

BMJ Open Interventions to reduce post-traumatic stress disorder symptoms in health care professionals from 2011 to 2021: a scoping review

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ABSTRACT

Objectives This scoping review aimed to describe available interventions for decreasing (post-traumatic stress disorder) PTSD symptoms among healthcare professionals in hospital care.

Method A scoping review was conducted following Arksey and O'Malley's framework. PubMed, EMBASE, Cochrane Library, CINAHL, PsycINFO, Web of Science, Scopus and ProQuest were searched for original research published in English from 2011 to 2021, on 8 July 2021. We included studies that described interventions that focused on reducing the PTSD symptoms of healthcare professionals. A narrative synthesis was adopted to synthesise the data.

Results A total of eight studies out of 2558 articles were identified. Six used a quantitative study design and two adopted qualitative methods. cognitive behavioural therapy and mindfulness-based interventions were the most commonly adopted. Most studies used a combination of different intervention strategies. Trauma-related knowledge, emotion regulation and relaxation skill training, and psychological support from peers and psychologists were three core intervention components. The duration ranged from 2 weeks to 6 months. Healthcare professionals who participated in training programmes reported both positive experiences and suggestions for the improvement of PTSD-reducing interventions in their qualitative feedback.

Conclusions The scoping review provides a practical summary of the intervention characteristics for reducing the PTSD symptoms of healthcare professionals. Hospitals and managers could use the overview of interventions to assist healthcare professionals with PTSD symptoms. More research investigating the effects of PTSD symptom-reducing interventions for healthcare professionals with appropriate follow-up assessments is needed in the future.

INTRODUCTION

Post-traumatic stress disorder (PTSD) is a mental disorder that may occur following exposure to exceptionally horrifying events. It can develop after a single traumatic event or from long-term exposure to trauma.¹ Four main symptoms characterise PTSD: re-experiencing the event, avoidance of reminders, negative emotions related to the event and

Strengths and limitations of this study

- To the best of the researchers' knowledge, this is the first scoping review on interventions for reducing the post-traumatic stress disorder symptoms of healthcare professionals.
- This review was rigorous and based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews checklist.
- We only searched English electronic databases, which means that some articles in this area published in languages other than English may have been missed.

chronic hyperarousal symptoms.² PTSD has a close relationship with substantial psychosocial morbidity,^{3 4} increased risk of suicide⁵ and poor physical health outcomes.^{3 6}

It has been reported that 3.0% of adults screen positive for PTSD at any time.⁷ PTSD occurs in approximately 8% of men and 20% of women after exposure to traumatic events.⁸ The estimated lifetime prevalence of PTSD is 8.3%.⁹ Due to occupational specialty, healthcare professionals have more opportunities for indirect or direct exposure to trauma by providing care to patients, and it has the potential to induce the symptomatic responses of PTSD.^{10 11} PTSD symptoms have been reported by a variety of healthcare professional groups, including physicians,^{12 13} nurses^{14 15} and midwives.^{16 17} The respective prevalence of PTSD in ambulance personnel, emergency physicians and midwives were 11%, 22% and 36%, respectively.^{18–20}

Healthcare professionals are facing the dilemma of PTSD symptom distress and insufficient organisational support. It has been reported that a stressful work environment and lack of sufficient organisational support could be antecedents of PTSD.^{11 15} Healthcare professionals described their experiences of trauma and PTSD as feeling alone

and unsupported and lacking emotional support.^{21 22} This may lead to adverse consequences among healthcare professionals, such as burnout, job dissatisfaction and the intention to leave their job.¹⁵ It is also likely to cause other mental disorders, including depression²³ and secondary stress disorder.²⁴ The poor mental states of healthcare professionals may increase the risk of medication errors and lower the quality of care provided for patients.^{25–27}

Only one previous meta-analysis examined the efficacy of psychological interventions for healthcare professionals with PTSD in a life-threatening pandemic.²⁸ This review paid more attention to the effectiveness of psychological interventions and included only one study in each meta-analysis. Studies of interventions conducted in healthcare professionals focusing on reducing PTSD symptoms are accumulating, especially amid the COVID-19 pandemic. Mindfulness approaches,²⁹ resilience training,³⁰ online three good things intervention³¹ and so on were conducted in this field. Considering that the intervention types and study designs varied, it is more appropriate to perform a scoping review, as it could give a general map of the interventions in this field. To the best of our knowledge, this is the first scoping review on interventions for reducing the PTSD symptoms of healthcare professionals. Previous studies demonstrated the importance of managing healthcare professionals' PTSD^{32–34}; therefore, it is meaningful to provide a comprehensive review in this area, thereby enhancing their psychological well-being and the quality of health services. This scoping review focused on intervention details (eg, intervention type, content, format, duration, frequency) to present a much-needed and broad overview of current interventions proposed to reduce the PTSD symptoms of healthcare professionals and to show gaps in published research that can be further explored.

