Effectiveness of interventions to reduce emergency department staff occupational stress and/or burnout: a systematic review

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ABSTRACT

Objective: The objective of this review was to synthesize the best evidence for the effectiveness of interventions to reduce occupational stress and/or burnout in the emergency department.

Introduction: The prevalence of occupational stress and burnout among busy emergency department staff requires urgent attention. This review summarizes the current evidence to provide recommendations on interventions to reduce occupational stress in the emergency department.

Inclusion criteria: Studies reporting on all health personnel working in emergency departments were included in the review. Any individual-focused or organizational-directed intervention was considered. Both published and unpublished studies including experimental and quasi-experimental studies were considered for inclusion in the review. The outcomes of interest included occupational stress, burnout, compassion fatigue, anxiety, and depression.

Methods: A three-step search strategy was utilized to search seven databases (PubMed, CINAHL, Cochrane Central Register of Controlled Trials, Embase, Scopus, PsycINFO, Web of Science) and five gray literature resources (MedNar, Google Scholar, ProQuest Dissertations and Theses, Conference Proceedings). The search was limited to papers published in English between January 1, 2008, and February 1, 2019. Titles and abstracts of the studies were screened. Two reviewers independently appraised the full text of selected studies and extracted data using standardized tools from JBI. Where possible, data were pooled in statistical meta-analysis. Effect sizes were expressed as standardized mean differences, and their 95% confidence intervals were calculated for analysis.

Results: A total of 14 studies were included in the systematic review. Sample sizes of the included studies ranged from 14 to 392 participants. Of the included studies, four were randomized controlled trials and 10 were quasi-experimental studies. The overall quality of the included studies was compromised due to lack of true randomization, concealment, blinding, or the use of a single-group without a comparator. Educational-style interventions were investigated in six included studies and mindfulness-based interventions in four studies. The remaining four studies investigated organizational-directed interventions that incorporated a variety of strategies. The top three most commonly used tools were the Maslach Burnout Inventory, the Perceived Stress Scale, and the Professional Quality of Life Scale. The studies that investigated educational interventions reported a statistically significant reduction in both stress and/or burnout. Three of the four studies that investigated mindfulness-based interventions reported reduced stress levels. A fixed-effects meta-analysis of two of the studies demonstrated a non-significant difference in stress between groups receiving mindfulness-based interventions and those who did not (n = 58, SMD = 0.32, 95% CI – 0.84 to 0.60, P = 0.23; heterogeneity: x² = 0.01, P = 0.93, I² = 0%). Organizational-based interventions were found to reduce stress levels but increase burnout.

Conclusions: Individual-focused interventions, including both educational interventions and mindfulness-based interventions, have the potential to reduce occupational stress and/or burnout for staff working in emergency departments. However, inconsistencies in reporting and outcome measurements impact certainty of results. More
high-quality randomized controlled trials are recommended with larger sample sizes as well as measurement of long-term effects to improve knowledge in this field.

**Keywords** Burnout; education; emergency medicine; mindfulness; organizational intervention


**Summary of Findings**

**Individual-focused and organizational-directed interventions for reducing occupational stress and/or burnout in emergency department staff**

**Bibliography:** Xu H, Kynoch K, Tuckett A, Eley R. Effectiveness of interventions to reduce emergency department staff occupational stress and/or burnout: a systematic review. *JBI Evid Synth* 2020;18(6):1156-88.

**Patient or population:** Emergency department staff  
**Setting:** Emergency departments  
**Intervention:** Organizational-directed interventions, individual-focused interventions (mindfulness based interventions or educational interventions)  
**Comparison:** No interventions or other intervention

**Outcomes**  

<table>
<thead>
<tr>
<th>Anticipated absolute effects* (95% CI)</th>
<th>of participants (studies)</th>
<th>Certainty of the evidence (GRADE)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Stress Assessed with: Perceived Stress Scale, Professional Quality of Life Scale, Perceived Stress Questionnaire, Kessler-10 Psychological Distress Scale, Medical Personnel Stress Survey-Revised, Multidimensional Validated tool</td>
<td>SMD 0.32 lower (0.84 lower to 0.20 higher)</td>
<td>772 (3 RCTs, 6 quasi-experimental studies)</td>
<td>📊 VERY LOW 📊</td>
</tr>
</tbody>
</table>
**SYSTEMATIC REVIEW**

H.G. Xu et al.

**Individual-focused and organizational-directed interventions for reducing occupational stress and/or burnout in emergency department staff**

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</thead>
<tbody>
<tr>
<td></td>
<td>Risk with no intervention</td>
<td>Risk with intervention</td>
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<td>Very LOW</td>
</tr>
</tbody>
</table>

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).

CI: confidence interval; RCT: randomized controlled trial; SMD: standardized mean difference; MBI: mindfulness-based intervention

**GRADE Working Group grades of evidence**

**High certainty:** We are very confident that the true effect lies close to that of the estimate of the effect

**Moderate certainty:** We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

**Low certainty:** Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

**Very low certainty:** We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of the effect

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*a Due to serious risk of bias.

*b Due to serious indirectness.

*c Due to strongly suspected publication bias.
Introduction

Occupational stress is defined as a reaction that may occur when an individual’s job demands and pressures do not match their knowledge, capacity, and ability to cope. The symptoms of occupational stress may vary and can manifest in many forms such as compassion fatigue, a reduced capacity and interest in being empathetic towards the suffering of others, and psychological signs such as anxiety or depression. Common occupational stressors in the health care industry can increase health care workers’ risk of distress. When health care workers are unable to manage high job stress on a regular basis, they are likely to experience burnout. Burnout, as a response to prolonged exposure to chronic occupational stressors, is generally characterized as emotional exhaustion, depersonalization, and decreased personal accomplishment.

There is a large amount of literature reporting on the high prevalence of occupational stress and burnout in emergency departments (EDs) globally. A number of studies state that between 26% and 82% of ED nurses and physicians report burnout, which is higher than in other specialties. Additional studies also found that 85% of ED nurses reported at least one symptom of secondary traumatic stress, 86% of ED nurses reported moderate to high levels of compassion fatigue, and 52% of ED staff reported moderate to severe anxiety. This phenomenon is closely related to occupational stressors such as high ED service demands, overcrowding, work overload, lack of control, exposure to traumatic events, and resource shortages. Other occupational stressors in EDs include working in a chaotic and consistently changing working environment that demands rapid critical decision making and response to life-and-death situations. With limited information about patient history, ED staff are required to perform quick assessments and manage a wide range of complex clinical situations. It is well documented that ED staff face assaults by either patients or patients’ family members more frequently than other specialties. As overcrowding and access block affect many EDs, staff are required to be flexible and adaptable to accommodate changing workloads. Occupational stress levels can also be intensified by interpersonal issues between colleagues and inadequate manager support. As a consequence of chronic exposure to these unavoidable occupational stressors, ED staff report higher incidents of occupational stress and burnout.

