C Long <http://orcid.org/0000-0002-0553-682X>

Frances Rapport <http://orcid.org/0000-0002-4428-2826>

Robyn Clay-Williams <http://orcid.org/0000-0002-6107-7445>

#### REFERENCES

- Krupat E, Dienstag JL, Padrino SL, *et al*. Do professionalism lapses in medical school predict problems in residency and clinical practice? *Acad Med* 2020;95:888–95. doi:10.1097/ACM.0000000000003145
- Merriam-Webster. Impairment [online]. Available: <https://www.merriam-webster.com/dictionary/impairment> [Accessed 15 Jul 2020].
- Kornmehl H, Singh S, Adler BL, *et al*. Characteristics of medical liability claims against dermatologists from 1991 through 2015. *JAMA Dermatol* 2018;154:160. doi:10.1001/jamadermatol.2017.3713
- Otaki Y, Ishida MD, Saito Y, *et al*. Analysis of closed claims in the clinical management of rheumatoid arthritis in Japan. *Chin Med J* 2017;130:1454–8.
- Spittal MJ, Bismark MM, Studdert DM. Identification of practitioners at high risk of complaints to health profession regulators. *BMC Health Serv Res* 2019;19:380.
- Nowotny BM, Loh R, Lorenz K. Sharing the pain: lessons from missed opportunities for healthcare improvement from patient complaints and litigation in the Australian health system. *Australian Health Rev* 2018;43.
- Bismark MM, Spittal MJ, Gurrin LC, *et al*. Identification of doctors at risk of recurrent complaints: a national study of healthcare complaints in Australia. *BMJ Qual Saf* 2013;22:532–40.
- Taylor N, Clay-Williams R, Hogden E, *et al*. High performing hospitals: a qualitative systematic review of associated factors and practical strategies for improvement. *BMC Health Serv Res* 2015;15.
- Spittal MJ, Bismark MM, Studdert DM. The PRONE score: an algorithm for predicting doctors' risks of formal patient complaints using routinely collected administrative data. *BMJ Qual Saf* 2015;24:360–8. doi:10.1136/bmjqs-2014-003834
- Moher D, Liberati A, Tetzlaff J, *et al*. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097.
- Ouzzani M, Hammady H, Fedorowicz Z, *et al*. Rayyan—a web and mobile APP for systematic reviews. *Syst Rev* 2016;5:210. doi:10.1186/s13643-016-0384-4
- Tufanaru C, Munn Z, Aromataris E. Chapter 3: Systematic reviews of effectiveness. In: Aromataris EMZ, ed. *Joanna Briggs Institute reviewer's manual*. 2017. The Joanna Briggs Institute, 2017. [https://joannabriggs.org/ebp/critical\\_appraisal\\_tools](https://joannabriggs.org/ebp/critical_appraisal_tools)
- Moola S, Munn Z, Tufanaru C. Chapter 7: Systematic reviews of etiology and risk. In: Aromataris E, Munn Z, eds. *Joanna Briggs Institute reviewer's manual*. The Joanna Briggs Institute, 2017. [https://joannabriggs.org/ebp/critical\\_appraisal\\_tools](https://joannabriggs.org/ebp/critical_appraisal_tools)
- Fathy CA, Pichert JW, Domenico H, *et al*. Association between ophthalmologist age and unsolicited patient complaints. *JAMA Ophthalmol* 2018;136:61. doi:10.1001/jamaophthalmol.2017.5154
- Nikoghosyan-Bossen G, Hauberg A, Homøe P. Increased number of ear-nose-throat malpractice complaints in Denmark. *Dan Med J* 2012;59:A4321.
- Alam A, Klemensberg J, Griesman J. The characteristics of physicians disciplined by professional colleges in Canada. *Open Med* 2011;5:166–72.
- Azab SMS. Claims of malpractice investigated by the Committee of medical ethics, Egyptian medical Syndicate, Cairo. *Egyptian Journal of Forensic Sciences* 2013;3:104–11.
- Gómez-Durán EL, Martín-Fumadó C, Benet-Travé J, *et al*. Malpractice risk at the physician level: Claim-prone physicians. *J Forensic Leg Med* 2018;58:152–4.
- Schaffer AC, Babayan A, Yu-Moe CW, *et al*. The effect of clinical volume on annual and per-patient encounter medical malpractice claims risk. *J Patient Saf* 2020 doi:10.1097/PTS.0000000000000706
- Makowski MS, Shanafelt TD, Hausel A. Associations between dietary patterns and sleep-related impairment in a cohort of community physicians: a cross-sectional study. *Am J Lifestyle Med* 2019;55.