METHODS

A scoping review was chosen, as this methodology is ideal for mapping the field of study's extent based on the review question's broad nature.³⁵ It facilitates information collection from different sources and study designs concerned with various research questions.³⁶ This scoping review was conducted based on a five-step methodological framework proposed by Arksey and O'Malley.³⁶ The Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) checklist was followed.³⁷

Stage 1: identify the research question

This review sought to answer the following research question: What interventions are proposed to reduce the level of PTSD symptoms of healthcare professionals in hospital care?

Stage 2: identify the relevant studies

A systematic search was undertaken in PubMed, EMBASE, Cochrane Library (CENTRAL trials database), CINAHL,

PsycINFO, Web of Science, Scopus and ProQuest for articles published from 2011 until July 2021 to obtain the latest evidence in this area. We identified the main concepts, including 'healthcare professionals', 'intervention' and 'PTSD'. A combination of Medical Subject Headings/Emtree terms and free terms was used following the population, intervention, outcome scheme. The different search strings adapted for each database are displayed in online supplemental file 1. Two independent reviewers (JQ and WW) performed the search process following the same strategies. Reference lists of included articles were reviewed thoroughly to search for additional studies.

Stage 3: study selection

Studies were selected based on the inclusion and exclusion criteria. The inclusion criteria were as follows: (a) research studies conducted among healthcare professionals who have experiences of exposure to trauma in the context of the hospital; (b) original studies focusing on the evaluation of the effectiveness or experiences of any intervention with the primary or secondary aim of reducing healthcare professionals' PTSD symptoms; (c) PTSD symptoms were evaluated using valid measurements, such as the Impact of Event Scale—Revised (IES-R) and PTSD Symptom Checklist (PCL-C); (d) qualitative, quantitative or mixed methods studies and (e) published in English between 2011 and 2021. Restrictions on the date were made to concentrate on recent clinical practice and to update previous literature. This review focused on primary research studies; therefore, conference abstracts, reviews, news, study protocol commentaries, case reports, letters, guidelines and books were excluded. Two reviewers (JQ and WW) independently determined the eligibility of studies using a two-step screening process: (1) titles and abstract screening and (2) full-text screening. Any discrepancy was resolved by discussion with a third reviewer (SS).

Stage 4: charting the data

The research team designed a standardised table, and pilot testing was performed on two articles. A consensus was reached to extract data that answered the review question.³⁸ The extracted data included the first author, year of publication, country, study design, study aim, participants, sample size, intervention details (type, duration, frequency and so on), PTSD measurement and results. The first author carefully read and assessed each identified article, which another reviewer (WHW) double checked to ensure accuracy. We did not undertake a systematic quality appraisal of the included studies because it was a scoping review rather than a systematic review.³⁹

Stage 5: collating, summarising and reporting the results

A narrative synthesis was adopted to collate the extracted data.⁴⁰ The Synthesis Without Meta-analysis guideline was followed.⁴¹ Groupings of intervention types, strategies, content, format, duration, session, frequency, assessment

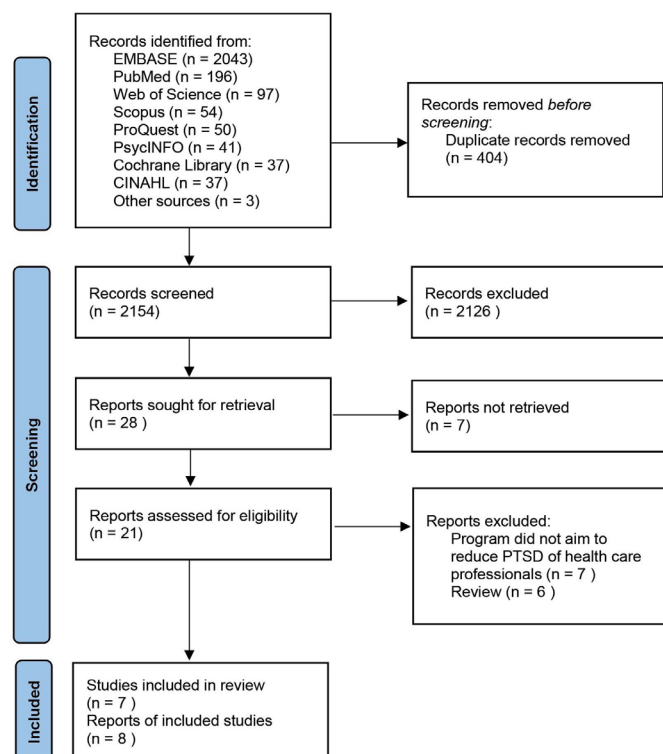


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analysis flow diagram illustrating the search process. PTSD, post-traumatic stress disorder.

time and effectiveness of the interventions were used in the synthesis. We used descriptive tables to synthesise and compare the broad findings. Similarities and differences between the identified studies were compared with generate common themes. Research team members participated in the discussion and revision of the results and assisted in validating the theme identification and description throughout the process.