High occupational stress and burnout have detrimental effects not only on individual staff, but also on patient safety and an organization’s financial profile. Prolonged exposure to these occupational stressors can place staff at risk of depression, anxiety, musculoskeletal pain, fatigue, sleep disturbances, and cardiovascular diseases. Exposure to stress on a repetitive basis without adequate coping strategies can lead to maladaptive behaviors such as smoking, alcohol or substance abuse, and suicide. In addition, burnout has negative impacts on social relationships with co-workers. A qualitative study exploring the experience of occupational stress on ED nurses found that high levels of emotional and mental fatigue led to bullying, aggression, interpersonal confrontations, and low staff morale within the workplace. Besides these negative impacts on staff, burnout can also cause harm to patients and impact on organizational safety. A systematic review by Hall and colleagues found that staff burnout has a significant negative association with patient safety. The impact of burnout on the organization includes reduced productivity, increased absenteeism, poor staff retention, and high training costs, which lead to economic loss to the organization and community. Given the devastating effects of occupational stress on staff, patients, and the organization, it is essential to promote staff well-being and manage occupational stress in emergency health service staff.

Existing stress management interventions primarily focus on either organizational-directed interventions or individual-focused interventions. Organizational-directed interventions are strategies used to modify organizational factors or implement policy and procedure changes to reduce sources of stress generated by the job or organization. Examples include changes to staff on-call periods and reduced working hours or workloads to minimize workplace stress. Individual-focused interventions refer to strategies focusing on promoting the individual’s tolerance or coping abilities to manage workplace stress. Common individual strategies include mindfulness techniques, cognitive-behavioral therapy, or education to improve individuals’ communication skills or coping strategies.

Mindfulness is an awareness training that encourages the individual to pay attention to the present
moment and respond non-judgmentally. It allows an individual to be open and accepting, instead of reacting to a stressful situation. Mindfulness-based stress reduction interventions have been extensively reviewed in many systematic reviews in various populations, including health care workers, with positive stress reduction outcomes. In comparison, cognitive behavior therapy is a psychotherapy used to change and replace negative thoughts and behaviors with more positive and constructive solutions. In addition to its main usage in reducing depression and anxiety, cognitive behavior therapy is also used in stress reduction and suicide prevention. Educational interventions include training or programs designed for specific purposes, such as promoting staff wellness, self-care, lifestyle changes, effective communication, resilience, and stress management.

A preliminary search of PROSPERO, MEDLINE, the Cochrane Database of Systematic Reviews, and the JBI Database of Systematic Reviews and Implementation Reports was conducted and no current or ongoing systematic reviews on this topic were identified. Although there are published systematic reviews, including Cochrane reviews, that address occupational stress management among health care workers, none of these reviews focus on ED staff specifically. The meta-analysis results in the most recent Cochrane review suggested that individual-focused interventions such as cognitive behavioral training, and mental (e.g. meditation) and physical relaxation (e.g. massage) decreased stress compared with no intervention. However, the majority of organizational-directed interventions included in the review had no clear effect on stress reduction apart from low-quality evidence suggesting that changing work schedules may reduce stress. One recent systematic review’s primary aim was to summarize ED stressors; however, the review only included one peer-reviewed ED stress reduction intervention study. In addition, studies with fewer than 50 participants were excluded. Therefore, the objective of this review was to determine the effectiveness of interventions to reduce occupational stress and/or burnout in all staff who work in the emergency department.

**Review question**

What is the effectiveness of interventions to reduce occupational stress and/or burnout among ED staff?

**Inclusion criteria**

**Participants**

The review considered studies that included all health personnel working in EDs, such as physicians, nurses, and allied health and administrative staff. Any hospital setting providing emergency care, irrespective of size, was considered for inclusion, such as large tertiary hospitals or small rural remote hospitals. There was no restriction regarding participants’ educational levels or years of clinical experience.

**Interventions**

This review included studies that evaluated any type of individual-focused or organizational-directed workplace interventions designed to manage occupational stress or burnout (acute or chronic) in the ED environment. There was no restriction regarding the content, length, and/or frequency of the intervention. Individual-focused interventions included mindfulness-based interventions (e.g. wellness programs), cognitive-behavioral-based interventions, stress-reduction interventions, pharmacological/herbal interventions, lifestyle interventions (e.g. changes to diet and exercise) and educational programs for improving resiliency or communication skills. Organizational-directed interventions included changes in resources, working environment, work tasks, workload, and/or shift length. There were no limits to frequency, intensity, or duration of interventions. Studies utilizing singular or multi-faceted interventions were included.

**Comparators**

This review considered studies that compared the intervention of interest to a different intervention or no intervention.

**Outcomes**

This review included studies with perceived or biological measures of occupational stress and burnout as the primary outcome measures. For studies to be included in the review, the occupational stress needed to be measured using a validated tool such as, but not limited to, the Perceived Stress Scale, the Mental Health Professionals Stress Scale, the Survey of Recent Life Experiences, and Maslach Burnout Inventory.

The secondary outcomes included perceived or biological measures of compassion fatigue, or other psychological measurements (e.g. anxiety,
depression). The types of measurement tools for these outcomes included the Compassion Fatigue self-test, \(^70\) the Hospital Anxiety and Depression Scale, \(^71\) the Depression Anxiety Stress Scale, \(^72\) and the State-Trait Anxiety Inventory. \(^73\)

**Types of studies**

This review considered experimental, quasi-experimental, and other types of quantitative study designs for inclusion, such as randomized controlled trials (RCTs), before-and-after studies, and interrupted time-series studies. Single group studies with pre-test/post-test designs were also included. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies were considered for inclusion. If the study design used mixed methods, only the quantitative data were included.

**Methods**

This systematic review was conducted in accordance with the JBI methodology for systematic reviews of effectiveness \(^74\) and an *a priori* protocol. \(^75\)

**Search strategy**

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilized in this review. An initial limited search of PubMed and CINAHL was undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the articles. The search strategy, including all identified keywords and index terms, was adapted for each included information source and was initially undertaken on November 1, 2018, for papers published in English from January 1, 2008, until November 1, 2018. This time frame was selected because the preliminary search found most relevant studies had been published after 2008. An updated search was undertaken on February 1, 2019, prior to drafting the review. The full search strategies are provided in Appendix I. Finally, the reference lists of all studies selected for critical appraisal were screened for additional studies.

**Information sources**

The databases searched included CINAHL via EBSCO, Cochrane Central Register of Controlled Trials via Cochrane Collaboration, Embase via EBSCO, PubMed via EBSCO, Scopus via Elsevier Science, PsycINFO via EBSCO, and Web of Science via Web of Science.

The search for unpublished studies included MedNar, Google Scholar, ProQuest Dissertations and Theses, and Conference Proceedings.

**Study selection**

Following the search, all identified citations were uploaded into EndNote X9 (Clarivate Analytics, PA, USA) and duplicates were removed. Studies were selected by screening titles and abstracts against the inclusion criteria, with potentially relevant studies retrieved in full and assessed by two independent reviewers (HX, KK). Reasons for exclusion of full-text studies were recorded (Appendix II). No disagreements arose between the reviewers; therefore, a third reviewer was not required.

**Assessment of methodological quality**

Two reviewers (HX, KK) independently assessed the eligible studies that met the review inclusion criteria for methodological validity prior to inclusion in the review. The standardized critical appraisal instruments for experimental and quasi-experimental studies from the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; JBI, Adelaide, Australia) \(^74\) were used according to the study design. Authors of papers were contacted twice to request missing or additional data for clarification, where required. Five authors responded and provided additional data. We were unable to contact four authors due to lack of published contact details. Any disagreements were resolved through consensus without needing to consult a third reviewer. Regardless of methodological quality, all studies were included for data extraction and synthesis.

