

A Literature Review of Interventions for the Prevention of Empathic Distress and Burnout in Medical Trainees

Afra Rahman, Rebecca Jennings, Matthew Wu, Austin Hake, Christina Mazza*, Eshani Goradia, Krishna Mehta and Stephen G. Post

Renaissance School of Medicine at Stony Brook, Stony Brook, NY, USA

*Corresponding Author

Christina Mazza, Renaissance School of Medicine at Stony Brook, Stony Brook, NY, USA.

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Abstract

Empathic distress in medical trainees may evolve into burnout in the workplace. Medical trainees are particularly susceptible. To assist in the development and implementation of effective programs to combat empathic distress, a literature review of the various available interventions aimed at increasing compassion was conducted. An investigation into whether the mindfulness component offered any benefit to the medical trainee was also performed. Twenty relevant studies were identified and analyzed. The results indicated that interventions with a mindfulness-component were effective at improving trainee well-being and compassion, and may have an impact on burnout.

Keywords: Empathic Distress, Burnout, Compassion Fatigue, Mindfulness, Medical Trainees, Medical Students, Residents

1. Introduction

Burnout is a current topic in healthcare. Its use has risen over the past decades to describe the process of emotional exhaustion, depersonalization, and sense of low personal accomplishment that reduces a clinician's ability to empathize, provide compassion for, and generate a personal affect towards patients [1,2]. Distinct from burnout is the concept of compassion fatigue. Compassion fatigue has been described as a “state experienced by those helping people in distress; it is an extreme state of tension and preoccupation with the suffering of those being helped to the degree that it can create a secondary traumatic stress for the helper [3].” However, compassion fatigue or compassion burnout is a concept that is a misnomer. In the face of repetitive insults, empathy fatigues in caregivers, not compassion. This is called empathic distress. Emerging research and meta-analysis have successfully proven that brain circuitry responsible for empathy and compassion are distinct. Whereas compassion training activates the pleasure and reward system involved in prosocial behaviors, empathy training activates neural circuitry involved in pain processing [4]. Exposure to either mental or physical chronic pain leads to depletion of dopamine within brain circuits associated with motivation and rewards [5]. When in a state of repetitious empathic distress, the depletion of dopamine results in a chronic blunted ability to experience pleasure and decreased motivation for rewards which

inevitably leads to burnout [3].

Burnout affects about a third of physicians, and these characteristics begin to appear as early as a medical student's clerkship year [6-8]. Various studies have described the factors that contribute to burnout including work overload, lack of control, lack of support and trust, insufficient recognition, unfair workplace decisions, and conflict between individual and organizational values [6,10]. In the workforce, hospitals have now implemented courses that use cognitive behavioral therapy, mindfulness, gratitude training, and health coaching to reduce burnout [11-13]. In medical schools, these interventions often focus on compassion training through didactic lectures, simulation, standardized patients, and reflections [14,15]. Despite the encouraging efforts to combat burnout, the most effective methods still have yet to be revealed [16]. Although systemic changes may be best suited to lift excess stressors contributing to burnout, another plausible tactic may be a focus on building resilience among medical students and residents before they become burnt out [7]. Indeed, the stages of burnout begin in medical school as students transition from their “honeymoon” phase, to the “onset of stress” in their clerkships, to the “chronic stress” of residency [6]. This scoping review evaluates interventions aimed at increasing compassion, to investigate which might be beneficial and whether those with a mindfulness component offer

a superior benefit to the medical trainee.

2. Protocol

The search strategy was developed in consultation with a research librarian. This included the development and refinement of the research question, search string strategies and the selection of databases. The search string consisted of terms related to compassion burnout, intervention and medical trainees. Given the interdisciplinary nature of the topic, Pubmed, Embase, Web of Science, CINAHL and PsychInfo were the academic databases selected. The literature review was performed in a standardized fashion.

Although language restrictions were not placed on the search, search results that were not in English were excluded. No date restrictions were applied. An initial test search was conducted on March 16, 2022. The search was redone on April 9, 2022 for the final time, and the citations were downloaded onto Endnote and deduplicated. The citations were subsequently uploaded to Rayyan QCRI to facilitate screening and discussion. Of note, while “compassion fatigue” is a misnomer for empathic distress, it was included in the search given the common usage of the term.

2.1 Inclusion and Exclusion Criteria

Screening was done twice, with the first level of screening involving reading the title and abstract to determine relevance of the search results. The second level of screening involved reading the full text articles.