Patient and public involvement

There was no direct patient or public involvement in this review.

RESULTS

Search outcomes and study characteristics

Electronic searches and other sources identified 2558 citations, resulting in 2154 unique citations to be screened by title and abstract following the removal of 404 duplicates. Overall, 2126 publications were excluded based on title and abstract screening, which left 28 citations for full-text review. Ultimately, eight studies were identified as focusing on reducing the PTSD symptoms of healthcare professionals.^{29–31 42–46} A PRISMA flow diagram illustrating the search process is shown in figure 1.

Details on the study characteristics are displayed in table 1. These studies were conducted in a variety of countries, including the USA (n=3)^{30 31 43} and the UK (n=2),^{45 46} with one study each from Australia (n=1),⁴² Spain (n=1)²⁹ and Mexico (n=1).⁴⁴ The publication year ranged from

2012 to 2021. Of the eight empirical publications, four used a randomised controlled trial design,^{29 30 42 44} two reported qualitative methods,^{31 46} one was a pre-post pilot test study⁴³ and one was a longitudinal design.⁴⁵ The included studies were mainly conducted among healthcare professionals working in a relatively stressful environment, such as the intensive care unit, emergency room, palliative care unit or maternity unit. A total of 859 participants were included in this review. The sample size in each study ranged from 21 to 482. In quantitative studies, the Clinician-Administered PTSD Scale, Davidson Trauma Scale, Post-traumatic Diagnostic Scale (PDS), PCL-C, and IES-R were used to measure PTSD symptoms.

Intervention types and strategies

See online supplemental file 2 for details on interventions for reducing PTSD in healthcare professionals and online supplemental file 3 for a summary of the intervention characteristics. Five studies used a combination of different intervention strategies^{29 30 43 45 46} and three studies^{31 42 44} used a single intervention. Cognitive behavioural therapy (CBT)^{29 30 42 45 46} was the most commonly adopted intervention. Four studies conducted mindfulness-based interventions.^{29 30 43 44} One study used the three good things intervention.³¹

Among the eight included studies, various strategies were used. CBT interventions were chosen for psychoeducation, emotion regulation training, exposure therapy and event-triggered counselling. Mindfulness-based interventions usually used relaxation exercises through breathing or imagination, stretching and deep breathing exercises and mindfulness-based stress reduction exercises (eg, body scan and sitting meditation). Four studies^{30 43 45 46} employed a group workshop. Writing therapy, including the three good things intervention and written exposure,^{30 31} was applied. Two studies provided available referral and access to psychological assessment from a clinical psychologist.^{45 46}

Intervention content and format

Interventions on reducing the PTSD symptoms of healthcare professionals mainly contained the following three core components: (1) trauma-related knowledge: giving theoretical guidance to help healthcare professionals understand trauma reactions and management; (2) emotion regulation and relaxation skill training and (3) psychological support from peers and psychologist: strengthening the feelings of support of healthcare professionals to express trauma experiences and offering a professional psychological assessment.

Six of eight studies were conducted offline,^{30 42–46} and only two studies used a mobile-based intervention and an online intervention.^{29 31}

Duration, session and frequency

The duration of intervention ranged from 2 weeks to 6 months. Generally, the intervention session varied from 5 to 16. The length of each session ranged from 15 to

Table 1 Characteristics of included studies (n=8)

Author & year (Country)	Study design	Study aims	Participants	Sample size	PTSD measurement
Bryant, 2019 (Australia) ⁴²	RCT	To assess the efficacy of cognitive behavioural therapy (CBT) for PTSD in emergency service personnel and examined if brief exposure to trauma memories is no less efficacious than prolonged exposure.	Emergency service personnel with PTSD	100	CAPS
Fiol-DeRoque, 2021 (Spain) ²⁹	RCT	To evaluate the effectiveness of a mobile phone-based intervention to reduce mental health problems in healthcare workers during the COVID-19 pandemic.	Healthcare workers providing face-to-face healthcare to patients with COVID-19	482	DTS
Gerhart, 2016 (USA) ⁴³	A pre-post pilot test	To examine the efficacy of mindfulness-based communication training on depression, burnout and PTSD symptoms.	Palliative care providers	21	PCL-C
Kim, 2012 (Mexico) ⁴⁴	RCT	To determine whether mindfulness-based stretching and deep breathing exercise reduces PTSD symptom severity among nurses with subclinical features of PTSD.	Nurses	22	PCL-C
Mealer, 2014 (USA) ³⁰	RCT	To determine if a multimodal resilience training programme for ICU nurses was feasible to perform and acceptable to the study participants.	ICU nurses	27	PDS
Rippstein, 2017 (USA) ³¹	A qualitative study using thematic analysis	To explore the content of the good things reported by healthcare workers participating in the Three Good Things intervention, which were used to strengthen healthcare workers' skills to deal with stressful events	Neonatal ICU healthcare professionals	32	/
Slade, 2018 (UK) ⁴⁵	Longitudinal design	To identify the programme for the prevention of PTSD in midwifery on their psychological well-being and job satisfaction.	Midwives	153	IES-R
Slade, 2020 (UK) ⁴⁶	A qualitative interview study	To examine the perceived acceptability, utility and relevance of the POPPY resources.	Midwives and midwifery managers	22	/

