Emotion regulation and burnout in doctors: A systematic review

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Abstract:

Background: Burnout is a pervasive health condition affecting many doctors at various stages in their careers. Characterised by emotional exhaustion, depersonalisation, and a reduced sense of personal accomplishment it can result in significant personal and professional consequences putting patient care at risk. Emotion regulation describes a capacity to self-modulate emotions to achieve desirable emotional outcomes. Emotional intelligence theory suggests that emotion regulation skills facilitate the maintenance of appropriate emotions, reducing or adapting undesirable emotions in oneself and others. Emotion regulation is usually automatic but can be controlled through learnt strategies. There is evidence that occupationally stressed individuals are less capable of down-regulating negative emotions. This paper systematically reviews studies of the role of emotion regulation in burnout in doctors.

Aims: To examine the relationship between emotion regulation and burnout among doctors.

Methods: Four online databases (Psych Info 1833-2017, Medline 1928-2017, Scopus 1960-2017 and Embase 1974-2017) were searched in August 2017. Searches returned 15,539 citations, which after de-duplication yielded 12,295 citations. After title and abstracts screening 12,273 citations were excluded. Twenty-two full text articles were read and eight excluded for ineligibility. Following data extraction, bias and methodological quality assessment, findings were synthesised using descriptive analysis and presented according to relevant themes.

Results: A correlative relationship was observed between emotion regulation and burnout in doctors. Findings also indicated that - using self-regulatory or taught emotion regulation skills or interventions such as mindfulness were associated with a reduction in burnout.

Conclusion: Emotion regulation is an important psychological variable associated with burnout.

Key words: Burnout; emotion regulation; occupational stress; doctors; systematic review.

Introduction

Occupational stress and burnout are known to be associated with negative work-related outcomes such as low work satisfaction, low productivity, employee ill-health, absenteeism and higher employee attrition [1]. Within human service professions like medicine, the deleterious effects of burnout from prolonged occupational stress are well known. Among physicians, the most common causes of burnout have been reported as excessive workload and loss of control in one's work, while in surgeons, a commonly cited reason is long working hours [2].

Burnout is considered to be a psychological syndrome which usually presents with a state of physical, emotional, and mental exhaustion, often associated with diminution of the individual's ability to cope with the demands of the work environment as a result of cumulative or chronic work-related stress [3]. It is usually characterised by three components; emotional exhaustion (which can also be described as the individual's loss of passion for their work), depersonalization (where the individual treats the patient as an object), and lack of personal accomplishment (described as a sense of the individual's work no longer being meaningful) [4]. Apart from these three classic components, burnout can also present with symptoms that mimic common mental health problems such as depression [5]. Deciding whether burnout is a type of depressive condition remains a subject of continuing scientific debate [7]. What is known however is that burnout is specifically work-related, while depression can be non-specific and develop outside the context of work. What is also established on the same subject is that there are personal consequences of burnout to doctors' mental health [8]. Other established professional consequences include attrition from the profession, [9] negative impact on patient care, [10] and poor interaction with

patients often due to poor emotion management [11]. These consequences continue to attract the attention of researchers particularly to find more effective methods of preventing the condition and managing it when it occurs.

It is believed that about a third to half of all physicians irrespective of speciality will experience at least one of the three components of burnout in their professional careers, and studies have reported that burnout in doctors often begins during undergraduate training and continues throughout postgraduate training and beyond [12, 13]. Prevalence rates among medical students have been estimated at 50% [14], while in surgical and medical residents figures are reported to be between 50 and 76% respectively [2, 16]. In practising physicians, prevalence rates of between 25 to 60% have been reported [2, 13].

Of the three components of burnout, emotional exhaustion is believed to be the first presenting symptom [3]. It is characterised by feelings of emotional depletion, extreme tiredness, lacking energy and motivation, and feeling bereft of emotional resources to cope with the continuing demands of work. It is suggested that at the point of extreme tiredness, the individual acts to preserve and regulate their energy levels, investing less effort in their work and gradually withdrawing emotionally and cognitively from it [17]. This cognitive and emotional withdrawal then progresses to depersonalisation, which presents with the individual displaying significantly detached responses to their work with a tendency to treat clients as objects [3]. In the final phase of burnout, the individual tends to evaluate himself/herself negatively, comparing their current level of competence to their competence prior to emotional exhaustion and depersonalisation. They realise they are not as effective in

accomplishing their current work-related responsibilities, resulting in reduced personal accomplishment (characterised by a feeling of incompetence, low productivity and a feeling of lack of achievement) [3].

There are currently no known biological markers for burnout. Additionally, the underlying physiological mechanisms by which occupational stress manifests into burnout remain unclear. Emerging evidence however suggests that associations may exist between burnout and distinct alterations in the hypothalamic-pituitary-adrenal axis production of cortisol [18]. This evidence suggests that stress-related pathologies like burnout may result from dysfunction of stress response mediators in the brain. Corticotrophin Releasing Factor (CRF), a known brain neuromodulator responsible for coordinating autonomic, behavioural and cognitive responses to stress has been suggested as one such mediator thought to be a significant player in this stress response paradigm . Similarly, different convergent points for interaction (mainly within the nucleus coeruleus and dorsal raphe nucleus) have been identified for opioids/CRF, where altered balances between 'pro-stress' and 'anti-stress' systems are thought to occur [19].