For search results to pass the first level of screening, readers looked to ensure the abstracts stated the populations studied were medical

students or/and residents, and included interventions with reported outcomes on empathic distress. Case reports with $n < 3$, articles that were not in English and articles without reporting of outcomes were excluded. The first round of screening was completed by two independent reviewers. Any conflicts were resolved by the two after discussion.

During the second round of screenings, full text articles were screened for relevance. The inclusion and exclusion criteria remained the same with the exception of excluding any results that were limited to abstracts. Given the subjective nature of the definition of compassion fatigue, it was important to have full texts to determine if the articles discussed compassion fatigue as opposed to just burnout. The second level of screening was performed by three independent reviewers such that each article was read twice. Conflicts were resolved by the assigned readers after discussion.

2.2 Data Extraction and Analysis

A table for data extraction was created using the Microsoft Excel table function. The nature of the extracted data was discussed with the research librarian prior to finalization of the table. Data was extracted from the full text and tabulated. The data extraction focused on study characteristics such as country of study, research design, scales used for measuring outcomes and more. It also contained demographics such as average age of participants, age range of participants, sex (male, female, other), race and ethnicity. For the study focus, data was extracted on intervention modality, intervention length, post-intervention follow-up, mindfulness component, voluntariness of participation and outcomes. Data was then tabulated and analysis was performed.

Study	Country	Participants	Gender Distribution of Participants
Chiasson, A. M.	US, Canada	Residents	Not reported
Danilewitz, M.	Canada	Medical Students	30.8% male 69.2% female
Dotters-Katz,	US	Residents	Not reported
Erogul, M.	US	Medical Students	54.4% male 45.6% female
Fernando, Antonio T.	New Zealand	Medical Students	45.8% male 54.2% female
Hicks, M. D.	US	Residents, Faculty	Not reported
Kemper, K. J.	US	Does not specify	20% male 80% female
Mascaro, J. S.	US	Medical Students	37.5% male 62.5% female
Moore, S.	Australia	Medical Students	19.1% male 80.9% female
Nguyen, M. C.	US	Residents	52% male 48% female

Ofei-Dodoo, S.	US	Medical Students, Residents, Faculty, Staff	14% male 86% female
Runyan, C.	US	Residents	25% male 75% female
Sofka, S.	US	Residents	Not reported
Solms, L.	Netherlands	Residents, Faculty	21.9% male 78.1% female
Son, D.	Japan	Medical Students	73.6% male 22.4% female 1.7% not reported
Tucker, T.	Canada	Medical Students	27% male 71% female 2% not reported
van Vliet, Marja	Netherlands, Sweden	Medical Students	17.6% male 82.4% female
Verweij, H.	Netherlands	Residents	88% female 12% not reported
Weingartner, L. A.	US	Medical Students	Not reported

Table 1: Studies on Interventions that aim to Increase Compassion in Medical Trainees

Study	Participants	Design	Qualitative or quantitative intervention?	Sample Size	Brief description of intervention	Outcome measures	Key Results
Chiasson, A. M.	Residents, Fellows, Faculty, Staff	Quasi-experimental	quantitative	102 (48 residents)	11-hour course on pain management	Pain management medical knowledge test, Orientation to Chronic Pain Patient (OCP) Scale, Health Care Providers Pain and Impairment Relationship Scale (HC-PAIRS), Self-Efficacy for Using Non-Drug Therapies (SEND), Professional Quality of Life Scale - Compassion Satisfaction and Burnout scales	No statistically significant difference for compassion satisfaction [F(1,100)=0.3, p=0.59] or burnout [F(1,100)=3.4, p=0.068] before and after the intervention as compared to controls
Danilewitz, M.	Medical Students	Survey	quantitative	52	Completed video modules on mindfulness and performed meditation (MIND-MED, up to 7 modules at 25-35 minutes in duration)	Maslach Burnout Inventory, the Jefferson Scale of Empathy-medical student version, the Five Facets of Mindfulness Questionnaire (short form), and the Self Compassion Scale (short form) pre and post-intervention.	No significant effect on all three aspects of burnout (p= 0.051, 0.71, 0.55), about 1 in 4 students still burnt out following intervention. JSE-S scores not significant (p=0.06). FFMQ increased in two facets (observe and describe, p=<0.001). Improvement in self compassion scale, p=0.001. Little association between modules, meditation practices, and outcomes.