CAPS, Clinician-Administered PTSD Scale; CBT, cognitive behavioural therapy; DTS, Davidson Trauma Scale; IES-R, Impact of Event Scale – Revised; PCL-C, PTSD Symptom Checklist; PDS, Post-traumatic Diagnostic Scale; POPPY, programme for the prevention of PTSD in midwifery; RCT, randomised controlled trial.

120 min. The frequencies were weekly,^{30 42 43} semiweekly⁴⁴ or daily.^{29 31}

Assessment time and effectiveness of the interventions

In six quantitative studies,^{29 30 42–44 46} all the studies conducted preintervention and postintervention assessments. One study added a mid-training assessment.⁴³ Additionally, only one study reported follow-up assessment scores at 9 months post intervention.⁴² Significantly improved symptoms of PTSD were observed in quantitative studies at postintervention assessment.^{29 30 42–44 46} The effectiveness of CBT in reducing PTSD was still maintained at the 9-month follow-up.⁴²

Findings from qualitative studies

There were two studies describing participants' experiences after the PTSD symptom-reducing interventions.

Benefits of the PTSD symptom-reducing interventions

Two studies both obtained positive feedback from participants. In the study that conducted the three good things intervention,³¹ participants reported promoted well-being and resilience. They proposed that good teamwork, supportive coworkers, communication and relaxing sleep were important factors contributing to their well-being. Another qualitative study interviewed midwives and midwifery managers.⁴⁶ Midwives reported that this training raised awareness of the impact of trauma and made them feel more informed about managing their trauma responses after the intervention. The availability of trusted peer supporters and access to psychological assessments was helpful. From the point of midwifery managers, they reported that the programme enabled acknowledgement and management of trauma in midwifery. Midwifery managers thought the programme filled a clinical gap for midwives seeking support pathways after workplace trauma.

Suggestions and challenges of PTSD symptom-reducing interventions

Midwives reported uncertainty, fear of judgement and stigma as barriers to accessing peer support. Midwives suggested peer supporters should have sufficient clinical experience to fully understand the situation being discussed. For access to psychological support, easy access and confidentiality were essential. Midwifery managers thought the programme should be integrated into the organisational context and require financial investment from the organisation. It could be mandatory training and applied among the wider maternity workforce.

DISCUSSION

The objective of this scoping review was to describe the range of interventions designed to reduce PTSD symptoms among healthcare professionals. This review synthesises intervention settings and the available quantitative and qualitative results regarding the effectiveness of interventions, thereby providing a basis for applying interventions

for healthcare professionals' PTSD symptom reduction. Eight studies were identified in our scoping review. Considering the high prevalence rate of PTSD among healthcare professionals⁴⁶ and the numerous adverse consequences caused by it,^{24 26 27 47} the importance of this scoping review becomes more apparent.

Included studies all showed positive effects in reducing PTSD symptoms in healthcare professionals. In terms of intervention types and strategies, CBT and mindfulness-based interventions were commonly used. This might be explained by previous research which found CBT and mindfulness-based interventions to be effective for PTSD treatment in previous studies.^{48 49} One study focused on resilience training.³⁰ Resilience has been implicated a positive and dynamic outcome following stressors such as traumatic events.⁵⁰ It protects individuals against stress-related mental problems.⁵¹ Interventions focused on enhancing resilience can help prevent and treat individuals with PTSD.^{52 53} The 'three good things' writing therapy showed benefits in relieving PTSD,³¹ which is consistent with previous studies.^{54–56} With the development of positive psychology, many studies have tried to improve PTSD symptoms by increasing positive psychological changes, which may help individuals re-establish a new understanding of life.^{57 58} Group format workshops tend to be used because they can help share useful information on trauma management and help them gain sufficient peer support and organisational support.^{30 43 46}

Trauma-related knowledge, emotion regulation and relaxation skill training, and psychological support from peers and psychologists were summarised as three core intervention components. On the one hand, the knowledge and skills of PTSD management should be improved by providing training to healthcare professionals. On the other hand, there is a need to establish a communication platform to provide adequate psychological and professional support for providers.²² Comprehensive PTSD symptom-reducing interventions based on these three core components could be referred in clinical implementation.