Emotion regulation on the other hand describes processes by which individuals can modulate their emotions in pursuit of desirable emotional states or outcomes. In understanding the construct of emotion regulation, a description of what emotions are is vital. Historically, emotions theorists have struggled to define emotions as unitary concept and they have frequently attributed very different yet heuristic interpretations to the term. Generally however, most theorists have viewed emotions as multifaceted, whole-body responses (to relevant or personal events) which

involve coordinated changes in bodily areas such as physiology, the subjective experience, and behaviour. From this perspective, leading emotion researchers like Gross and Thompson have described emotion regulation as goal directed processes that function to influence the intensity, duration and type of emotion experienced [20]. Emotion regulation can be categorised as an automatic (implicit) process, or an effortful (explicit) process (controlled by learnt strategies to initiate, display, maintain or modify it) [21]. Implicit regulation occurs without the individual making a conscious effort to do so, frequently initiated by simple registration of sensory inputs which in turn activate knowledge paradigms or schemas which then influence psychological functions. Explicit emotion regulation however requires volition and attention. In his influential process model of emotion regulation, Gross distinguished between two main emotion regulation strategies based on whether the strategy influences emotions at the input phase (antecedent-focused) or output phase (response-focused). In the model, emotions may be regulated at five points during the emotion generation process; 1) situation selection (e.g. approach or avoid certain situations), 2) situation modification (e.g. tailor situation to alter its emotional impact), 3) attention deployment (e.g. distraction or concentration), 4) appraisal (e.g. cognitive change) and 5) response modulation (e.g. suppression) [20]. The first four elements of this process are antecedent-focused (i.e. occurring before fully generated emotional responses) and the last element regarded as response-focused (i.e. occurring after fully generated emotional responses). Ultimately, the process does result in emotional responses which are either lessened in severity or duration (thereby reducing deleterious or negative outcomes) or augmented (increasing such outcomes).

Emotion regulation is also an aspect of affect regulation and it represents an important facet of the set of competencies included in human emotional intelligence. The theory of emotional intelligence suggests that individuals with greater emotion regulation skills hold wider ranges of strategies for maintaining appropriate emotions, which helps them reduce or adapt undesirable emotions in themselves and in others [22]. . In a recent functional magnetic resonance imaging study on a non-physician population, the influence of work-related chronic stress on the regulation of emotion and brain functional connectivity reported that occupationally stressed participants were less capable of down-regulating negative emotions and had altered stress-processing limbic networks [24]. This finding suggests that occupationally stressed individuals with impaired emotion regulation ability might be more vulnerable to burnout. Evidence from the nursing profession has suggested that high levels of occupational stress are associated with low levels of emotional intelligence and self-efficacy [25]. Similar nursing evidence has found consistent inverse relationships between emotion control, its management, and burnout [26]. What remains unclear is the role of emotion regulation in burnout among doctors. The aim of this review is therefore to systematically review the literature on the relationship between emotion regulation and burnout in doctors. The review will address the question: What is the role of self-regulatory or taught emotion regulation skills or interventions in burnout among doctors.

Methods

We followed the PRISMA guidelines throughout all stages of study selection [27]. The bibliographic databases (Psych Info 1833-2017, Medline 1924-2017, Scopus 1960-2017 and Embase 1974-2017) were searched in August 2017. The subject-

specific keywords [doctor* or physician* OR GP* OR general practitioner* OR intern* OR resident* OR registrar* OR fellow* OR consultant*] *AND* [burnout* OR stress* OR stress management* OR exhaust* OR occupational stress*] *AND* [emotional affect* OR emotion regulation*, OR positive affect* OR negative affect* or positive mood* or negative mood* OR cognitive reappraisal or expressive suppression*] were combined separately to help identify relevant papers. Identified papers were limited to English language citations only.

Our inclusion criteria were primary quantitative studies, studies conducted in inpatient and outpatient healthcare settings, and studies published in English and in peer review journals focusing on emotion regulation in doctors and whose findings relate to burnout. Exclusion criteria included qualitative studies and systematic reviews, studies conducted in non-healthcare settings, studies not focusing on doctors or not focusing on emotion regulation in doctors, opinion-based articles, editorials, or articles focused exclusively on theoretical contributions of emotion regulation.

Our study eligibility adhered to the Population, Intervention, Comparator, Outcome (PICO) framework [28]. The study population being doctors, and interventions being self-regulatory or taught emotion regulation skills/interventions. There were no comparators and the contexts were healthcare settings. Outcomes assessed were whether emotion regulation in doctors correlated with or predicted burnout. One author (GJK) screened titles and abstracts, removed ineligible citations, and selected full text articles for inclusion in the study. A second author (PG) checked for discrepancies and disagreements were resolved through discussion. The reference lists of all eligible papers were searched for further references that had not been identified during electronic searching. Data extracted included the study author, year

and country of publication, aim, participants, setting, design, burnout measure, emotion regulation intervention or measure, data analysis technique used, and findings reported.

We assessed risk of bias using six questions from the Critical Appraisal Tool for assessing the quality and risk of bias in Cross-Sectional studies (AXIS) [29]. The tool consists of 20 questions; seven relating to quality of reporting, seven to study design quality, and six to the possible introduction of bias. Each question in the tool requires a 'yes', 'no' or 'don't know' response. The tool does not provide a total numerical scale and therefore a degree of subjective assessment is required. The six possible introduction of bias questions used were: (1) was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation, (2) were measures undertaken to address and categorise non-responders, (3) were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously, (4) does the response rate raise concerns about non-response bias, (5) If appropriate, was information about non-responders described, and (6) were the results internally consistent?