Dotters-Katz,	Residents	Quasi-experimental	quantitative	20	Two to three 2-hour course sessions on humanism in medicine, including mindfulness	ProQOL compassion satisfaction and burnout scores, Psychological Medicine Inventory, and self-reported number of ethical missteps in the last 30 days	Significant decrease in burnout scores in intervention group as compared to controls (-3.1 vs. 2.5, P=0.048). No significant change in compassion satisfaction scores in intervention group vs. control group (4.4 vs.-0.6, P = 0.096).
Erogul, M.	Medical Students	Randomized Controlled Trial	quantitative	58	8-week mindfulness-based stress reduction course	Perceived stress scale (PSS), the Resilience Scale (RS), and Self-Compassion Scale (SCS), baseline, conclusion of intervention, and 6 months after.	Intervention group showed significant increase in SCS at conclusion of study (0.58, p=0.002), and at 6 mo. (0.56, p=0.001). PSS scores achieved significant reduction at conclusion of study (3.63, p=0.03), but not at 6 mo. No difference in RS after intervention, but it was correlated with SCS and PSS.
Fernando, Antonio T.	Medical Students	Randomized Controlled Trial	quantitative	83	Brief-mindfulness induction (10-minutes)	Pre: self compassion scale, Marlowe-Crowne Short Form C post: 13-item Toronto Mindfulness Scale, Brief Differential Emotions Scale, To test if intervention predicted compassionate responding among trainee physicians, participants were given a series of hypothetical case vignettes. Two other objective measures - see paper (involved time allocation)	Greater trait self-compassion (SCS) predicted greater liking of difficult patients (F(1,79)=4.37, p<0.04) but mindfulness did not (F(1,79)=0.01). Mindfulness induction increased caring among those with lower self-compassion and had opposite effect on those with greater self-compassion. Trait of self-compassion predicted ratings of greater patient closeness (p=0.06), but mindfulness is unrelated. ANCOVAs showed that mindfulness predicted greater patient "liking" and "caring" but only among persons lower in self-compassion.

Hicks, M. D.	Residents, Faculty	Randomized Controlled Trial	quantitative	19	Ten 10-minute meditation sessions via Headspace app over 14-day period	Generalized Anxiety Disorder scale-7, Patient Health Questionnaire-9, ProQOL	No statistically significant change in compassion satisfaction scores in intervention group vs. control group (2.00 ± 5.57 vs 1.0 ± 1.94 ; $p = 0.319$). No statistically significant change in burnout scores in intervention vs. control group (-1.10 ± 2.81 vs -1.89 ± 2.76 ; $p = 0.973$).
Kemper, K. J.	Does not specify (Faculty/Staff)	Quasi-Experimental	quantitative	149	Up to 12 hour online training on mind-body practices.	Questionnaire to determine frequency of practice. Stress assessed with Cohen's 10-item Perceived Stress Scale (PSS). Burnout assessed using the 7-item Mayo Clinic Physician Well-Being Index (PWBI). Absenteeism for work in the past 30 days. Mindfulness, resilience, and confidence assessed using the 10-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). Resilience assessed using Smith's 6-item Brief Resilience Scale (BRS). Compassion assessed with Confidence in providing Compassionate Care scale (CCCS).	Most participants reported changes in personal and professional behavior. The various scales were used to determine correlation between study variable. Mindfulness and resilience were strongly correlated to perceived stress and negative correlated with burnout. The dose of training was significantly associated with recent frequency of engaging in mind-body practices and negatively associated with perceived stress, which was strongly correlated with burnout. Both stress and burnout were significantly associated with the number of days of work missed. The frequency of engaging in mind=body practiced was significantly associated with both resilience and mindfulness, both of which were strongly associated with confidence in providing compassionate care.