- Cooper WO, Martinez W, Domenico HJ, *et al*. Unsolicited patient complaints identify physicians with evidence of neurocognitive disorders. *Am J Geriatr Psychiatry* 2018;26:927–36.
- Del Bene VA, Brandt J. Identifying neuropsychologically impaired physicians. *Clin Neuropsychol* 2020;34:318–31. doi:10.1080/13854046.2019.1666922
- Brooks E, Gendel MH, Parry AL, *et al*. Challenging cognitive cases among physician populations: case vignettes and recommendations. *Occup Med* 2017;67:68–70. doi:10.1093/occmed/kqw132
- Salmoirago-Blotcher E, Fitchett G, Leung K, *et al*. An exploration of the role of religion/spirituality in the promotion of physicians' wellbeing in emergency medicine. *Prev Med Rep* 2016;3:189–95.
- Brooks E, Gendel MH, Early SR, *et al*. Physician boundary violations in a physician's health program: a 19-year review. *J Am Acad Psychiatry Law* 2012;40:59–66.
- Buhl A, Oreskovich MR, Meredith CW, *et al*. Prognosis for the recovery of surgeons from chemical dependency: a 5-year outcome study. *Arch Surg* 2011;146:1286–91. doi:10.1001/archsurg.2011.271
- Wile C, Frei M, Jenkins K. Doctors and medical students case managed by an Australian doctors health program: characteristics and outcomes. *Australas Psychiatry* 2011;19:202–5. doi:10.3109/10398562.2011.561846
- Finlayson AJR, Dietrich MS, Neufeld R, *et al*. Restoring professionalism: the physician fitness-for-duty evaluation. *Gen Hosp Psychiatry* 2013;35:659–63.
- Oreskovich MR, Shanafelt T, Dyrbye LN, *et al*. The prevalence of substance use disorders in American physicians. *Am J Addict* 2015;24:30–8. doi:10.1111/ajad.12173
- Oreskovich MR, Kaups KL, Balch CM, *et al*. Prevalence of alcohol use disorders among American surgeons. *Arch Surg* 2012;147:168. doi:10.1001/archsurg.2011.1481
- Elkin KJ, Spittal MJ, Elkin DJ. Doctors disciplined for professional misconduct in Australia and New Zealand, 2000–2009. *Med J Australia* 2011.
- Tibble HM, Broughton NS, Studdert DM. Why do surgeons receive more complaints than their physician peers? *ANZ J Surg* 2018;88:269–73.
- Brooks E, Gendel M, Gundersen D. Physician health programmes and malpractice claims: reducing risk through monitoring. *Occup Med* 2013.
- Studdert DM, Spittal MJ, Zhang Y. Changes in practice among physicians with malpractice claims. *N Engl J Med Overseas Ed* 2019.
- Millbank J. Health practitioner regulation: has the National law produced national outcomes in serious disciplinary matters? *Federal Law Review* 2019;47:631–54. doi:10.1177/0067205X19875028
- Baker SR, Whang JS, Luk L, *et al*. The demography of medical malpractice suits against radiologists. *Radiology* 2013;266:539–47. doi:10.1148/radiol.12110971
- Brooks SK, Chalder T, Gerada C. Doctors vulnerable to psychological distress and addictions: treatment from the practitioner health programme. *J Ment Health* 2011;20:157–64. doi:10.3109/09638237.2011.556168
- Walton M, Kelly PJ, Chiarella EM, *et al*. Profile of the most common complaints for five health professions in Australia. *Aust Health Rev* 2020;44:15. doi:10.1071/AH18074
- Kynes JM, Schildcrout JS, Hickson GB, *et al*. An analysis of risk factors for patient complaints about ambulatory anesthesiology care. *Anesth Analg* 2013;116:1325–32. doi:10.1213/ANE.0b013e31827aef83
- American Medical Association D of S and DR. *Physician characteristics and distribution in the US*, 2011: 1–46.
- Qureshi HA, Rawlani R, Mioton LM, *et al*. Burnout phenomenon in U.S. plastic surgeons: risk factors and impact on quality

- of life. *Plast Reconstr Surg* 2015;135:619–26. doi:10.1097/PRS.0000000000000855
- 42 Cottler LB, Ajinkya S, Merlo LJ, et al. Lifetime psychiatric and substance use disorders among impaired physicians in a physicians health program: comparison to a general treatment population: psychopathology of impaired physicians. *J Addict Med* 2013;7:108–12.