We assessed methodological quality assessment of selected studies using the 16-item quality assessment tool (QATSDD) [30]. Details of the tool's psychometric properties are available elsewhere [30]. The tool consists of 16 items, 14 of which apply to both qualitative and quantitative papers, and all 16 items apply to mixed methods papers. Each of the 16 criteria are scored on a Likert scale of 0 to 3 according to whether the descriptors were present in the paper or not (0 = not at all, 1 = very slightly, 2 = moderately, and 3 = complete). This scoring produces a

maximum score of 48 (16 x 3) for mixed methods papers, and 42 (14 x 3) for qualitative or quantitative papers. As this study involved only quantitative studies, only 14-tool-scoring items were used. To compare quality of the papers reviewed between studies, a calculation was undertaken for each paper in percentage of the maximum possible score obtained. Data synthesis was achieved by an in-depth descriptive analysis of key findings. Meta-analysis was not undertaken because of study heterogeneity.

Results

The four electronic databases searched yielded 15,539 citations. After de-duplication 12,295 citations were retuned. Titles and abstracts of the 12,295 citations were screened and 12,273 citations excluded because they did not meet the eligibility criteria. Full text articles of the remaining 22 papers were read. Eight full text papers were excluded as they did not meet the eligibility criteria. Five of the excluded studies were conducted in non-physicians, two studies had no emotion regulation measures, and one was a discussion paper on emotion regulation strategies (figure 1).

Figure 1 here

Six studies were conducted in the USA [31-36], two in Canada [37, 38], two in Italy [39, 40], one from Greece [41], one from Hungary [42], one from Spain [43], and one from Israel [44]. Six studies were conducted in hospital settings [31, 35, 36, 38, 40], another six in hospital and outpatient community settings [33, 34, 37, 39, 41, 42, 44], and two in primary care outpatient settings [32, 43]. All fourteen studies were of a cross-sectional design. Two of the studies used pre- and post-intervention

approaches and involved the administration of interventions [33, 34]. Of the fourteen studies reviewed, eight involved doctors only [31-33, 35-37, 42, 43], while the study populations in six involved a combination of doctors and other healthcare professionals [34, 38-41, 44]. Eight studies examined the relationship between correlates such as mindfulness, self-regulation and intrinsic individual factors (such as positive and negative emotions) on occupational stress, burnout and professional wellbeing [31-34, 36, 37, 40, 41]. Three studies investigated how emotion regulation impacts on healthcare workers, including coping styles and use of different emotion regulation strategies and its associations with burnout [38, 39, 42, 43]. One study examined the predictors of burnout in healthcare workers [42], while another focused on the relationship between emotional intelligence and professional wellbeing and burnout [35]. Another study sought to establish the role of personal and professional factors in physician compassion fatigue [44].

Table 1 here

Regarding risk of bias assessment, participant selection processes in majority of individual studies produced representative samples [31-33, 35, 36, 42-44]. All 14 studies used previously validated measures/tools. While across all 14 studies measures used to address and categorise non-responders could have been better defined, results generally were internally consistent [31-38, 40, 42-44]. Similarly, response rates in the majority of studies were adequate. For studies with a potential for non-response bias, the main issue identified was lack of adequate information about non-responders and measures (if any) taken to address and categorise non-responders [33, 38-42, 44].

Table 2 here

The overall methodological quality of studies was good. All 14 studies achieved more than 50% of the maximum achievable quality score of 42 points. The median quality score for all studies was 25 points (60%) The lowest scoring study achieved 22 points (52%) [42] and the highest achieved 32 points (76%) [43]. Three studies achieved a total quality score of ≥ 30 points (71% - 76%) [32, 41, 43], and seven studies achieved quality scores of ≥ 25 - 29 points (60% - 69%) [31, 33, 36-38, 40, 44]. Only four studies achieved quality scores below 25 points i.e. 21 - 24 points (52% - 57%) [34, 35, 42]. Main areas of methodological weaknesses across studies were lack of explicit statements regarding whether sample size calculations were considered in terms of analysis, the lack of explicit statements relating to the rationale for choice of data collection tool(s), and not making explicit evidence of user involvement in the design of studies. Individual quality ratings scores of studies are displayed in Table 3.

Table 3 here

In respect of emotion regulation interventions, taught emotion regulation skills were measured in 2 studies [37-39], and individual self-regulation skills measured in 12 studies [31, 33, 35-38, 40-42, 44]. All 12 studies which measured self-regulation skills used previously validated emotion regulation measures [31, 33, 35-44]. Regarding outcome measures, emotion regulation measures were much more heterogeneous compared with burnout measures. All fourteen burnout measures were standardised and validated [77-90]. Emotion regulation interventions/outcome measures are summarised in Table 4, and burnout measures in Table 4A.

Table 4 here

Constructs investigated which related to emotion regulation were correlates of burnout [31], antecedents and consequences of burnout [39], predictors of burnout [42], intrinsic factors associated with burnout [36], job satisfaction, professional quality of life and burnout [32], psychological wellbeing and burnout [33, 34, 37, 40, 43], positive emotions and occupational strain [41], emotional intelligence and clinician wellbeing [35], and personal/professional factors related to compassion fatigue [44].