**Data extraction**

Two reviewers independently extracted data from the included studies using the standardized JBI data extraction tool in JBI SUMARI. \(^74\) The extracted data included specific details about the populations, methods, interventions, and outcomes of significance to the review question and objective. At this stage, a further three authors \(^76\) were contacted to request missing or additional data, with all providing additional data that was used in the review.
**SYSTEMATIC REVIEW**

**H.G. Xu et al.**

**Data synthesis**
Where possible, meta-analysis was performed using RevMan V5.3.5 (Copenhagen: The Nordic Cochrane Centre, Cochrane). Heterogeneity was assessed statistically using the standard chi squared (χ²) and I² tests. Analyses were performed using a fixed-effects model. Choice of this model was based on the guidance of Tufanaru et al. and also due to the small number of included studies in the meta-analysis and presence of low heterogeneity (I²<25%). Effect sizes were expressed as standardized mean differences (SMDs) for continuous data and their 95% confidence intervals (CIs) were calculated for analysis. Where statistical pooling was not possible, the findings are presented in narrative form including tables and figures to aid in data presentation.

**Assessing certainty in the findings**
The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach for grading the certainty of evidence was followed and a Summary of Findings was created using GRADEpro GDT Version 4 (McMaster University, ON, Canada). The Summary of Findings presents the following information where appropriate: outcomes, impact, number of participants and studies, a ranking of the certainty of the evidence based on the risk of bias, directness, heterogeneity, precision, and risk of publication bias of the review results.

**Results**

**Study inclusion**
The results of the search are presented in a PRISMA flow diagram (Figure 1). A total of 6399 records were found following the search of databases and gray literature sites. Following the removal of duplicates, 81 full texts were retrieved for review. Sixty-seven papers were excluded after reviewing the full texts as they did not meet the inclusion criteria for this review (Appendix II). Some of the reasons for study exclusion at this stage included ineligible population, outcomes not included in the review, or ineligible study designs. In total, 14 articles met the inclusion criteria and were included in this review.

**Methodological quality**
Tables 1 and 2 summarize the critical appraisal results of the included studies. All studies were included in the review regardless of methodological quality; however, some methodological issues were identified. The four RCTs included lacked either true randomization, concealment of treatment assignment to treatment allocator, blinding of participants to treatment assignment, or blinding of those delivering treatment. Only one study reported in-depth details of the randomization process. It was unknown if true randomization was achieved in the remaining three studies due to limited reporting of the process. A similar issue was identified for concealment to treatment assignment. Apart from one study, treatment allocators appeared not to be blinded, which increases the risk of allocation bias. Due to the nature of the interventions being investigated, it was not uncommon for participants to know to which group they were being allocated; hence, it was not always possible to blind participants. Blinding of those delivering the treatment was either unclear or not undertaken in three studies. The methodological quality of the 10 quasi-experimental studies were assessed using the JBI quasi-experimental critical appraisal assessment tool. Only one quasi-experimental study used a comparison group; the remaining nine studies were single-group studies utilizing pre- and post-test design without a comparator.

**Characteristics of included studies**
All included studies measured either stress and/or burnout levels in staff working in the emergency department. Appendix III provides a summary of the study characteristics. Out of the 14 studies, 12 were published between 2016 and 2019, with the remaining two studies published in 2011 and 2013. The geographical locations included the United States, Europe, Australia, Asia, and Africa. The sample sizes within the included studies varied widely from 14 to 392 participants. In total, there were 1033 participants across the 14 included studies. A large proportion of study participants were either exclusively ED nurses or ED physicians. Two studies included both ED physicians and nurses as participants. Two studies involved all ED staff including allied health as well as non-clinical administrative staff. One study included ED nurses and emergency medical technicians.
The types of study designs included quasi-experimental studies (n = 8), RCTs (n = 4), and the quasi-experimental component of a mixed-methods design (n = 2). As this systematic review focused on effectiveness, only quantitative data from both mixed-methods studies were included in the review. Both individual-focused interventions (n = 10) and organizational-directed interventions (n = 4) were investigated across the studies. There were...
## Table 1: Critical appraisal of eligible randomized controlled trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<th>Q6</th>
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<th>Q10</th>
<th>Q11</th>
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</table>

% 25 25 50 0 25 0 100 100 100 100 100 100 100

Yes, yes; U, unclear; N, no; NA, not applicable.

JBI critical appraisal checklist for randomized controlled trials:

Q1. Was true randomization used for assignment of participants to treatment groups?
Q2. Was allocation to treatment groups concealed?
Q3. Were treatment groups similar at baseline?
Q4. Were participants blind to treatment assignment?
Q5. Were those delivering treatment blind to treatment assignment?
Q6. Were outcomes assessors blind to treatment assignment?
Q7. Were treatment groups treated identically other than the intervention of interest?
Q8. Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?
Q9. Were participants analyzed in the groups to which they were randomized?
Q10. Were outcomes measured in the same way for treatment groups?
Q11. Were outcomes measured in a reliable way?
Q12. Was appropriate statistical analysis used?
Q13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

## Table 2: Critical appraisal of eligible quasi-experimental studies

<table>
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<tr>
<th>Study</th>
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<th>Q3</th>
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Y, yes; U, unclear; N, no.

JBI critical appraisal checklist for quasi-experimental studies:

Q1. Is it clear in the study what is the cause and what is the effect (i.e. there is no confusion about which variable comes first)?
Q2. Were the participants included in any comparisons similar?
Q3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
Q4. Was there a control group?
Q5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?
Q6. Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?
Q7. Were the outcomes of participants included in any comparisons measured in the same way?
Q8. Were outcomes measured in a reliable way?
Q9. Was appropriate statistical analysis used?
considerably large variations regarding content, length, and intensity of the interventions investigated in the included studies.

All studies included in the review used self-reported psychometric tools to measure outcomes. The Maslach Burnout Inventory, Perceived Stress Scale, and the Professional Quality of Life Scale were the most commonly used tools. The majority of the studies measured both stress and burnout or either stress or burnout. One study also measured depression. None of the included studies measured compassion fatigue and anxiety. Apart from one study that measured outcomes before and three months after the intervention period, all other studies measured outcomes before and immediately after the intervention. One study included additional follow-up at six months, and one study measured an ongoing program one year later.

Review findings

The findings of the review are presented as individual-focused (10 studies) and organization-directed interventions (four studies).

Individual-focused interventions

Six studies investigated educational interventions and four studies investigated mindfulness-based interventions (MBIs) to reduce stress and burnout in ED.

Educational interventions. Two RCTs and four quasi-experimental studies investigating the effectiveness of an educational program to reduce occupational stress were included. There was variation in terms of program content, intensity, and length across all six studies. One study by Kharghani et al. implemented communication skills training without clearly reporting the program content, intensity, and length. The remaining five studies provided more detailed information about the design of their programs.