- 43 Yen W, Thakkar N. State of the science on risk and support factors to physician performance: a report from the Pan-Canadian physician factors collaboration. *J Med Regul* 2019;105:6–21. doi:10.30770/2572-1852-105.1.6
- 44 Chen K-Y, Yang C-M, Lien C-H, et al. Burnout, job satisfaction, and medical malpractice among physicians. *Int J Med Sci* 2013;10:1471–8.
- 45 Liu J, Hyman DA. Targeting bad doctors: lessons from Indiana, 1975–2015. *J Empir Leg Stud* 2019;16:248–80. doi:10.1111/jels.12214
- 46 Huizinga CRH, de Kam ML, Stockmann HBAC, et al. Evaluating fitness to perform in surgical residents after night shifts and alcohol intoxication: the development of a “fit-to-perform” test. *J Surg Educ* 2018;75:968–77.
- 47 St Hilaire MA, Anderson C, Anwar J, et al. Brief (<4 hr) sleep episodes are insufficient for restoring performance in first-year resident physicians working overnight extended-duration work shifts. *Sleep* 2019;42 doi:10.1093/sleep/zsz041
- 48 Tseng YW, Vedula SS, Malpani A. Association between surgical trainee daytime sleepiness and intraoperative technical skill when performing septoplasty. *JAMA Facial Plast Surg* 2019;21:104–9.
- 49 Anderson C, Sullivan JP, Flynn-Evans EE, et al. Deterioration of neurobehavioral performance in resident physicians during repeated exposure to extended duration work shifts. *Sleep* 2012;35:1137–46. doi:10.5665/sleep.2004
- 50 Wilson M, Randhawa H, Lavis J. Rapid synthesis: identifying risk and protective factors for quality clinical practice [online]. Hamilton, Canada, 2015 <https://macsphere.mcmaster.ca/handle/11375/17255> [Accessed 7 Aug 2020].
- 51 Bismark MM, Spittal MJ, Studdert DM. Prevalence and characteristics of complaint-prone doctors in private practice in Victoria. *Med J Aust* 2011;195:25–8.
- 52 Studdert DM, Bismark MM, Mello MM, et al. Prevalence and characteristics of physicians prone to malpractice claims. *N Engl J Med* 2016;374:354–62. doi:10.1056/NEJMsa1506137
- 53 Elkin K, Spittal MJ, Elkin D, et al. Removal of doctors from practice for professional misconduct in Australia and New Zealand. *BMJ Qual Saf* 2012;21:1027–33. doi:10.1136/bmjqs-2012-000941
- 54 Balch CM, Oreskovich MR, Dyrbye LN, et al. Personal consequences of malpractice lawsuits on American surgeons. *J Am Coll Surg* 2011;213:657–67.
- 55 Myers LC, Gartland RM, Skillings J, et al. An examination of medical malpractice claims involving physician trainees. *Acad Med* 2020;95:1215–22. doi:10.1097/ACM.0000000000003117
- 56 Australian Institute of Health and Welfare. Medical practitioners workforce 2015 [online], 2016. Available: <https://www.aihw.gov.au/getmedia/355dbfe6-9944-4dcf-98a2-472ca076458b/Medical-practitioners-workforce-2015.pdf.aspx?inline=true>
- 57 Australian Institute of Health and Welfare. Australia’s medical indemnity claims 2012–13 [online]. Canberra, 2014. Available: <https://www.aihw.gov.au/reports/hospitals/medical-indemnity-claims-2012-13/contents/summary> [Accessed 7 Aug 2020].
- 58 Jones AT, Kopp JP, Malangoni MA. Association between maintaining certification in general surgery and loss-of-license actions. *JAMA* 2018;320:1195. doi:10.1001/jama.2018.9550
- 59 Birkeland S, Bogh SB. General practice location and malpractice litigation. *Rural Remote Health* 2019;19:4663. doi:10.22605/RRH4663
- 60 Carlson JN, Foster KM, Pines JM, et al. Provider and practice factors associated with emergency physicians’ being named in a malpractice claim. *Ann Emerg Med* 2018;71:157–64.
- 61 Dallal RM, Pang J, Soriano I, et al. Bariatric-related medical malpractice experience: survey results among ASMBS members. *Surg Obes Relat Dis* 2014;10:121–4.
- 62 Tiffin PA, Paton LW, Mwandigha LM, et al. Predicting fitness to practise events in international medical graduates who registered as UK doctors via the professional and linguistic assessments board (PLAB) system: a national cohort study. *BMC Med* 2017;15:66. doi:10.1186/s12916-017-0829-1
- 63 Boyll P, Kang P, Mahabir R, et al. Variables that impact medical malpractice claims involving plastic surgeons in the United States. *Aesthet Surg J* 2018;38:785–92. doi:10.1093/asj/sjx182
- 64 Carney PA, Frederick PD, Reisch LM, et al. How concerns and experiences with medical malpractice affect dermatopathologists’ perceptions of their diagnostic practices when interpreting cutaneous melanocytic lesions. *J Am Acad Dermatol* 2016;74:317–24.