Regarding emotion regulation as a predictor of burnout, findings from three studies [35, 37, 42] reported predictive relationships between clinician emotion regulation and burnout. In one study, clinician's self-regulation capacity negatively predicted all three components of burnout (emotional exhaustion, depersonalization, personal accomplishment), and positively predicted psychological wellbeing in the form of personal growth, positive relationships with others, and clinician self-determination [37]. In another study [42], the strongest predictors of the emotional exhaustion component of burnout was emotional dissonance, while clinicians' display of negative emotions was predictive of depersonalization. In a third study, emotional intelligence was found to be positively predictive of wellbeing and negatively associated with two components of burnout (emotional exhaustion and depersonalization) [35].

As a correlate, emotion regulation was associated with burnout in seven studies [36, 38-41, 43, 44]. Clinicians' experience of positive emotions in one study [41] was negatively correlated with occupational strain. Similarly, another study reported that

emotion regulation in clinicians was negatively associated with the emotional exhaustion component of burnout, but positively associated with surface acting [43]. Surface acting is an emotion regulation strategy where the individual regulates his or her emotional responses using response-focused strategies such as emotion suppression by cognitive or behavioural means, e.g. pretending to be enthusiastic about a task when that is really not the case. Surface acting was also found in another study to be positively associated with the emotional exhaustion and depersonalization components of burnout, while deep acting was positively correlated with the depersonalization component of burnout [39]. In deep acting the individual regulates the precursors of emotion using antecedent-focused strategies such as attention deployment or appraisal (cognitive change) to modify their perception of a situation, e.g. a doctor may attempt to understand a situation from a colleague's perspective as a means of modulating his or her feelings of anger toward the colleague. Higher levels of anger or loss of anger control in one study were reported to be associated with increasing burnout, and higher scores on state anger were associated with a pathological state of emotional exhaustion [40]. While task-oriented coping was found in one study to be associated with decreased risk of burnout, emotion-oriented coping in the same study was reported be associated with an increased risk of burnout [38]. Task and emotion-oriented coping are basic coping strategies by which workers manage stressful situations. In task-oriented coping the individual deals with the issue at hand using proactive measures such as outlining priorities, while with emotion-oriented coping the individual experiences emotional distress e.g. becoming tense or blaming themselves. Likewise, ability-based emotion management, trait emotional intelligence and emotion-focused coping were all found to be inversely associated with compassion fatigue in another study [44].

In respect of interventions, mindfulness was the commonest strategy-based emotion regulation intervention encountered in the studies reviewed. Its relationship to burnout was variously investigated in four studies [31-34]. While one study reported that trainee physicians with burnout had lower mean scores on the Cognitive and Affective Mindfulness Scale (CAMS-R) scale i.e. lower levels of mindfulness [31], another reported reduction in all three measures of burnout i.e. emotional exhaustion, depersonalization and personal accomplishment following administration of an abbreviated mindfulness intervention training. In another study which tested a hypothesis that mindfulness-based resilience training decreases burnout, no substantial short-term change in burnout parameters was reported, but there was a trend for higher perceived stress in residents (junior trainee doctors) to correlate with reduction in stress and burnout after training [33]. In a comparable study, which used a mindfulness-based stress reduction intervention, improvement was seen in all three measures of the Maslach Inventory scores i.e. emotional exhaustion, depersonalization, and personal accomplishment [34].

Discussion

Findings from this review show that emotion regulation predicts and correlates with burnout in doctors. The findings also indicated that use of self-regulatory or taught emotion regulation skills/interventions were associated with a reduction in burnout. It was also observed that emotion regulation measures used in this area of research were much more heterogeneous than expected, particularly when compared with burnout measures. This may be explained by the complexities associated with emotion regulation and its measurement, as emotion regulation is a multi-

dimensional concept and would frequently encompass cognitive and non-cognitive facets with consequences often extending beyond just the individual.

Regarding the predictive relationship between emotion regulation and clinician burnout, the importance of emotion management skills such as self-regulation and self-management are clearly essential in the practice of medicine, to help physicians manage occupational stress and the risk of burnout much more effectively [37]. Similar findings were reported in another study where a strong predictive relationship between self-regulation capacity and enhancement in physicians' psychological well-being was reported [46]. In other studies, effective self-regulation/self-management skills were demonstrated to be predictive not just of health and well-being but also of enhancement in performance [47]. Taken together, these findings suggest that self-regulation capacity ensures that physicians can continue to maintain optimum physical and psychological well-being over the duration their professional careers and a proposed mechanism of self-regulation capacity within this context is the proactive regulation of emotions by the individual [48]. It is thought that this proactive regulation simultaneously protects the individual from recurring stressors or strains, and this helps them achieve external psychological well-being [48]. Some of these ideals include establishing purpose in life and environmental mastery [46]. Simon and Durand-Bush [46] argue that these two ideals have significant implications for maintaining one's position because by being able to regulate emotions in this manner, one maintains purpose and meaning in life generally, and occupationally in particular.

The predictive role of emotional dissonance and the display of negative emotions in burnout has also garnered research attention and a recent meta-analysis reported findings in this regard, where surface acting was strongly and positively correlated with emotional exhaustion, depersonalization and psychological strain [49].