Mascaro, J. S.	Medical Students	Randomized Controlled Trial	quantitative	32	Cognitively based-compassion training (CBCT) course that met 1.5 hr a week for 10 weeks.	Observed changes in perceived stress scale (PSS), Self Compassion Scale (SCS), Compassion Scale (CS), weekly survey, 500-word reflective essay	Students randomized to CBCT reported decreased depression and loneliness, an increase in compassion, and less exercise. There was no significant change between the pre- and post-assessments within the wait-list control group for any measures. Observed a significant difference for compassion at the post-assessment between CBCT and wait-list groups ($p=0.010$).
Moore, S.	Medical Students	Survey	both qualitative and quantitative	47	8-week online mindfulness training program (MTP) was delivered to students.	Assessed changes in their perceived stress (PSS), self-compassion (SCS) and compassion levels (CS), personal and professional attitudes and behaviors.	50% of participants practiced mindfulness weekly by end of 8 weeks and 32% reported practicing weekly 3 months after intervention. Statistically significant reduction in perceived stress levels, increase in self compassion at 4-mo f/u. Participants SCS scores increased significantly at both 8 weeks and 4 months. Participants had difficulty remaining engaged, feeling overloaded by tasks that they could not prioritize mindfulness, could not enjoy practices.
Nguyen, M. C.	Residents, Faculty	Survey	quantitative	50	Mind-body Skills training curriculum including four 1-hour online modules and three in-person 1-hour interactive lectures	Cognitive and Affective Mindfulness Scale-Revised (CAMS-R), Self-compassion scale (SCS), confidence in providing calm, compassionate care (CCCS), Perceived Stress Scale (PSS), Physician Well-Being Index (PWBI), Emotional Exhaustion and Depersonalization domains of Maslach Burnout Inventory (MBI)	Significant mean difference between those who completed at least one hour of training vs. those who completed none of the training in terms of: compassion as measured by the confidence in providing calm, compassionate care scale (CCCS) ($M = 6.52$, $t(48) = 2.04$, $p = 0.05$); burnout as measured by the Physician Well-Being Index (PWBI) ($M = -0.74$, $t(48) = 1.96$, $p = 0.05$); and emotional exhaustion: ($M = -0.91$, $t(48) = 2.77$, $p < 0.01$)

Ofei-Dodoo, S.	Medical Students, Residents, Faculty, Staff	Survey	quantitative	43	8-week mindfulness-based workplace yoga activities	Post and pre-intervention MBI-9 Emotional Exhaustion, MBI-9 Depersonalization, MBI-9 Personal Accomplishment, DASS-21 Depression, DASS-21 Stress, 14-item Resilience Scale (RS-14), Santa Clara Brief Compassion Scale (SCBC).	Respondents had increase from baseline in MBI-9 scores ($p < 0.01$) while emotional exhaustion and depersonalization scores showed no significant change. Participants reported significant improvement in depression, anxiety, and stress (DASS-21 scores) ($p < 0.01$). Participants showed significant improvement in perceived resilience scores on RS-14 and in compassion scores (SCBC) post-intervention ($P = 0.007$).
Runyan, C.	Residents	Survey	quantitative	12	Wellness curriculum including four 2-hour sessions with a behavioral science faculty member	Maslach Burnout Inventory, Self Compassion Scale, Perceived Stress Scale, Jefferson Empathy Scale	Significant improvement in mindfulness subscale of Self Compassion Scale post-intervention vs. pre-intervention $t = -3.51$; $p = 0.008$. Otherwise, no significant differences between pre- and post-intervention for the other measures.
Sofka, S.	Residents	Survey	qualitative	Variable but including all PGY1 and PGY2 residents in an IM residency program with about 20 residents per year from 2014-2019	Well-being program involving scheduled visits with a licensed therapist through the Faculty Staff Assistance Program (FSAP); 2 scheduled visits as a PGY-1 and 1 scheduled visit as a PGY-2; residents were scheduled by default but could opt out if they wanted to	Proportion of universally scheduled visits to the attended by residents; number of resident-initiated visits, universally scheduled visits, and program-mandated visits to FSAP; proportion of professionalism reports attributed to IM residents out of all GME professionalism reports; PROQOL5.	Significant increase observed in number of resident-initiated visits over time; slope = 6.5; $P = .027$, 95% CI [1.0, 8.0]. Significant decrease in percentage of professionalism reports attributed to IM residents over time slope = -5.7%; $p = .024$; 95% CI [-11.6%, -0.6%]. No significant difference in mean compassion satisfaction or burnout scores between spring 2017 and winter 2020 using 2-tailed Student's t test ($p = .88$ and $p = .39$ respectively)