In regard to intervention format, two studies used a mobile-based intervention and an online intervention.^{29 31} In the era of rapid electronic technology development, requirements for healthcare services have promoted instant communication and accelerated efficiency in the transmission of information.⁵⁹ Compared with offline interventions, it might be more convenient to offer long-term support for healthcare professionals via internet technology⁶⁰ or smartphones.⁶¹

Regarding findings from qualitative studies, healthcare professionals gave their positive feedback, which illustrated that these interventions might be effective in PTSD symptom reduction. Meanwhile, suggestions and challenges of PTSD symptom-reducing interventions were proposed. Good teamwork and supportive coworkers were considered important to their mental health. However, the reality is that healthcare professionals feel that support from colleagues and managers is insufficient

after experiencing traumatic events.^{15 21 62 63} Our findings indicated that fear of judgement and stigma were barriers for healthcare professionals to access peer support. This finding is similar to previous findings that some healthcare professionals suffered stigma from their colleagues and managers.⁶⁴ Organisational support from the hospital is insufficient⁴⁶; therefore, hospitals should first attach full importance to healthcare professionals' PTSD management and make clear policies. PTSD symptom screening should be provided for healthcare professionals so that early intervention can be given, thereby decreasing negative psychological outcomes.⁶⁵ The availability of peer support and psychological assessments were viewed as useful resources for healthcare professionals.⁴⁶ Hospitals and managers should try to establish a comprehensive support system for PTSD management, thereby providing strong backing for healthcare professionals.

Only a small number of studies describing PTSD symptom-reducing interventions for healthcare professionals were included in this scoping review, which suggested that little attention has been given to the psychological well-being of healthcare professionals. More research should investigate the effects of PTSD symptom-reducing interventions for healthcare professionals in the future, given inadequate research in this area. Due to the combination of diverse intervention techniques, future studies would be needed to clearly determine the effectiveness of respective strategies. Internet technology or smartphones could be integrated into interventions for convenient and long-term support. Only one study reported follow-up assessment scores.⁴² Research should have appropriate follow-up times to comprehensively understand the maximal efficacy of PTSD severity in the future.

Strengths and limitations

A strength of this scoping review is that it provides a broad overview of interventions aimed at reducing the PTSD symptoms of healthcare professionals. It summarised detailed intervention characteristics and components, which could provide guidance for applying PTSD symptom-reducing interventions for healthcare professionals. This review adheres to the PRISMA-ScR checklist, which ensures the quality and rigour of the study.

There are several limitations of this review. This review has not been preregistered. And also, although we searched eight databases and thoroughly reviewed reference lists of identified studies, we only included eight studies in this review. Therefore, to some extent, this review contributed limited information. Another limitation is that this study is limited to papers published in the English language, which means that some articles in this area may have been missed. Finally, a quality assessment of the included research was not performed considering the scoping review methodology. It is not always necessary for a scoping review. Nevertheless, a scoping review aims to give a general map of the research on a general topic to

inform the reader and to clarify the directions for further research,⁶⁶ which has been achieved in our study.

Conclusions

The scoping review provides a useful summary of the intervention characteristics for reducing the PTSD symptoms of healthcare professionals. This review highlights that hospitals and managers could use the overview of interventions and strengthen support for healthcare professionals' PTSD symptoms. Due to inadequate research in this area, more research should investigate the effect of PTSD symptom-reducing interventions for healthcare professionals with appropriate follow-up assessments in the future.

Contributors JQ, WW, SS, LL, YS and XY all contributed to the conception and design of the review. JQ and WW independently searched electronic databases and screened titles and abstracts. JQ and WW were responsible for reviewing the included studies. Disagreements were discussed with a third researcher (SS) to reach a consistent conclusion. This paper was drafted by JQ and reviewed by SS, LL, YS and XY critically prior to submission; XY served as scientific advisor. XY is responsible for the overall content as guarantor.