El-Shafei et al. delivered compassion fatigue resilience education in a single, four-hour interactive group seminar. In addition, the program offered participants a range of multimedia resources including seminar handouts, DVDs, CDs, and access to a website with educational resources regarding compassion fatigue. The remaining studies offered training on a more regular basis and over longer periods. Mache et al. implemented 90 minutes of mental health promotion training weekly for 12 weeks. The training was provided by qualified psychologists with the focus on actual work situations and problems, coping strategies, and colleague support. Caponnetto et al. provided autogenic training, a form of relaxation therapy involving self-hypnosis, twice a month for 16 weeks. Each session lasted 180-minutes and was guided by psychologists. Two additional studies had similar training intensity and length (twice a week for six months), but with different educational topics. El-Shafei et al. delivered a Worksite Wellness Education program, which incorporated two 30- to 45-minute educational sessions weekly for six months. The program focused on improving the wellness knowledge skills and coping strategies of participants by covering topics such as work-related stress, smoking and substance abuse, malpractice, exposure to patient mortality, and infectious disease. Wei et al. tested an active intervention that was delivered by nurse managers. Participants in the intervention group received training 30 minutes twice a week during meetings for six months covering a range of work-related coping skills such as communication, confliction, and emotion control.

The Maslach Burnout Inventory and the Professional Quality of Life scale were used to measure outcomes in six of these studies. The Maslach Burnout Inventory tool was broken down and reported as three subscales: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). Other psychometric tools used to measure stress and/or burnout in the six included studies that investigated educational interventions included Perceived Stress Scale, Perceived Stress Questionnaire, Copenhagen Psychosocial Questionnaire, Utrecht Work Engagement Scale, and Emotion Regulation Skills Questionnaire-27.

All studies reported statistically significant decreases in stress and/or burnout levels in the participants after delivery of their interventions. The RCT by Mache et al. investigating a mental training program reported between-group effects, with the intervention group demonstrating highly statistically significant reduction in perceived stress levels at the end of the program (Mann Whitney U = 527; P<0.01), at 12 weeks (Mann Whitney U = 643; P<0.01), and six months later (Mann
Whitney $U = 669; P = 0.1$), compared to the waiting list group. A highly statistically significant effect was also reported when investigating the impact of the program on burnout ($P<0.01$). Over time, the effect size for the outcome of EE decreased slightly (at end of the program: Cohen’s $d = 0.61$; 12 weeks post intervention: Cohen’s $d = 0.50$; $P<0.01$). Similarly, Caponnetto et al.\(^{87}\) noticed a statistically significant stress reduction from pre- to post-test in their study ($t(27) = 7.72, P<0.001$), and a statistically significant burnout reduction in both EE subscale ($t(27) = 5.64, P<0.001$) and DP subscale ($t(27) = 6.67, P<0.001$). El-Shafei et al.\(^{88}\) also reported that both stress and burnout were significantly reduced following their intervention.

For the outcome of stress, pre-test mean was 31.12 (standard deviation [SD] = 5.22) with post-test mean of 28.87 (SD = 5.84; $P<0.001$), and for burnout the pre-test mean was 29.98 (SD = 4.54; $P<0.001$) with post-test mean of 23.75 (SD = 5.93; $P<0.001$). The study undertaken by Flarity et al.\(^{89}\) reported there was a statistically significant increase in compassion satisfaction (subscale of compassion fatigue scale) ($P = 0.004$), decrease in burnout ($P<0.001$), and decreased stress symptoms ($P = 0.001$) from baseline scores, following attendance at a resiliency program. Results from Wei et al.\(^{86}\) showed that both EE and DP reduced significantly in the intervention group compared with the control group ($P<0.01$). Kharaghani et al.\(^{84}\) also reported statistically significant differences in burnout reduction by comparing average burnout scores before (mean $\pm$ SD: 57/82 $\pm$ 12/44, $P<0.001$) and after training (40/87 $\pm$ 5/95, $P<0.001$) using the Maslach Burnout Inventory.

All six studies\(^{84,83,86-89}\) reported statistically significant reductions in burnout scores following delivery of their interventions. Two studies\(^{86,87}\) reported significant reductions in EE and DP scores, while one study\(^{84}\) reported a significant decrease in EE scores. Another study\(^{89}\) reported significant improvement in compassion satisfaction, while four studies\(^{83,87,89}\) reported significant reductions in stress symptoms. Despite the overall positive results, it should be noted that across the studies there were considerable differences in intervention content, delivery, timing, and outcome measurements.

Mindfulness-based interventions. Two RCTs,\(^{84,85}\) one quasi-experimental study,\(^{91}\) and one mixed-methods study\(^{76}\) investigated MBIs for individuals. The content, frequency, and length of the intervention varied across the studies. Three of the four MBI studies used either repeated brief guided meditation sessions\(^{91}\) or weekly mindfulness workshops.\(^{84,85}\) The study by Rooney\(^{91}\) provided 20 brief guided meditation sessions to ED nurses after they completed their clinical shift. Kwok\(^{85}\) delivered a one-and-a-half-hour program once a week over four weeks, addressing mindfulness, emotion regulation, distress tolerance, and interpersonal relationships (MEDI program), to ED nurses in the intervention group. Ireland et al.\(^{84}\) delivered weekly one-hour mindfulness training workshops to the intern medical officers in the intervention group for 10 weeks. For these two RCTs, Kwok\(^{85}\) did not provide any intervention to the control group while Ireland et al.\(^{84}\) provided an extra hour break per week to the control group (as an “active” control). Only Braganza et al.\(^{76}\) used multi-modal forms of mindfulness activities, which included a one-day mindfulness workshop plus mindfulness-themed flyers, a “four-minute pause” during morning medical hand-over (i.e. two-to-three-minute videos about mindfulness and 90-second guided meditations), and weekly 30-minute “drop-in” sessions for six months, led by the program coordinator and delivered to all ED staff. Again, different lengths of guided meditation sessions were reported between the studies from four minutes\(^{76}\) to one hour.\(^{84}\) All the sessions were delivered face-to-face at the participants’ workplaces. Two studies\(^{84,91}\) used the same stress-measurement tool (Perceived Stress Scale) to measure outcomes; however, the remaining studies utilized various other tools including Kessler-10 Psychological Distress Scale,\(^{76}\) Maslach Burnout Inventory,\(^{76}\) Copenhagen Burnout Inventory,\(^{84}\) and Revised Medical Personnel Stress Survey,\(^{85}\) to measure stress and/or burnout.

Three out of four studies\(^{76,84,91}\) reported a statistically significant reduction in stress levels after delivery of their intervention, although only one study\(^{84}\) reported a reduction in burnout scores. Of these, the RCT by Ireland et al.\(^{84}\) reported a significant stress reduction ($F = 5.88, P = 0.007, \eta^2 = 0.28$) and a reduction in burnout; however, the result was not statistically significant ($F = 2.88, P = 0.072$,
(\(\eta^2 = 0.16\)) following intervention delivery. The single-group, pre- and post-quasi-experimental study by Rooney\(^{91}\) reported a reduction of stress scores following the intervention. The participants who attended one mindfulness session reported a 9.52\% stress score reduction, while the ones who did not attend any sessions reported a 1.61\% reduction. The rate of stress score reduction increased to 43.23\% for those who attended three sessions. Braganza and colleagues\(^{76}\) also observed a significant reduction of stress scores by a mean difference of 1.8 points (95\% CI, 0.3 to 3.4, \(P = 0.022\)) at the follow-up assessment. However, there were no changes to burnout levels (Maslach Burnout Inventory: EE subscale, \(P = 0.981\); DP subscale, \(P = 0.498\); PA subscale, \(P = 0.663\)). In contrast to the above findings, another RCT with a small sample size (n = 14) by Kwok\(^{85}\) reported no difference in stress measurements when comparing results for the intervention group against the control group. Two RCTs\(^{84,85}\) of the four MBI studies were pooled in a meta-analysis using a fixed-effects model due to low heterogeneity and the small number of included studies (Figure 2).\(^{79}\) One study\(^{76}\) that utilized a quasi-experimental design was unable to be included in the meta-analysis. The fourth study\(^{91}\) was excluded from the meta-analysis as it did not report means and SDs. The meta-analysis showed an overall statistically non-significant difference between the intervention and control groups on the outcome of stress (n = 58, SMD = −0.32; 95\% CI, −0.84 to 0.20, \(P = 0.23\); heterogeneity: \(x^2 = 0.01, P = 0.93, I^2 = 0\%\)).