Solms, L.	Residents, Faculty	Quasi-Experimental	qualitative	114	Up to six coaching sessions with professional coach each lasting 1 to 1.5 hours over the course of about 10 months tailored to the needs of the participant.	Job demands assessed with Quantitative Workload Inventory, 5-item adapted version of job insecurity scale, and work family conflict scale. Job autonomy assessed with Work Design Questionnaire (9 items) as well as perceived supervisor and colleague support. Additional use of 9 items from Dutch version of PsyCap Questionnaire. Generalised Self-Efficacy scale, Self Compassion Scale. Psychological flexibility assessed with Work Acceptance and Action Questionnaire. Exhaustion and cynicism measured with Dutch version of Maslach Burnout Inventory. Work engagement with Utrecht Work Engagement Scale.	Decrease in job insecurity and work family conflict in the intervention group with $p < 0.05$. In the intervention group, autonomy increased, psychological capital and self-compassion increased all $p < 0.05$. Decrease in self-compassion and supervisor support in the control group $p < 0.05$. No changes in psychological flexibility between groups. Outcomes analyses showed that coaching group significantly decreased their burnout symptoms, but showed no difference in work engagement. Post hoc comparisons showed a decrease in exhaustion in the intervention group, $p < 0.05$, with no such change in control group all $p > 0.05$.
Son, D.	Medical Students	Survey	quantitative and	295	Communication training via school-administered observed structured clinical examination (OSCE)	Completed Jefferson empathy Scale and a newly developed set of items on willingness to show empathetic behavior twice after communication skills training,	There was an increase in perspective taking (95% confidence interval: 0.057–0.150 points), compassionate care (95% confidence interval: 0.150–0.240) and willingness to show empathetic behavior (95% confidence interval: 0.179–0.333) from retrospective pre-training to post-training. Both the main effect of the number of medical interviewing training sessions and its interaction with occasion were not statistically significant for any of these factors.

Tucker, T.	Medical Students	Survey	both qualitative and quantitative	165	Compassion Fatigue workshop involving self-reflection exercises prior to beginning their clinical training.	Prior to beginning workshop, students were asked to completed Professional Quality of Life scale (ProQOL), fill it out again at time 2 (middle of academic year) and 3 (end of academic year). Focus group f/u 6 mo. later.	Compassion Satisfaction scores based on ProQoL data significantly lowered between Time 1 and Time 3 (p=0.000). Burnout scores significantly increased between Time1 and Time 3 (p=0.002). Workshop feedback: "Seeing my own struggles/thoughts amongst the topics discussed-makes you feel less alone." "Back in 1st and 2nd year the student affairs office had these wellness checks. I wish we had that in third year because we can all sign up for one but a lot of us are too busy to even think of it."
van Vliet, Marja	Medical Students	Randomized Controlled Trial	quantitative	74	11-week mind-body medicine (MBM) skills course consisting of experimental sessions of mind-body techniques and group reflections.	Perceived stress (PSS), empathy (IRI subscales perspective taking, fantasy, empathic concern, and personal distress), and self-reflection (GRAS). Completed questionnaires at baseline, post-intervention, at 6 and 12 mo. f/u.	Medical students showed significantly increased empathic concern [1.42 (95% CI 0.05, 2.78), p = 0.042], increased fantasy [3.24 (95% CI 1.58, 4.90), p < 0.001], and decreased personal distress [-1.73 (95% CI -3.04, -0.35), p = 0.010] compared to controls until 12 months follow-up.
Verweij, H.	Residents	Randomized Controlled Trial	quantitative	148 (80 in intervention group)	Mindfulness Based Stress Reduction (MSBR) course with 8 weekly sessions of 2.5 hours and a 6 hour silent day during the weekend.	Utrecht Burnout Scale (a validated Dutch version of the MBI), Penn State Worry Questionnaire, Survey Work-home Interaction-NijmeGen, Five-Facet Mindfulness Questionnaire Short Form, Self-Compassion Scale Short Form, Mental Health Continuum-Short Form, Jefferson Scale of Physician Empathy; Medical errors questionnaire	No significant difference between intervention and control group in terms of emotional exhaustion. Intervention group with significantly better personal accomplishment (p=0.028, d=0.24), worry (p=0.036, d=0.23), mindfulness skills (p=0.010, d=0.33), self-compassion (p=0.010, d=0.35), and empathy (p=0.025, d=0.33), as compared to control group.

Weingartner, L. A.	Medical Students	Survey	Both qualitative and quantitative	45	8-week CCT (Compassion Cultivation Training) elective at University of Louisville School of Medicine that aims to strengthen compassion, kindness, and well-being.	Pre/post course Kentucky Inventory of Mindfulness Skills (KIMS) scores were calculated for 4 facets of mindfulness: observing, describing, acting with awareness, and accepting without judgement	Post-test mean scores for mindfulness facets were higher than pre-test values, with significant improvements in observing and accepting without judgement (p=0.005, p=0.017). 74% (20/27) students reported using CCT skills daily or after the course. 76% continued meditating (N= (26/34), 29% expanding compassion (N=10/34), 18% using mindfulness (N=6/34), and 15% breathing for stress management (N=5/34)
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Table 2: Outcomes of Interventions that aim to Increase Compassion in Medical Trainees

3. Results

Using the search criteria, our database searches yielded a total of 625 results (87 from Pubmed, 93 from Embase, 162 from CINAHL, 266 from Web of Science, 17 from Psychinfo). After deduplication on Endnote, 611 articles remained. The titles and abstracts of the articles were uploaded to QCRI Rayyan for the first round of screening. After the application of our inclusion and exclusion criteria, 34 results were left for which full texts were obtained. These were screened using the full text, resulting in 20 papers being included in the final review (figure 1).