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Supplementary File 1 Search strategies of each database (2011-2021)

Database	Search Strategy	Literature
PubMed	<p>19 (((((((("Nurses"[Mesh]) OR ("Nurse Midwives"[Mesh])) OR ("Physicians"[Mesh])) OR ("Health Personnel"[Mesh])) OR ("Nurse Practitioners"[Mesh])) OR (nurs*[Title] OR midwi*[Title] OR nurse practitioners[Title] OR doctor*[Title] OR clinician*[Title] OR physician*[Title] OR healthcare workers[Title] OR healthcare professionals[Title] OR healthcare providers[Title] OR health personnel[Title] OR medical staff[Title] OR medical practitioner[Title] OR medical care personnel[Title]))) AND (((("Mindfulness"[Mesh]) OR ("Resilience, Psychological"[Mesh])) OR ("Cognitive Behavioral Therapy"[Mesh])) OR (intervention*[Title] OR program*[Title] OR training[Title] OR psychoeducation[Title] OR mindful*[Title] OR resilienc*[Title] OR cognitive behavioral[Title])))) AND (("Stress Disorders, Post-Traumatic"[Mesh]) OR (post-traumatic stress disorder[Title/Abstract] OR PTSD[Title/Abstract]))</p> <p>18 ("Stress Disorders, Post-Traumatic"[Mesh]) OR (post-traumatic stress disorder[Title/Abstract] OR PTSD[Title/Abstract])</p> <p>17 post-traumatic stress disorder[Title/Abstract] OR PTSD[Title/Abstract]</p> <p>16 "Stress Disorders, Post-Traumatic"[Mesh]</p> <p>15 (((("Mindfulness"[Mesh]) OR ("Resilience, Psychological"[Mesh])) OR ("Cognitive Behavioral</p>	196

	<p>Therapy"[Mesh])) OR (intervention*[Title] OR program*[Title] OR training[Title] OR psychoeducation[Title] OR mindful*[Title] OR resilienc*[Title] OR cognitive behavioral[Title])</p> <p>14 intervention*[Title] OR program*[Title] OR training[Title] OR psychoeducation[Title] OR mindful*[Title] OR resilienc*[Title] OR cognitive behavioral[Title]</p> <p>13 "Cognitive Behavioral Therapy"[Mesh]</p> <p>12 "Resilience, Psychological"[Mesh]</p> <p>10 "Mindfulness"[Mesh]</p> <p>9 (((("Nurses"[Mesh]) OR ("Nurse Midwives"[Mesh])) OR ("Physicians"[Mesh])) OR ("Health Personnel"[Mesh])) OR ("Nurse Practitioners"[Mesh])) OR (nurs*[Title] OR midwi*[Title] OR nurse practitioners[Title] OR doctor*[Title] OR clinician*[Title] OR physician*[Title] OR healthcare workers[Title] OR healthcare professionals[Title] OR healthcare providers[Title] OR health personnel[Title] OR medical staff[Title] OR medical practitioner[Title] OR medical care personnel[Title])</p> <p>8 nurs*[Title] OR midwi*[Title] OR nurse practitioners[Title] OR doctor*[Title] OR clinician*[Title] OR physician*[Title] OR healthcare workers[Title] OR healthcare professionals[Title] OR healthcare providers[Title] OR health personnel[Title] OR medical staff[Title] OR medical practitioner[Title] OR medical care personnel[Title]</p> <p>7 "Nurse Practitioners"[Mesh]</p> <p>6 "Health Personnel"[Mesh]</p>	
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	5 "Physicians"[Mesh] 3 "Nurse Midwives"[Mesh] 1 "Nurses"[Mesh]	
EMBASE	#34. #21 AND #30 AND #33 #33. #31 OR #32 #32. 'post-traumatic stress disorder' OR 'ptsd':ab #31. 'posttraumatic stress disorder'/exp #30. #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 #29. 'intervention*' OR 'program*' OR 'training' OR 'psychoeducation' OR 'mindful*' OR 'resilienc*' OR 'cognitive behavioral':ti #28. 'cognitive behavioral therapy'/exp #27. 'resilience'/exp #26. 'mindfulness'/exp #25. 'psychoeducation'/exp #24. 'training'/exp #23. 'program'/exp #22. 'intervention'/exp #21. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 #20. 'medical care personnel':ti #19. 'medical practitioner':ti #18. 'medical staff':ti #17. 'health personnel':ti #16. 'healthcare providers':ti #15. 'healthcare professionals':ti #14. 'healthcare workers':ti	2043

	#13. 'clinician*':ti #12. 'clinician*':ti #11. 'clinician'/exp #10. 'doctor*':ti #9. 'nurse practitioners':ti #8. 'midwi*':ti #7. 'nurs*':ti #6. 'medical staff'/exp #5. 'health care personnel'/exp #4. 'physician'/exp #3. 'nurse practitioner'/exp #2. 'midwife'/exp #1. 'nurse'/exp	
Cochrane Library (CENTRAL trials database)	#1 MeSH descriptor: [Nurses] explode all trees #2 MeSH descriptor: [Nurse Midwives] explode all trees #3 MeSH descriptor: [Nurse Practitioners] explode all trees #4 MeSH descriptor: [Physicians] explode all trees #5 MeSH descriptor: [Health Personnel] explode all trees #6 MeSH descriptor: [Medical Staff] explode all trees #7 (nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical practitioner OR medical care personnel):ti (Word variations have been searched) #8 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 #9 MeSH descriptor: [Program] explode all trees #10 MeSH descriptor: [Mindfulness] explode all trees	37