The role of mindfulness and its relationship to reduction in burnout suggests that it plays an important role in burnout. Several studies have investigated and demonstrated the usefulness of mindfulness based interventions such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) in decreasing emotion regulation difficulties, and thereby reducing emotional reactivity which increases an individual's ability to engage in day-to-day activity regardless of levels of emotional arousal or stresses [50]. In the context of burnout, mindfulness is thought to contribute to the enhancement of an individual's ability to derive meaning in their work through a process of self-awareness which assists in countering facets of burnout such depersonalization and emotional exhaustion [31].

Practically these findings will be beneficial to healthcare employers when planning psychological services aimed at helping prevent and manage burnout. By incorporating emotion regulation training into targeted psychological programmes, healthcare employers are likely to cultivate cohorts of doctors equipped with relevant emotion regulation and resilience skills, so that they can to cope with the relentless pressures which inevitably are associated with medical practice. Collaboration between occupational psychologists and occupational physicians might be one way of setting up such programmes. Occupational physicians could play a central role by

identifying individuals with early signs of burnout and refer them for early intervention to ensure that this refractory distress condition is managed appropriately thereby reducing its deleterious personal and occupational impact.

Limitations of this review include acknowledgement that studies used were all conducted in English and therefore the potential for publication bias cannot be ruled out. Other limitations include the relatively small sample sizes and non-responders in some individual studies, both associated with the risk of bias in outcomes. Also notable was heterogeneity in studies, precluding metanalysis. Additionally, as studies are drawn from different countries across the world, with different healthcare systems, it is possible that physicians' emotion regulation and associated outcomes may be influenced by differing local working conditions and practice.

Future research should include clarification of the mechanisms by which positive emotions help doctors cope better with occupational stress and burnout. Similarly, studies in nursing and allied professionals are likely to be beneficial. Prospective or randomised controlled designs in future studies will also help strengthen internal validity of studies in this area.

In summary, results from this systematic review suggest a correlative relationship exists between emotion regulation and burnout in doctors. Our findings also indicate that use of self-regulatory or taught emotion regulation skills/interventions such as mindfulness are associated with a reduction in burnout in doctors. It is widely recognised in human service professions that those most vulnerable to burnout are typically those who are dedicated, highly driven, and often heavily emotionally

involved (such as doctors), it is therefore vital that early recognition and assessment of emotion driven processes associated with their work is routinely assessed. This will ensure that appropriate psychological interventions are offered to help prevent development of burnout and associated adverse consequences such as professional attrition and risks to patient safety.

Key points

- An association exists between emotion regulation and burnout in physicians.

- Emotion regulation training is associated with a reduction in burnout.

- Appropriate emotion regulation confers positive benefits such as diminution of negative emotions and increased psychological resilience.

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Table 1: Summary of characteristics of studies

Author, year, country	Design	Participants & setting	Aim	Burnout measure	Emotion regulation measure/Intervention	Data analysis	Findings
Chaukos et al 2016, USA [31]	Cross-sectional	75 medicine and psychiatry hospital residents	Examined correlates of burnout prior to starting clinical rotations	Maslach Burnout Inventory	Cognitive and Affective Mindfulness Scale (CAMS-R)	Chi Squared tests and Unpaired two-tailed t tests	Residents with burnout had significantly lower levels of mindfulness (CAMS-R 28.5 ± 6.6 vs. 32.5 ± 6.3, t -2.3, p<0.05 , d = -0.63)
Fortney et al., 2013, USA [32]	Cross-sectional	30 physicians working in primary care	Investigated abbreviated mindfulness intervention pre/post training and increases job satisfaction, quality of life and compassion	Maslach Burnout Inventory	Abbreviated mindfulness intervention	Linear mixed-effect model analysis	Reductions in all measures of burnout: Emotional exhaustion p<0.001, depersonalization p< 0.005, , personal accomplishment P< 0.001)
Gagnon et al., 2016, Canada [37]	Cross-sectional	25 Physicians and 37 medical students in hospitals and community settings	Investigated relationship between self-regulation, psychological wellbeing and burnout	Maslach Burnout Inventory	Self-regulation Questionnaire	Hierarchical regression analyses	Self-regulation capacity positively predicted psychological wellbeing (personal growth ß=0.49, positive relationships with others ß=0.46, autonomy ß=0.43) and negatively predicted burnout (emotional exhaustion ß =-0.45, depersonalization ß= - 0.30, personal accomplishment ß= - 0.56)
Galanakis et al., 2011, Greece [41]	Cross-sectional	2775 professionals from public and	Investigated relationship between positive emotions and occupational strain	Occupational Stress Inventory	Differential Emotion Scale- Modified	Correlation and regression analyses	Experiencing positive emotions is negatively correlated