During the analysis process, certain scales and metrics were repeatedly encountered. Some of the commonly used metrics found during the literature search were the Jefferson Scale of Empathy (JSE), the professional Quality of Life (ProQOL) scale and the Self-Compassion Scale (SCS). The JSE was developed by Hojat et al with the goal of developing a tool to measure empathy specially in healthcare providers in the context of patient care scenarios [18]. ProQOL was developed by Dr. Stamm to study compassion satisfaction and compassion fatigue [19]. Developed and validated by Dr. Neff, the SCS aims to understand an individual's ability to practice kindness on self when encountering failure instead of being self-critical, to accept that one's experiences are part of the larger human experience and to be mindfully aware of painful thoughts and feelings instead of over-identifying with them [20].

3.1 Interventions to Prevent Compassion Burnout in Medical Residents

Our literature search yielded ten peer-reviewed journal articles meeting inclusion criteria that included residents as part of their study population. Five of these studies were resident-exclusive, while the other five also included faculty, fellows, and/or staff; one paper also included medical students. Sample sizes ranged from n=12 to n=148. The studies took place in the US, Canada,

and the Netherlands. Interventions included online or in-person training courses/curricula, meditation sessions, yoga, universally scheduled appointments with a licensed therapist, and a life coaching program. Consistent with the demanding work schedule of residency training, interventions tended to be relatively short in terms of time commitment. The interventions in five of the ten studies consisted of courses/curricula ranging from 4 to 20 hours total, often offered over a period of several weeks to a few months (Table 1).

A number of studies implemented curricula focused on reducing stress and improving compassion. Chiasson et al. studied the Integrative Pain Management course, an 11-hour online course on pain management, and how the course affected family medicine residents' knowledge and attitudes towards pain management. They looked at compassion satisfaction and burnout scales of the ProQOL, and when comparing the intervention group to controls did not find a significant difference before and after the pain management course in terms of either compassion satisfaction or burnout [22]. Dotters-Katz et al. developed and tested a humanism curriculum for OBGYN and internal medicine residents including discussion of topics such as compassion fatigue and mindfulness. The curriculum included two to three 2-hour sessions. They found a significant decrease in burnout scores in the intervention group compared to the control group but no significant change in compassion satisfaction scores [23]. Runyan et al. integrated a wellness curriculum involving four 2-hour sessions into a pre-existing leadership curriculum for family medicine residents. They found a significant improvement in the Mindfulness Subscale of the Self-Compassion Scale but no significant differences in other subscales of the Self-Compassion Scale, nor in the Maslach Burnout Inventory, Perceived Stress Scale, or Jefferson Scale of Empathy [24]. Sofka et al. implemented a well-being program from 2014 to 2019 at an IM residency program consisting of ~20

residents per class that involved universally scheduled visits with a licensed therapist for all PGY-1s and PGY-2s. They observed a significant increase in the number of resident-initiated visits over time and a significant decrease in the percentage of negative professionalism reports attributed to IM residents out of all the GME professionalism reports at their institution. They found no significant difference in compassion satisfaction or burnout scores [25]. Solms et al. performed a quasi-experimental study in which the intervention group physicians were each paired with a professional coach. The physicians met with their coaches for up to six 1- to 1.5-hour sessions over the course of 10 months. The goals of coaching were tailored to the needs of the physician. The intervention group had a significant decrease in job insecurity, work family conflict, burnout symptoms, and exhaustion. They found that the intervention group had a significant increase in autonomy, psychological capital, and self-compassion [26].