	<p>#11 MeSH descriptor: [Resilience, Psychological] explode all trees</p> <p>#12 MeSH descriptor: [Cognitive Behavioral Therapy] explode all trees</p> <p>#13 (intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral):ti (Word variations have been searched)</p> <p>#14 #9 OR #10 OR #11 OR #12 OR #13</p> <p>#15 MeSH descriptor: [Stress Disorders, Post-Traumatic] explode all trees</p> <p>#16 (post-traumatic stress disorder OR PTSD):ti,ab,kw (Word variations have been searched)</p> <p>#17 #15 OR #16</p> <p>#18 #8 AND #14 AND #17</p>	
CINAHL	<p>1#TI: nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical practitioner OR medical care personnel</p> <p>2#TI: intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral</p> <p>3#AB: post-traumatic stress disorder OR PTSD</p> <p>4# 1# AND 2#AND 3#</p>	37
PsycINFO	<p>1#TI: nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical practitioner OR medical care personnel</p>	41

	<p>2#TI: intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral</p> <p>3#AB: post-traumatic stress disorder OR PTSD</p> <p>4# 1# AND 2#AND 3#</p>	
Web of Science	<p>1# TI: nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical practitioner OR medical care personnel</p> <p>2# TI: intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral</p> <p>3#Subject Term: post-traumatic stress disorder OR PTSD</p> <p>4# 1# AND 2#AND 3#</p>	97
Scopus	<p>1#TI: nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical practitioner OR medical care personnel</p> <p>2#TI: intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral</p> <p>3#AB: post-traumatic stress disorder OR PTSD</p> <p>4# 1# AND 2#AND 3#</p>	54
ProQuest	<p>1#TI: nurs* OR midwi* OR nurse practitioners OR doctor* OR clinician* OR physician* OR healthcare workers OR healthcare professionals OR healthcare providers OR health personnel OR medical staff OR medical</p>	50

	<p>practitioner OR medical care personnel</p> <p>2#TI: intervention* OR program* OR training OR psychoeducation OR mindful* OR resilienc* OR cognitive behavioral</p> <p>3#AB: post-traumatic stress disorder OR PTSD</p> <p>4# 1# AND 2#AND 3#</p>	
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Supplementary file 2: Details on interventions for reducing PTSD in health care professionals

Author & Year (Country)	Intervention type	Content and format	Duration	Session	Frequency	Assessment time	Results
Bryant, 2019 (Australia)	Cognitive behaviour therapy	Prolonged exposure(CBT-L) and brief exposure (CBT-B) comprised one session of psychoeducation, four sessions of cognitive behaviour therapy (CBT) skills training (provided brief instruction in depression management, emotion regulation and so on; a workbook was offered), six sessions that comprised imaginal and in vivo exposure and one session of relapse prevention.	12 weeks Cognitive restructuring was incorporated into sessions 2 - 11. CBT-L sessions were 90 minutes in duration and comprised 40 minutes of imaginal exposure. CBT-B sessions were 60 minutes in duration and comprised 10 min of imaginal exposure	12 sessions	1 session per week	Pre-treatment, post-treatment and 9-month follow-up (6 months following treatment completion)	This study highlights that CBT, which can include either long or brief imaginal exposure, is efficacious in reducing PTSD in emergency service personnel.
Fiol-DeRoque, 2021 (Spain)	A mobile phone-based intervention	An app targeting emotional skills, healthy lifestyle behaviour,	2 weeks	5 sessions	daily prompts (notifications)	Pre-intervention and post-intervention	Among health care workers consuming

	based on cognitive-behavioural therapy and mindfulness approaches	burnout, and social support was delivered. Additionally, daily prompts (notifications) included brief questionnaires, followed by short messages offering tailored information according to the participants' responses.						psychotropic medications, compared to the control app, the intervention significantly improved symptoms of PTSD.
Gerhart, 2016 (USA)	An Experiential Provider Training Series (ACCEPTS)	It is a multimodal program with an emphasis on using mindfulness and communication training. A group format was used. Communication training included directed exercises to engage with peers, express common reactions to patient trauma, and listen to the reactions shared by others. Sitting	8 weeks -Two half-day sessions: 4 h -Weekly session: 1.5 - 2 h	10 sessions	1 session per week	Pre-training, mid-training and post-training	PTSD Re-experiencing (posttreatment d=-0.34, p<0.01). The results indicated that ACCEPTS is an acceptable and feasible intervention for providers that may enhance well-being.	