		private sectors including 71 medical doctors					with occupational strain (r=-0.53, p<0.01)
Goldhagen et al., 2015, [33] USA	Cross-sectional: pre/ post intervention prospective study	47 residents (before intervention), 30 residents (after intervention) from hospital and primary care settings	Test hypothesis that a mindfulness-based resilience intervention would decrease stress and burnout	Oldenberg Burnout Inventory (OLBI)	Mindfulness-based resilience activities measured with Mindfulness Attention Awareness Scale	Kruskal-Wallis and Wilcoxon signed rank tests	No significant short-term change in stress or burnout, but there was a trend for higher perceived residency stress to correlate with reduction in stress and burnout after intervention (OLBI disengagement subscale p< 0.05,
Goodman & Schorling 2012, USA [34]	Cross-sectional: pre/ -& post intervention study	93 healthcare providers including 51 physicians from university and community settings	Determine if mindfulness-based stress reduction could decrease burnout and improve wellbeing	Maslach Burnout Inventory	Mindfulness Based Stress Reduction Programme	*T tests* and Chi-squared tests	Maslach Burnout Inventory scores improved after the MBSR programme (emotional exhaustion p<0.05), depersonalization (p<0.05), personal accomplishment (p<0.001) and mental wellbeing (p<0.001)
Howlett at al., 2015, Canada [38]	Cross-sectional	616 healthcare, including 43 physicians' professionals within a hospital setting	Examined relationship between coping styles and burnout	Maslach Burnout Inventory	Coping Inventory for Stressful Situations (CISS)	Regression analyses	Task oriented coping associated with decreased risk of burnout, whiles emotion-oriented coping associated with increased risk of burnout
Kovacs et al., 2010, Hungary [42]	Cross-sectional	186 healthcare workers from in-and-outpatient services 80 physicians	Investigate predictors of burnout in healthcare workers	Maslach Burnout inventory	Frankfurt Emotion Work Scale – Hungarian version	Independent *T tests* and regression analyses	Strongest predictors of burnout were emotional dissonance for emotional exhaustion (ß=0.401), and

							display of negative emotions for depersonalization (ß=0.332)
Lin et al., 2016, USA [35]	Cross-sectional	73 hospital residents	Understand the relationship between emotional intelligence and wellness among surgical residents	Maslach Burnout Inventory	Emotional Intelligence Questionnaire – short form	Multivariate regression analyses	Emotional intelligence strongly & positively predictive of wellbeing (ß=0.76; p<0.001), and negatively with emotional exhaustion (ß=-0.63; 0.001), depersonalization (ß=-0.48; p<0.05) and depression (ß= -0.60; p<0.001)
Martínez-Íñigo 2007, Spain [43]	Cross-sectional	345 primary care General Practitioners	Examined how use of different emotion regulation strategies relates to doctor's emotional exhaustion	Maslach Burnout Inventory	Emotion Labour Scale	Hierarchical multiple regression	Emotion regulation negatively associated with emotional exhaustion F (6,322) = 24.05, ß = - 0.12, p < 0.01) but positively associated with surface acting F (6,324) = 25.82, ß = 0.17, p < 0.01) and neutral with deep acting
Muscatello et al., 2006, Italy [40]	Cross-sectional	68 healthcare professionals including medical oncologists, medical oculists and nurses in a hospital setting	Evaluate prevalence of anger emotions in oncology staff and its correlation with burnout compared with staff in ophthalmology	Maslach Burnout Inventory	State-Trait Anger Expression Inventory	Correlational and regression analysis	Correlational analysis showed that higher anger/loss of anger control associated with increasing burnout. Higher scores on State Anger associated with

							pathological state of Emotional exhaustion (OR: 1.17, 95% CI = 1.04-1.32)
Olson et al., 2015, USA [36]	Cross-sectional	45 first year paediatric and medicine-paediatric residents in a hospital setting	Test a conceptual model that defined selected intrinsic factors that are related to burnout	Maslach Burnout Inventory	The Five Facet Mindfulness Questionnaire and Neff's Self-Compassion Scale	Pearson correlations and analyses of variance	Self-compassion and mindfulness positively associated with resilience (r=0.37, p<0.05) & (r= 0.38, p<0.05) respectively. Self-compassion and mindfulness inversely associated with burnout (r=-0.35, p<0.05) & (r= -0.33, p<0.05) respectively
Zammuner et al 2003, Italy [39]	Cross-sectional	180 hospital employees including doctors and nurses	Investigate how emotion regulation affects healthcare workers' jobs, the kinds of emotion regulation processes needed, antecedents/consequences and whether emotional labour might be a causal	Maslach Burnout Inventory	Emotional Labour Scale	Correlational analysis	Surface acting positively associated with emotional exhaustion (r=0.31, p<0.01) and depersonalization (r=0.21, p<0.01) and negatively with deactivated affect

			component of burnout				(r=-0.23, p<0.01). Deep acting positively correlated with depersonalization (r=0.15, p< 0.05) and negatively correlated with social desirability (r=-0.26, p<0.01)
Zeidner et al 2013, Israel [44]	Cross-sectional	83 mental health practitioners and 93 physicians from seven hospitals and six private clinics	Investigated the role of personal and professional factors in compassion fatigue	Professional Quality of Life Scale – (Compassion Satisfaction/Fatigue Subscales)	Emotion Management Subscale of the Mayer-Salovey-Caruso Emotional Intelligence Test	MANCOVA	Ability-based emotion management (ß = -0.18, t = - 2.35, p < 0.01) and trait emotional intelligence (ß = -0.18, t = -2.29, p < 0.05), were inversely associated with compassion fatigue. Emotion focused coping was inversely related to compassion fatigue (ß= 0.56, t=8.52, p < 0.01)

Table 2: Risk of bias assessment *(can be made available as supplementary data at Occupational Medicine on line)*