Four studies focused on mindfulness/meditation practices and their effect on trainees' levels of compassion and burnout, amongst other measures. Nguyen et al. studied a Mind-Body Skills training (MBST) curriculum in EM, IM, and surgery residents, fellows, and faculty. The curriculum included four 1-hour online modules and three in-person interactive lectures. They found significant improvements in terms of compassion; confidence in providing calm, compassionate care (both towards oneself and compassionate care for others); decreased burnout; and decreased emotional exhaustion in those who completed at least one hour of the training as compared to those who did not complete at least one hour of the training [27]. Verweij et al. tested a mindfulness-based stress reduction (MBSR) course involving one 2.5-hour session every week for 8 weeks. The course also included a weekly 6-hour "silent day". Although there was no significant difference in their primary outcome of emotional exhaustion between the intervention and control groups, the intervention group was found to have significantly better personal accomplishment, worry, mindfulness skills, self-compassion, and perspective-taking (a component of empathy) [28]. Ofei-Dodoo et al. studied the effect of group mindfulness-based yoga on burnout, depression, anxiety, stress, resilience, and compassion. Yoga sessions were 1 hour weekly for 8 weeks, and participants were encouraged to practice yoga outside of the weekly session. Participants had significant improvements from baseline in personal accomplishment, depression, anxiety, stress, resilience, and compassion scores [29]. Hicks et al. studied the effect of meditation sessions delivered via the Headspace app on anxiety (GAD7 score), depression (PHQ9 score), and professional quality of life (ProQOL score) in otolaryngology residents. The full intervention involved ten 10-minute such sessions over a period of 14 days. They found a significantly greater change in the GAD-7 score for the intervention group. They found no statistically significant difference between the change of the intervention group compared to the change of the control group on the ProQOL or the PHQ9 [30].

3.2 Interventions to Prevent Compassion Burnout in Medical Students

Our literature search disclosed 9 studies including solely medical

students as participants, and 1 containing a mix of medical students among residents, faculty, and staff. Based on the 10 studies, sample sizes averaged at $n = 89.4$ with a range of $n = 43$ to $n = 295$. Gender distribution varied. 7 of 9 medical student studies that reported gender showed a predominant percentage of females to males. Of note, Ofei-Dodoo et al. had enrollment of 86% females, and van Vliet et al. had enrollment of 82.4% females (Table 1) [29, 31]. Studies took place across multiple countries: Canada, the US, New Zealand, Australia, the Netherlands, Japan, and Sweden. Interventions included multiple modalities, nearly all incorporating a component of mindfulness. Examples include: video modules on mindfulness, meditation practice, workshops and training programs on mindfulness, or brief courses on mindfulness principles. 6 studies offered course enrollment, ranging from 8 and 11 weeks. Two studies used the JSE. Multiple studies utilized the combination of observed changes in perceived stress (Perceived Stress Scale/PSS), self-compassion (SCS), and compassion levels (Compassion Score/CS).

Danilewitz et al. offered students online video material that addressed pillars of mindfulness practice followed by a meditation practice. Implementing video modules on mindfulness and meditation showed no significant effects on burnout, such that 25% of participants were still experiencing burnout following the intervention. However, it did produce a significant increase in two facets of mindfulness as well as self-compassion [32]. An 8-week mindfulness-based stress reduction course (MBSR) was studied by Erogul et al. Students demonstrated a significant increase in SCS at the end of 8 weeks and at follow-up 6 months later. They also had a reduction in their perceived stress, but no change in their resilience [33].

Fernando et al. looked at whether a brief mindfulness induction would enhance personal mindfulness and observed the effects it had on challenging patient scenarios. The induction had a greater effect on those with lower-self compassion in terms of their ability to deal with difficult patients and to be compassionate towards others - as measured by "liking" and "caring" for said patients. Amongst those with higher self-compassion at baseline, the intervention increased helping behavior. Factorial ANCOVA showed no main effect of the intervention on self-compassion or mindfulness [34]. The mindfulness training program (MTP) course evaluated in Moore et al. was delivered to students over 8 weeks while assessing the duration of ability to engage in mindfulness meditation. This intervention enhanced student participation in mindfulness, such that 32% of participants practiced techniques weekly 3 months after the intervention. There was a significant reduction in perceived stress, as well as an increase in self-compassion at follow up [35].

Weingartner et al. offered medical students an 8-week Compassion Cultivation Training (CCT) and examined the effects of the course on the Kentucky Inventory of Mindfulness Skills (KIMS) for 4 facets of mindfulness: observing, describing, acting with awareness, and accepting without judgment. Post-test scores for mindfulness were higher in the aspects of observing and accepting

without judgment. 74% of students reported using the CCT skills daily or after the course and 63% felt this intervention should be required. Participants felt key aspects to the course's success were the enthusiasm and efforts of their instructors [36].