**Organizational-directed interventions**

Three quasi-experimental studies\(^{77,78,90}\) and one mixed-methods study\(^{92}\) investigated organizational-directed interventions. There was variation between the studies in respect to interventions, duration, intensity, and number of study sites. The study by d’Ettorre et al.\(^{77}\) introduced a range of extensive organizational improvement interventions such as goals to improve occupational safety and wellness, which involved employees in decision making and improving communication with management staff. Schneider et al.\(^{92}\) attempted to improve ED work conditions by developing and implementing solutions to address work stressors during 10 regular multi-professional meetings. Greenwald et al.\(^{78}\) introduced telemedicine shifts to allow senior ED physicians to work from home on weekends to reduce burnout. In contrast, Pascual\(^{90}\) focused on team development to alleviate staff burnout by adopting a management model (Training Within Industry).\(^{90}\) The project aimed to eliminate unnecessary processes, streamline ED flow, and improve team coordination through strategies such as staff training and champions.

The duration of these organizational-directed interventions varied from 90 days\(^{90}\) to seven months.\(^{92}\) The telemedicine shift study by Greenwald et al.\(^{78}\) was held on an ongoing basis. The study by d’Ettorre et al.\(^{77}\) did not specifically report the length of the intervention period, but the overall study time frame was over two years. Only Schneider et al.\(^{92}\) stated that meetings were held at three-week intervals while another two studies\(^{77,90}\) did not report any information about the intervention time frame. Two studies\(^{90,92}\) were conducted at a single site while another two studies\(^{77,78}\) involved multiple EDs. The Maslach Burnout Inventory was used in three studies,\(^{78,90,92}\) while one study\(^{77}\) used the Multidimensional Validated Tool.

In terms of outcomes, only d’Ettorre et al.\(^{77}\) measured stress reduction. The pre- and post-test results from this quasi-experimental, single-group study demonstrated a stress reduction from medium to low using a multidimensional validated tool among

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**Figure 2: Meta-analysis of the effects of mindfulness-based interventions on stress in emergency department staff (intervention versus control)**

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<tr>
<th>Study or Subgroup</th>
<th>Experimental Mean</th>
<th>SD</th>
<th>Total</th>
<th>Control Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Std. Mean Difference IV, Fixed, 95% CI</th>
<th>Std. Mean Difference IV, Fixed, 95% CI</th>
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<tr>
<td>Ireland 2017</td>
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<td>0.45</td>
<td>23</td>
<td>2.78</td>
<td>0.55</td>
<td>21</td>
<td>76.2%</td>
<td>-0.33 [0.93, 0.28]</td>
<td>-0.28 [1.35, 0.78]</td>
</tr>
<tr>
<td>Kwok 2011</td>
<td>10.5</td>
<td>5.36</td>
<td>6</td>
<td>19.08</td>
<td>3.97</td>
<td>8</td>
<td>23.8%</td>
<td>-0.28 [1.35, 0.78]</td>
<td>-0.28 [1.35, 0.78]</td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>29</strong></td>
<td></td>
<td></td>
<td><strong>29</strong></td>
<td></td>
<td></td>
<td>100.0%</td>
<td><strong>-0.32 [0.84, 0.20]</strong></td>
<td><strong>-0.32 [0.84, 0.20]</strong></td>
</tr>
</tbody>
</table>

Heterogeneity: Ch^2 = 0.01, df = 1 (\(P = 0.93\)); P = 0\%; Test for overall effect: Z = 1.21 (\(P = 0.23\)).
both physicians (Pre 22.75 vs. Post 15.37; $P<0.05$) and nurses (Pre 25.12 vs. Post 15.75; $P<0.05$). Three studies\textsuperscript{78,90,92} measured burnout. Two studies reported that staff burnout levels worsened after introducing the interventions. One study\textsuperscript{78} reported no change to the overall burnout levels. Schneider \textit{et al.}\textsuperscript{92} reported small but non-significant increases of EE (mean Pre 4.19 [SD 0.94] vs. Post 4.21 [SD 1.03]; $P = 0.855$) and depressive symptoms (mean Pre 1.90 [SD 1.48] vs. Post 2.22 [SD 1.53]; $P = 0.119$) with a statistically significant increase of DP over one year (mean Pre 3.18 [SD 1.23] vs. Post 3.54 [SD 1.22]; $P = 0.027$). Similarly, Pascual\textsuperscript{90} also reported an increase of EE by an average of 4.74 points ($t$ (26) $= 2.56$; $P = 0.017$) among all participants, while an increase of PA by an average of 3.20 points ($t$ (9) $= 2.57$; $P = 0.030$) was detected among emergency medical technicians only. The authors were unable to determine a cause for these findings. Greenwald \textit{et al.}\textsuperscript{78} reported no difference to overall burnout levels (Wilk’s lambda $= 0.96$, F (3, 34) $= 0.42$, $P = 0.74$) between physicians who worked telemedicine shifts and physicians who worked regular clinical schedules. Although there was a reduction in EE score ($-4.8$ vs. $1.0$; $P = 0.04$) for telemedicine physicians, there was no difference in PA ($-1.2$ vs. $1.4$; $P = 0.24$) or DP ($-2.2$ vs. $-0.4$; $P = 0.36$). Meta-analysis was unable to be conducted due to the different types of organizational interventions utilized in the included studies. Overall, results of organizational-directed interventions demonstrated inconsistent findings, with some studies reporting reduced stress levels\textsuperscript{78} and some studies an increase in burnout levels.\textsuperscript{90,92}

**Discussion**

This review provides a comprehensive synthesis of current research to determine the effectiveness of interventions to reduce stress and burnout among ED staff. The review included 14 studies that investigated individual-focused and organizational-directed interventions with two studies suitable for the meta-analysis. It is important to highlight that most of the included studies were conducted within the past three years, which reflects an increasing awareness and promotion of ED staff wellness. Although there is growing interest in occupational stress management in EDs, the lack of high-quality research in this area remains an issue, and additional rigorous studies are needed.

**Effectiveness of interventions**

The results of this review demonstrate that individual-focused interventions may be more effective in occupational stress and/or burnout reduction than organizational-directed interventions for staff working in the ED. However, results were limited due to the small number of low-quality studies that investigated organizational-directed interventions. The educational interventions may lead to small but significant reductions in occupational stress and burnout for individual ED staff. This finding is similar to other systematic reviews\textsuperscript{59,93} that reported training interventions or self-care workshops were effective in reducing stress and/or burnout in a broader population of health care workers. More specifically, this systematic review identified that MBIs had the most significant effect, with three studies reporting statistically significant effects and only one study\textsuperscript{83} finding no effect. However, it is important to note that this final study had a small sample size of only 14 participants. The findings of this review support other reports\textsuperscript{76,84,93} within the literature that suggest that MBIs can assist ED staff in developing attention and awareness, improving mental well-being and capacity to cope with stress, as well as have wider implications for the health service, patient safety, and quality of care.\textsuperscript{94} Support from the organization is integral to embedding educational programs and promoting the development of these skills in staff working in the ED.