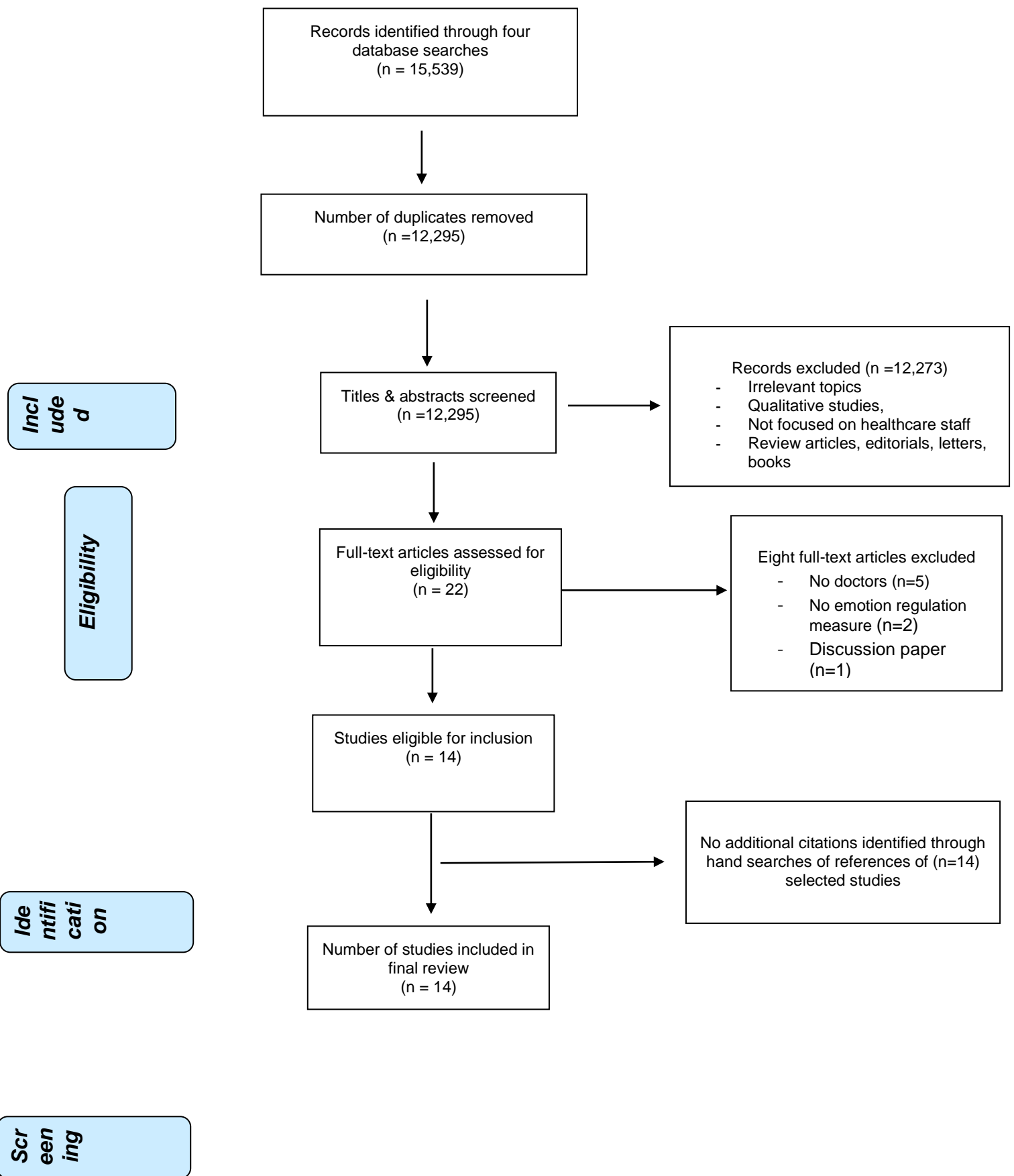| Risk of bias questions → Studies ↓	Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?	Were measures undertaken to address and categorise non-responders?	Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?	Does the response rate raise concerns about non-response bias?	If appropriate, was information about non-responders described?	Were the results internally consistent?
Chaukos et al 2016	+	≠	+	-	-	+
Fortney et al 2013	+	≠	+	-	+	+
Gagnon et al 2016	-	≠	+	-	+	+
Galanakis et al 2011	-	≠	+	≠	≠	≠
Goldhagen et al 2015	+	≠	+	+	-	+
Goodman & Schorling 2012	≠	≠	+	-	+	+
Howlett et al 2015	-	≠	+	+	-	+
Kovacset al 2010	+	≠	+	+	-	+
Lin et al 2016	+	≠	+	-	-	+
Martínez-Íñigo 2007	+	≠	+	-	-	+
Muscatello et al 2006	-	≠	+	≠	-	+
Olson et al 2015	+	≠	+	-	-	+
Zammuner et al 2003	≠	≠	+	≠	-	≠
Zeidner et al 2013	+	≠	+	≠	-	+

Key: **Yes = +, No = -, Don't know = ≠**

Table 3: Quality rating scores of studies *(can be made available as supplementary data at Occupational Medicine on line)*