- 65 Finkelstein J, Zhu S. Phenotyping physicians with frequent malpractice claims. In: Proceedings - 2017 IEEE International Conference on Bioinformatics and Biomedicine, BIBM 2017. Institute of Electrical and Electronics Engineers Inc. 2017:1567–70.
- 66 Lyu S-Y, Liao C-K, Chang K-P. Analysis of medical litigation among patients with medical disputes in cosmetic surgery in Taiwan. *Aesthetic Plast Surg* 2011;35:764–72.
- 67 AbuDagga A, Wolfe SM, Carome M, et al. Cross-Sectional analysis of the 1039 U.S. physicians reported to the National practitioner data bank for sexual misconduct, 2003–2013. *PLoS One* 2016;11:e0147800. doi:10.1371/journal.pone.0147800
- 68 Jena AB, Schoemaker L, Bhattacharya J, et al. Physician spending and subsequent risk of malpractice claims: observational study. *BMJ* 2015;351:h5516. doi:10.1136/bmj.h5516
- 69 Tsugawa Y, Jha AK, Newhouse JP, et al. Variation in physician spending and association with patient outcomes. *JAMA Intern Med* 2017;177:675. doi:10.1001/jamainternmed.2017.0059
- 70 Black B, Hyman DA, Lerner JY. Physicians with multiple paid medical malpractice claims: are they outliers or just unlucky? *Int Rev Law Econ* 2019;58:146–57.
- 71 Raineri Bernain G, Bravo Rodríguez L, Lagos Tissie D, et al. Analysis of Chilean Supreme Court rulings in medical malpractice cases, 2014–2015. *Spanish Journal of Legal Medicine* 2019;45:108–13.
- 72 Casali MB, Blandino A, Del Sordo S, et al. Alleged malpractice in orthopaedics. Analysis of a series of medical insurance claims. *J Orthop Traumatol* 2018;19:7. doi:10.1186/s10195-018-0500-4
- 73 Faisant M, Papin-Lefebvre F, Rerolle C, et al. Twenty-five years of French jurisprudence in criminal medical liability. *Med Sci Law* 2018;58:39–46. doi:10.1177/0025802417737402
- 74 Hamasaki T, Hagihara A. Physicians’ explanatory behaviours and legal liability in decided medical malpractice litigation cases in Japan. *BMC Med Ethics* 2011;12:7. doi:10.1186/1472-6939-12-7
- 75 Bishop TF, Ryan AM, Ryan AK, et al. Paid malpractice claims for adverse events in inpatient and outpatient settings. *JAMA* 2011;305:2427–31. doi:10.1001/jama.2011.813
- 76 Gaitan-Duarte H, Eslava-Schmalbach J, Montoya L, et al. Association between reportable preventable adverse events and unfavorable decisions in medical malpractice claims involving obstetricians covered by FEPASDE Colombia 1999 to 2014. Case-control study. *Colomb J Anesthesiol* 2019;47:14–22. doi:10.1097/CJ9.0000000000000081
- 77 Mozeika AM, Sachdev D, Asri R, et al. Sociological and medical factors influence outcomes in facial trauma malpractice. *J Oral Maxillofac Surg* 2019;77:1042.e1–1042.e10.
- 78 Medical Board AHPRA. Registration data table - March 2020 [online], 2020. Available: <https://www.medicalboard.gov.au/News/Statistics.aspx>
- 79 Brooks E, Early SR, Gundersen DC, et al. Comparing substance use monitoring and treatment variations among physician health programs. *Am J Addict* 2012;21:327–34. doi:10.1111/j.1521-0391.2012.00239.x
- 80 Keshavarz P, Dehghani M, Malekpour F, et al. A 10-year retrospective descriptive study of internists’ complaints referred to Fars Legal Medicine Center. *Egypt J Forensic Sci* 2019;9. doi:10.1186/s41935-019-0130-x
- 81 Oshel RE, Levitt P. The detection, analysis, and significance of physician clustering in medical malpractice lawsuit Payouts. *J Patient Saf* 2016;1–5.
- 82 Tessler MJ, Shrier I, Steele RJ. Association between anesthesiologist age and litigation. *Anesthesiology* 2012;116:574–9.
- 83 Yadav M, Rastogi P. A study of medical negligence cases decided by the district consumer courts of Delhi. *J Ind Acad Foren Med* 2015;37:50–5.