The effectiveness of organizational-directed interventions was based on the results of four quasi-experimental studies. Overall, these studies reported organizational-directed interventions reduced stress...
levels, but either had no effect or increased burnout levels. It is worth noting that two studies reported that implementing organizational interventions increased the levels of staff burnout. As highlighted in a previous study, burnout deterioration can be related to other complex issues such as a staff’s disappointment towards leadership, organizational management, or change fatigue. Another factor that can impact on burnout is the lack of staff willingness to engage with intervention measures due to poor mental well-being. Therefore, it is important for organizations to consider these complex issues when implementing a stress-reduction program.

This review provides some evidence for educational interventions in reducing both occupational stress and burnout for staff working in the ED. However, it is also worth considering that all the included educational interventional studies delivered varied educational content and had different approaches to their intervention. Consequently, it is difficult to ascertain which educational content and teaching approaches were the most effective.

Organizational-directed interventions versus individual-focused interventions

Previous systematic reviews have found that organizational-directed interventions are less commonly adopted than individual-focused interventions. The majority of previous studies within the literature investigating organizational interventions aimed to reduce access block, improve departmental performance in key performance indicators, or target other environmental issues in EDs, rather than focusing on ED staff stress or burnout reduction. Effective stress reduction is unlikely to be achieved by implementing solely individual-focused interventions without addressing the root health care system causes. Staff stress levels may improve over time by managing environmental issues. Therefore, it is important for organizations to take more ownership of high staff burnout issues by implementing strategies to reduce stressful working environments and promote staff mental health.

Throughout the literature there is a lack of acknowledgement and ownership of the issue of health care worker burnout by organizations. A multi-institutional survey by Dyrebe and colleagues found that burnout was seen as a personal failure and stigmatized among medical students rather than as an outcome of chronic occupational hazard exposure. Meanwhile, the challenge of implementing organizational interventions needs to be acknowledged. Organizational interventions require additional resources to facilitate large-scale changes and a longer assessment period to evaluate effectiveness. However, this may be unrealistic or difficult to achieve for some departments with limited resources and budget constraints. As a comparison, individual-focused interventions teaching clinicians to manage their own stress levels are easier to implement. This may account for the number of included studies in this review that investigated individual-focused interventions. Therefore, assessing and considering the specific needs of ED staff before implementing any individual-focused or organizational-based intervention is essential to ensure the best outcomes for the organization and health care staff.

Review strengths and limitations

This review has several limitations. Firstly, limiting the search between 2008 and 2019, and to English language papers only may have excluded some studies. Secondly, there are methodological limitations in some of the RCT studies included in the review. Almost all included RCTs were associated with risk of allocation bias, performance bias, and detection bias by not blinding the participants and treatment allocators. There were also some limitations with the quasi-experimental studies that are intrinsic to the study design (e.g. single group studies, limited follow-up measures). Thirdly, almost all included studies had small sample sizes without sample size calculations, which reduced statistical power and confidence in reliability and the ability to generalize the results. Fourthly, only three studies assessed either medium or long-term (three months to one year) post-intervention effects. Insufficient amount of long-term follow-up (e.g. more than one year) has been identified as a limitation in other systematic reviews on similar topics. This deficit limits confidence in sustainability of any change following delivery of the interventions. Long-term outcome measurements can provide valuable insights if the interventions have a long-term effect on participants and/or participants can integrate the interventions into their lives over time. The potential benefits or necessity of periodical intervention re-exposure to maximize or sustain its effects, or the
frequency of re-exposure is also unknown. Regardless of the above limitations, this review contributes to the current knowledge base on occupational stress reduction interventions for staff in the ED.

Conclusion
Occupational stress and burnout impact on the well-being of ED staff; therefore, it is imperative that ED staff have access to evidence-based interventions to eliminate stress and prevent burnout. This review has found that both educational interventions and MBIs have potential to reduce occupational stress and burnout in staff working in the ED. However, the certainty of evidence was considered as low per the GRADE criteria due to limitations in study designs, indirectness of evidence, and publication bias. Therefore, the strength of the recommendations from this review is limited due to the heterogeneity across the studies and quality of the included studies. More research is recommended, particularly high-quality RCTs with larger sample sizes and measurement of long-term effects to improve knowledge in this field.

Recommendations for practice
According to the JBI Grades of Recommendations, the recommendations for practice are limited. This review has found that individual-focused interventions including both educational interventions and MBIs can potentially reduce stress and burnout among ED staff and should be considered as tools for reducing ED staff occupational stress. Individual-based interventions seem to be more cost-effective to implement with fewer resources required. In addition, individual-focused interventions are easily adaptable. Consideration should be given to having these interventions implemented by local wellness champions and clinicians, which may produce more beneficial effects and long-term sustainability. Organizational-directed interventions such as communication interventions, multi-disciplinary meetings, and management models also have the potential to reduce ED staff stress, but can increase burnout. However, implementing large-scale, organizational-directed interventions would require additional resources and involve more stakeholders than individual-based interventions. Organizations need to consider the timing and impact of these interventions to avoid change fatigue and change resistance from staff. Strategies need to be implemented to ensure future projects can be easily adapted to a variety of circumstances to provide safe and beneficial effect.

Recommendations for research
There are several recommendations for future research. Firstly, further high-quality RCTs are needed to address the risk of bias highlighted in studies included in this review. Secondly, as most of the included studies in this review had small sample sizes without sample size calculations, future studies with larger sample sizes are required. Thirdly, some qualitative research into barriers and facilitators around these types of interventions would further support the findings of this review. Finally, a scoping review would assist to determine the breadth of studies on this topic and guide future research.

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Dr Mary-Anne Ramis (Queensland Centre for Evidence Based Nursing and Midwifery: A JBI Centre of Excellence) and Mr Luke Burgess (Queensland Centre for Evidence Based Nursing and Midwifery: A JBI Centre of Excellence) for their assistance with manuscript development.

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References


90. Pascal AA. Training within industry in the emergency department: team development to improve patient care and alleviate staff burnout [dissertation]. Dissertation Abstracts International: Section B: The Sciences and Engineering, 2018; 78(9-8(E)).

91. Rooney J. Trialing an evidence-based guided meditation project to reduce perceived stress in emergency department nurses; a DNP project [dissertation]. Southeastern Louisiana University; 2017.

### Appendix I: Search strategy

#### PubMed (pubmed.gov)

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SYSTEMATIC REVIEW

H.G. Xu et al.