	Scoring of quality rating 0 = Not at all, 1 = Very slightly, 2 = Moderate, 3 = Complete (**Maximum possible score =42**)													
Study reference → ***Quality assessment criteria*** ***↓***	[31]	[32]	[37]	[41]	[33]	[34]	[38]	[42]	[35]	[43]	[40]	[36]	[39]	[44]
Explicit theoretical framework	1	1	3	3	2	1	3	2	3	3	3	1	1	2
Statement of aims/objectives in main body of report	2	3	3	3	1	2	2	3	3	3	3	3	3	1
Clear description of research setting	3	3	3	2	3	2	3	1	3	3	3	3	1	2
Evidence of sample size considered in terms of analysis	1	1	0	1	3	0	0	0	0	0	0	0	0	0
Representative sample of target group of a reasonable size	3	3	3	3	3	3	3	3	2	3	2	2	3	3
Description of procedure for data collection	3	3	1	3	2	3	1	1	2	3	2	2	2	2
Rationale for choice of data collection tool(s)	1	3	1	1	1	0	1	0	0	1	1	1	3	2
Detailed recruitment data	2	3	3	2	1	2	1	1	2	3	2	2	2	2
Statistical assessment of reliability and validity of measurement tool(s)	0	1	1	3	0	0	2	2	0	3	1	2	1	2
Fit between stated research question and method of data collection	3	3	3	3	3	3	3	3	3	3	2	3	3	3
Fit between research question and method of analysis	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Good justification for analytic method selected	1	2	2	0	3	1	2	1	1	2	1	1	1	1
Evidence of user involvement in design	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Strengths and limitations critically discussed	2	2	1	3	3	2	2	2	2	2	2	2	1	2
Total quality score (Maximum score = 42)	25	31	27	30	29	22	27	22	24	32	25	25	24	25
Comparison of quality scores in (%) percentage	59.5%	73.8%	64.2%	71.4%	69.0%	52.3%	64.2%	52.3%	64.2%	76.1%	59.5%	59.5%	57.1%	59.5%

Key: Chaukos et al 2016, USA [31], Fortney et al., 2013, USA [32], Gagnon et al., 2016, Canada [37], Galanakis et al., 2011, Greece [41], Goldhagen et al., 2015, USA [33], Goodman & Schorling 2012, USA [34], Howlett at al., 2015, Canada [38], Kovacs et al., 2010, Hungary [42], Lin et al., 2016, USA [35],Martínez-Íñigo 2007, Spain [43], Muscatello et al., 2006, Italy [40], Olson et al., 2015, USA [36], Zammuner et al 2003, Italy [39], Zeidner et al 2013, Israel [44]

Figure 1: Flow of citations through the review process

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┌────────────────────────────────┐
│ Records identified through four │
│      database searches         │
│        (n = 15,539)            │
└────────────────────────────────┘
              │
              ▼
┌────────────────────────────────┐
│  Number of duplicates removed   │
│        (n =12,295)             │
└────────────────────────────────┘
              │
              ▼
┌────────────────────────────────┐        ┌────────────────────────────────────┐
│  Titles & abstracts screened    │───────▶│ Records excluded (n =12,273)        │
│        (n =12,295)             │        │  -  Irrelevant topics              │
└────────────────────────────────┘        │  -  Qualitative studies,           │
              │                            │  -  Not focused on healthcare staff │
              │                            │  -  Review articles, editorials,    │
              │                            │     letters, books                  │
              ▼                            └────────────────────────────────────┘
┌────────────────────────────────┐        ┌────────────────────────────────────┐
│ Full-text articles assessed for │───────▶│ Eight full-text articles excluded   │
│         eligibility            │        │   -  No doctors (n=5)              │
│          (n = 22)              │        │   -  No emotion regulation          │
└────────────────────────────────┘        │      measure (n=2)                 │
              │                            │   -  Discussion paper (n=1)        │
              │                            └────────────────────────────────────┘
              ▼
┌────────────────────────────────┐
│  Studies eligible for inclusion │
│          (n = 14)              │
└────────────────────────────────┘
              │
              │                            ┌────────────────────────────────────┐
              │──────────────────────────▶│ No additional citations identified  │
              │                            │ through hand searches of references │
              │                            │    of (n=14) selected studies       │
              ▼                            └────────────────────────────────────┘
┌────────────────────────────────┐
│ Number of studies included in   │
│        final review            │
│          (n = 14)              │
└────────────────────────────────┘
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Included

Eligibility

Identification

Screening

Appendix 4: Emotion regulation measures *(can be made available as supplementary data at Occupational Medicine on line)*

Type of measure/intervention	Number of studies
Abbreviated mindfulness intervention programme	1 [78]
Mindfulness-based stress reduction programme	1 [82]
Emotional Labour Scale	2 [86, 89]
Cognitive and Affective Mindfulness Scale	1 [31]
Self-regulation Questionnaire	1 [37]
Differential Emotion Scale-Modified	1 [41]
Mindfulness Attention Awareness Scale	1 [33]
Coping Inventory for Stressful Situations	1 [38]
Frankfurt Emotion Work Scale – Hungarian version	1 [42]
Emotional Intelligence Questionnaire – short form	1 [35]
State-Trait Anger Expression Inventory	1[40]
Five Facet Mindfulness Questionnaire and Neff's Self-Compassion Scale	1 [36]
Emotion Management Subscale of the Mayer-Salovey-Caruso Emotional Intelligence Test	1 [44]

Appendix 4A: Burnout measures *(can be made available as supplementary data at Occupational Medicine on line)*

Type of measure	Number of studies
Maslach Burnout Inventory	11 [31, 32, 34, 35, 37-40, 42, 43]
Occupational Stress Inventory	1 [41]
Oldenberg Burnout Inventory	1 [33]
Professional Quality of Life Scale	1 [44]