		meditation was the primary mindfulness exercise emphasized during the group.						
Kim, 2012 (Mexico)	Mindfulness-based stretching and deep breathing exercise	The intervention consisted of stretching and balancing movements combined with breathing and a focus on mindfulness.	8 weeks, 60 minutes each session	16 sessions	Semiweekly	Pre-intervention and post-intervention	The intervention significantly reduced PTSD symptom severity.	
Mealer, 2014 (USA)	Resilience training program	The program included a 2-day educational workshop, written exposure sessions, event-triggered counselling sessions, mindfulness-based stress reduction exercises, and a protocolized aerobic exercise regimen.	12 weeks -Educational workshop: 2 days; -Written exposure:30 minutes/session; -Mindfulness-based stress reduction practices:15 minutes/session; -Exercise:30 to 45 minutes/session -Event-Triggered Counselling	-Educational workshop: 1 session; -Written exposure: 12 sessions; -MBSR Practices: at least 36 sessions; -Exercise: at least 36 sessions; -Event-Trigg	-Educational workshop: 1 time; -Written exposure: 1 time/week; -MBSR Practices: at least 3 times per week; -Exercise: at least 3 times per week; -Event-Triggere	Pre-intervention and post-intervention	This multimodal resilience training program was feasible to conduct and acceptable to ICU nurses. A significant decrease in PTSD symptom score after the intervention was observed (p=0.02).	

				Session: 30 to 60 minutes/session	Counselling Session: at least 1 session	Session: 1 session/week		
Rippstein, 2017 (USA)	Online three good things intervention.	Participants were asked to report three things that went well today and their role in bringing them about.	2 weeks		14 sessions	Daily	/	The Three Good Things exercise acknowledges the importance of self-care in health care workers and appears to promote well-being, which might ultimately strengthen resilience.
Slade, 2018 (UK)	Program for the prevention of PTSD in midwifery	The program included 3 parts: (1) Workshop: support midwives' understanding of trauma experiences and providing guidance on managing feelings;	6 months		Not report	Not report	Pre-training and post-training	There was a trend towards reduced levels of PTSD symptomatology, and fewer midwives reported

		(2) Peer support: offer opportunity to receive confidential support over the telephone from a midwife peer; (3) Referral and access to psychological assessment and input: contact a clinical psychologist to receive assessment when needed					subclinical levels of PTSD (from 10% at T1 to 7% at T2)
Slade, 2020 (UK)	Same as above	Same as above	12 weeks	Not report	Not report	/	The program was viewed as highly acceptable and feasible. Midwives and their managers strongly supported its implementation.

Notes: ACCEPTS: An Experiential Provider Training Series; CBT: Cognitive behaviour therapy; CBT-L: Prolonged exposure; CBT-B: brief exposure.

Supplementary file 3 Overall characteristics of the interventions

Variable	Component	Intervention count
Types	Cognitive behaviour therapy	(Bryant et al., 2019; Fiol-DeRoque et al., 2021)
	Mindfulness-based interventions	(Gerhart et al., 2016; Kim & Burge, 2012)
	Comprehensive programmes	
Contents	Three good things intervention	(Rippstein-Leuenberger et al., 2017)
	Trauma-related knowledge	(Bryant et al., 2019; Mealer et al., 2014; Slade et al., 2018, 2020)
	Emotion regulation and relaxation skill training	(Fiol-DeRoque et al., 2021; Gerhart et al., 2016; Kim & Burge, 2012; Mealer et al., 2014; Rippstein-Leuenberger et al., 2017)
Formats	Psychological support from peers and psychologists	(Gerhart et al., 2016; Slade et al., 2018, 2020)
	Online	(Fiol-DeRoque et al., 2021; Rippstein-Leuenberger et al., 2017)
	Offline	(Bryant et al., 2019; Gerhart et al., 2016; Kim & Burge, 2012; Mealer et al., 2014; Slade et al., 2018, 2020)
Duration	2 weeks	(Fiol-DeRoque et al., 2021; Rippstein-Leuenberger et al., 2017)
	8 weeks	(Gerhart et al., 2016; Kim & Burge, 2012)
	12 weeks	(Bryant et al., 2019; Mealer et al., 2014)
	6-month	(Slade et al., 2018, 2020)
Assessment time	Pre-intervention and post-intervention	(Fiol-DeRoque et al., 2021; Kim & Burge, 2012; Mealer et al., 2014; Slade et al., 2018)
	Pre-training, mid-training and post-training	(Gerhart et al., 2016)
	Pre-treatment, post-treatment and 9-month follow-up	(Bryant et al., 2019)