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Appendix II: Studies ineligible following full-text review

   **Reason for exclusion:** Ineligible study design, qualitative study

   **Reason for exclusion:** Did not measure outcomes relevant to the review

   **Reason for exclusion:** Did not meet inclusion criteria

   **Reason for exclusion:** Ineligible study design

   **Reason for exclusion:** Did not meet inclusion criteria

   **Reason for exclusion:** Full text not in English

   **Reason for exclusion:** Ineligible study type

   **Reason for exclusion:** Did not measure outcomes relevant to the review

   **Reason for exclusion:** No clear intervention described, no clear study design

    **Reason for exclusion:** Unable to separate ED data from the overall results with a mixed group of participants

    **Reason for exclusion:** Ineligible population, not ED specific

    **Reason for exclusion:** Full text not available. Unable to contact author due to lack of published contact details

Reason for exclusion: Ineligible study design


Reason for exclusion: Did not measure outcome


Reason for exclusion: Conference study protocol, did not publish outcomes, author did not respond to requests for additional data


Reason for exclusion: Ineligible population, not ED specific


Reason for exclusion: Full text not available. Unable to contact author due to lack of published contact details


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Ineligible study type


Reason for exclusion: Did not measure outcome


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Ineligible study design, qualitative study


Reason for exclusion: Published more than 10 years ago


Reason for exclusion: Did not measure outcomes relevant to the review
*Reason for exclusion:* Ineligible setting

*Reason for exclusion:* Did not measure outcome

*Reason for exclusion:* Did not clearly describe the intervention, limited data regarding post intervention stress

*Reason for exclusion:* Ineligible study design, not experimental

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Full text not available. Unable to contact author due to lack of published contact details

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Full text not available. Unable to contact with author due to lack of published contact details

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Ineligible study design, qualitative study

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Ineligible study design, qualitative study

Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Ineligible population, not ED specific


Reason for exclusion: Full text is not in English


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Ineligible population, not ED specific


Reason for exclusion: Ineligible study design, qualitative study


Reason for exclusion: Ineligible study type


Reason for exclusion: Did not measure outcomes relevant to the review


Reason for exclusion: Ineligible population, military medical students
*Reason for exclusion:* Conference study protocol, did not publish outcomes

*Reason for exclusion:* Wrong population, not ED specific

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Ineligible study type

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Does not meet inclusion criteria

*Reason for exclusion:* Ineligible study type

*Reason for exclusion:* Ineligible study type

*Reason for exclusion:* Ineligible population, not ED specific

*Reason for exclusion:* Did not measure outcomes relevant to the review

*Reason for exclusion:* Full text is not in English

62. Sutherland KA, Pham C, La Riviere C, Weldon E. Mentorship in Canadian emergency medicine residency training programs: a needs assessment. CJEM. 2017;19:S34. 
*Reason for exclusion:* Ineligible study type

*Reason for exclusion:* Ineligible population, fire fighters
   *Reason for exclusion:* The aim of study did not meet the requirement of the review

   *Reason for exclusion:* Did not measure outcomes relevant to the review

   *Reason for exclusion:* Did not measure outcomes relevant to the review

   *Reason for exclusion:* Full text not available. Attempted to contact author twice and did not respond to requests for additional data
### Appendix III: Characteristics of included studies

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<th>Study details</th>
<th>Study method</th>
<th>Participant details</th>
<th>Setting &amp; location</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome measures</th>
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<tr>
<td><strong>Educational interventions (n = 6)</strong></td>
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<tr>
<td>Caponnetto et al. 2018&lt;sup&gt;37&lt;/sup&gt;</td>
<td>Quasi-experimental study</td>
<td>28 ED nurses and physicians</td>
<td>1 urban ED, Italy</td>
<td>A stress management program by autogenic training twice a month for 16 weeks.</td>
<td>None</td>
<td>PSS, MBI</td>
<td>Pre, post (immediately after intervention)</td>
<td>PSS: pre-test mean value is significantly different from post-test ($t(27) = 7.72, p&lt;0.001$). MBI: mean value is significantly different for EE subscale ($t(27) = 5.64, p&lt;0.001$) and for DP subscale ($t(27) = 6.67, p&lt;0.001$). No significant difference was observed for PA subscale.</td>
</tr>
<tr>
<td>El-Shafei et al. 2018&lt;sup&gt;58&lt;/sup&gt;</td>
<td>Quasi-experimental study</td>
<td>108 emergency medicine physicians</td>
<td>1 ED, Egypt</td>
<td>Worksite Wellness Education program: 2 educational sessions per week for 6 months. The key topics include work-related stress, diet and nutrition, musculoskeletal disorders, physical activity, smoking, substance abuse, sleep deprivation, circadian disruption, malpractice and fear of litigation, exposure to patient mortality, and exposure to infectious disease.</td>
<td>None</td>
<td>Professional Quality of Life Scale</td>
<td>Pre, post (3 months after)</td>
<td>Both stress (mean [SD]: 31.12 [5.22] pre-test vs. 28.87 [5.84] post-test, $p&lt;0.001$) and burnout (29.98 [4.34] pre-test vs. 23.75 [5.93] post-test, $p&lt;0.001$) were reduced significantly post the program.</td>
</tr>
<tr>
<td>Flarity et al. 2013&lt;sup&gt;59&lt;/sup&gt;</td>
<td>Quasi-experimental study</td>
<td>73 ED nurses</td>
<td>2 trauma centers, U.S.</td>
<td>A multifaceted compassion fatigue resiliency intervention program: (1) A 4-hour interactive group seminar, including 5 key elements: self-regulation, intentionality, perceptual maturation/self-validated caregiving, connection, and self-care. (2) Multimedia resources including printed seminar handouts; “Tools of Hope” DVD; guided imaging/music CD; and access to an ED website with compassion fatigue, compassion satisfaction, and resiliency educational resources and publications.</td>
<td>None</td>
<td>Professional Quality of Life Scale</td>
<td>Pre, post (immediately after intervention)</td>
<td>A statistically significant increase in compassion satisfaction ($p = 0.004$) and a decrease in burnout ($p = 0.001$ or less) and secondary trauma stress ($p = 0.001$) symptoms.</td>
</tr>
<tr>
<td>Kharaghani et al. 2016&lt;sup&gt;60&lt;/sup&gt;</td>
<td>Quasi-experimental study</td>
<td>46 ED nurses</td>
<td>University hospital EDs, Iran (exact number of EDs)</td>
<td>Communication skills training (No description of program content, length, and intensity)</td>
<td>None</td>
<td>MBI</td>
<td>Pre, post (immediately after intervention)</td>
<td>Average burnout scores before (mean ± SD 37/92 ± 12/44, $p&lt;0.001$) and after training (40/87 ± 3/95, $p&lt;0.001$) had statistically significant differences.</td>
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### Mindfulness-based interventions (n = 4)

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<td>Mache et al. 2018&lt;sup&gt;83&lt;/sup&gt;</td>
<td>RCT</td>
<td>70 Junior ED nurses (intervention group = 35; waiting list group = 35)</td>
<td>6 EDs, Germany</td>
<td>Mental health promotion program: 90-minute weekly training sessions over 12 weeks, focusing on actual working situations and problems, coping strategies, and support between colleagues and goals for the future.</td>
<td>None</td>
<td>Perceived Stress Questionnaire; Copenhagen Psychosocial Questionnaire; MBI; Utrecht Work Engagement Scale; Emotion Regulation Skills Questionnaire</td>
<td>Pre, post: T1 (immediately after intervention), T2 (after 12 weeks), T3 (after 6 months)</td>
<td>A highly significant reduction in perceived stress and EE: Stress: T1 (U = 527; p &lt; 0.01), T2 (U = 643; p &lt; 0.01) and T3 (U = 669, p = 0.1). EE: medium effect size at T1 (d = 0.63), medium effect size at T2 (d = 0.50) (p &lt; 0.01).</td>
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<tr>
<td>Wei et al. 2017&lt;sup&gt;70&lt;/sup&gt;</td>
<td>RCT</td>
<td>102 ED nurses (control group = 51, intervention group = 51)</td>
<td>3 EDs, China</td>
<td>6 month active intervention was carried out twice a week by nurse managers and included classes pertaining to communication skills, approaches to conflict, efficacy elevation, and emotion control, as well as working skills.</td>
<td>None</td>
<td>MBI – General Survey</td>
<td>Pre, post (immediately after intervention)</td>
<td>Job burnout (EE and DP) significantly decreased after active intervention in ED nurses in the intervention group compared with the control group (p &lt; 0.01).</td>
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<td>Braganza et al. 2018&lt;sup&gt;78&lt;/sup&gt;</td>
<td>Mixed method</td>
<td>19 (121 for the entire project): nurses, physicians, allied health, non-clinical staff completed both surveys</td>
<td>2 urban EDs, Australia</td>
<td>5 components: 1-day mindfulness workshop; mindfulness flyers; “4-minute pause” during morning medical hand-over; weekly 30-minute “drop-in” session</td>
<td>None</td>
<td>Kessler-10 Psychological Distress Scale (K-10); MBI-HSS</td>
<td>Pre, post (immediately after workshop)</td>
<td>Average K-10 score decreased significantly at follow-up by a mean difference of 1.8 points (95% CI, 0.3 to 3.4; p = 0.022). No significant changes of MBI-HSS (p = 0.981 for EE subscale; p = 0.498 for DP subscale; p = 0.643 for PA subscale).</td>
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<tr>
<td>Ireland et al. 2017&lt;sup&gt;79&lt;/sup&gt;</td>
<td>RCT</td>
<td>44 interns (intervention group = 23; control group = 21)</td>
<td>1 major hospital ED, Australia</td>
<td>Weekly one-hour mindfulness training workshops for 10 weeks 1-hour extra break per week</td>
<td>None</td>
<td>Copenhagen Burnout Inventory; PSS</td>
<td>Pre, mid-way (week 5), final session (week 10)</td>
<td>Changes over time for the mindfulness intervention condition were significant for stress (F = 5.88, p = 0.007, η² = 0.28) and marginally significant for burnout (F = 2.88, p = 0.072, η² = 0.16).</td>
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<tr>
<td>Kurok 2011&lt;sup&gt;75&lt;/sup&gt;</td>
<td>RCT</td>
<td>14 ED nurses (intervention group = 6, control group = 8)</td>
<td>2 EDs, Hong Kong, Taiwan</td>
<td>The MEDI program is a combination of 4 components including mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness over 4 weeks.</td>
<td>None</td>
<td>Medical Personnel Stress Survey-Revised</td>
<td>Pre, post (immediately after intervention)</td>
<td>No difference in stress measurements when comparing the intervention group with the control group.</td>
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<td>Rooney 2017&lt;sup&gt;77&lt;/sup&gt;</td>
<td>Quasi-experimental study</td>
<td>24 ED nurses</td>
<td>1 ED, U.S.</td>
<td>Brief guided meditation sessions following a 12-hour shift. 20 sessions were delivered.</td>
<td>None</td>
<td>PSS</td>
<td>Pre, post (immediately after intervention)</td>
<td>A reduction of pre and post-test stress score: the participants who attended one mindfulness session reported 9.52% stress reduction; the ones who did not attend any sessions reported 1.61% reduction; the ones who attended three sessions reported 43.23% stress reduction.</td>
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<td>d’Ettorre 2016</td>
<td>Quasi-experimental study</td>
<td>282 nurses and 110 physicians</td>
<td>6 EDs, Italy</td>
<td>Introduced a range of extensive organizational improvement interventions, such as working towards improving occupational safety and wellness, involving employee in decision-making, and improving communication with management staff.</td>
<td>None</td>
<td>Multidimensional tool</td>
<td>Pre, post immediately after intervention</td>
<td>Work-related stress after interventions decreased from medium to low among both physicians (22.75 vs 15.37; <em>p</em> &lt; 0.05) and nurses (23.12 vs 15.75; <em>p</em> &lt; 0.05). There was no statistically significant difference (<em>p</em> &gt; 0.05).</td>
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<td>Greenwald 2018</td>
<td>Quasi-experimental study</td>
<td>38 senior ED physicians (telemedicine group = 13; general group = 25)</td>
<td>2 EDs, U.S.</td>
<td>Introduced telemedicine shifts to allow ED physicians to do shifts (8am to 4pm, 4pm to 12am) from dedicated hospital studios during the weekdays with the option of doing shifts from home during weekends.</td>
<td>None</td>
<td>MBI - Areas of Worklife Survey</td>
<td>Pre, post (one year later)</td>
<td>Individual mean differences between pre and post scores demonstrated a higher reduction in emotional exhaustion score (−4.8 vs 1.0; <em>p</em> = 0.04) for telemedicine physicians, but no difference in personal accomplishment (−1.2 vs. 1.4; <em>p</em> = 0.24) or depersonalization (−2.2 vs. −0.4; <em>p</em> = 0.36), and no difference overall (Wilk’s lambda = 0.96, F (3, 34) = 0.42, <em>p</em> = 0.74).</td>
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<tr>
<td>Pascual 2018</td>
<td>Quasi-experimental study</td>
<td>21 nurses and 13 emergency medical technicians</td>
<td>1 small ED, U.S.</td>
<td>TWI (training within industry) project</td>
<td>None</td>
<td>MBI-HSS</td>
<td>Pre, post (immediately after intervention)</td>
<td>All participants combined increased their EE scores by an average of 4.74 points (t (26) = −2.56, <em>p</em> = 0.017). Emergency medical technicians increased their PA scores by an average of 3.20 points (t (9) = 2.57, <em>p</em> = 0.030).</td>
</tr>
<tr>
<td>Schneider 2019</td>
<td>Mixed method</td>
<td>41 participated both surveys (28 nurses, 5 physicians, 7 administrators)</td>
<td>1 ED, Germany</td>
<td>10 multi-professional meetings (90 minutes, health circles) in which ED physicians and nurses developed solutions to work stressors in a systematic moderated process. Meetings were held at 3-week intervals over 7 months.</td>
<td>None</td>
<td>MBI</td>
<td>Pre, post (immediately after intervention)</td>
<td>Both EE (mean (SD) 4.19 (0.94) vs. 4.21 (1.03), <em>p</em> = 0.855) and depressive symptoms increased (1.90 (1.48) vs. 2.22 (1.53), <em>p</em> = 0.119). Both trends were not statistically significant. DP significantly increased over time (3.18 (1.23) vs. 3.54 (1.22), <em>p</em> = 0.027).</td>
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*Only the quantitative data were extracted from the study.

CI, confidence interval; DP, depersonalization; ED, emergency department; EE, emotional exhaustion; MBI, Maslach Burnout Inventory; MBI-HSS, Maslach Burnout Inventory - Human Services Survey; PA, personal accomplishment; PSS, Perceived Stress Scale; RCT, randomized controlled trial; SD, standard deviation.