A similar intervention was performed by Mascaro et al. involving a 10-week cognitively based compassion training (CBCT) test and its effect on depression, compassion, and daily functioning. Students randomized to the CBCT group reported decreased depression and loneliness, as well as a significant increase in compassion at the post-assessment between the CBCT group and control [37]. Van Vliet et al. had students engage in an 11-week mind-body medicine skills course, evaluating perceived stress, empathy, and self-reflection at baseline and follow-up. Results showed a significant increase in empathic concern and decreased personal distress compared to controls until 12 months follow-up [31].

Ofei-Dodoo et al. studied an 8-week mindfulness-based yoga course, whose key results were discussed previously. Through this intervention, participants demonstrated improvements in depression, anxiety, and stress (DASS-21) as well as perceived resilience and compassion towards others at post intervention [29]. Tucker et al. invited students to a compassion fatigue workshop offered throughout their clinical year. At the beginning of the year, they completed a ProQOL and were given instructions involving self-reflection exercises to increase mindfulness and to develop strategies to mitigate compassion burnout. Towards the end of their clinical year, repeat ProQOL administration revealed an increase in burnout and decrease in compassion satisfaction scores despite the intervention [38].

Son et al. had participants complete a standard communication training in an examination context, called an objective structured clinical examination (OSCE). They were then evaluated for changes in mindfulness behaviors. The components of the mindfulness assessment included a three-item scale developed by the study which examines perspective taking, compassionate care, and willingness to show empathic behavior. As a result of the training, there was an increase in perspective taking, compassionate care, and willingness to show empathic behavior [39].

Comments of the students after engaging in these interventions revealed similar themes in self-reflection exercises. Some found that they had difficulty remaining engaged and that they were overloaded by tasks that they could not prioritize mindfulness or enjoy the practices [35], and others felt that it was useful to sign up but "a lot of us are too busy to even think of it" [38]. Students also seemed to gain greater self-awareness, saying that "I tended to ignore [stress] until I became overwhelmed or until the stressor was removed" [36]. While experiencing their clinical year, students commented that "seeing my own struggles/thoughts amongst the topics discussed - makes you feel less alone" [38].

4. Discussion

Burnout and compassion fatigue affect medical professionals, and

are seen not only in clinicians but also in medical trainees starting as early as medical school [8, 21]. Both burnout and compassion fatigue can adversely affect a medical trainees personal and professional life, and lead to decreased quality of patient care. Given this, it is important to provide effective, sustainable interventions that specifically target and mitigate burnout and compassion fatigue in medical trainees. A number of studies have looked at addressing burnout and increasing compassion in medical trainees, however, these studies are widely varied in the interventions that they used and many of the outcomes that they measured. The findings of these studies are also highly variable, possibly owing to the wide range in the number of participants and level of participation.

In medical residents, a number of courses and wellness curricula (n=5) have been tried, with only a few of them showing any change in compassion (n=2) or burnout (n=2). Of these interventions, the most effective appeared to be the professionalism coach utilized in Solms et al., showing decreased burnout and increased self compassion [26]. A wellness curriculum implemented by Runyan et al. showed increased self-compassion, but only on one of the self compassion scales utilized, and a humanism program implemented by Dotters-Katz et al. showed decreased burnout in participants but no change in compassion [23, 24]. Only a small number of studies looked at mindfulness/meditation interventions in residents (n=3). Of these studies, two of the three showed an increase in self-compassion in the participants (MBST and MBSR, but not simply using HeadSpace), and MBST led to increased compassion towards others whilst MBSR led to increased empathy on one of the measured subscales (perspective taking). Only the MBST course led to decreased burnout and exhaustion amongst participants. From this, it appears that the MBST course is more effective in mitigating both compassion fatigue and burnout in residents, however more work is needed to determine if this is the case. These results suggest that well-recognized mindfulness interventions, such as MBST and MBSR courses, are effective in increasing compassion - towards oneself and others - amongst medical trainees and can be useful programs to utilize in this population. Professional coaching is also a potentially valuable intervention when trying to prevent compassion fatigue and burnout in medical residents. While the outcomes for mindfulness or meditation based interventions were variable, each study showed that these techniques were able to improve the emotional wellbeing of residents in some manner: by improving empathy and compassion; decreasing burnout, exhaustion, or anxiety; or a combination of the aforementioned outcomes. These techniques should be investigated further; their use should be made available to and encouraged among residents.

A number of different interventions have also been looked at in the medical student population. Of these interventions, three had a mindfulness component. Video modules of mindfulness and MBSR increased self compassion, and a brief mindfulness intervention increased compassion towards others but only amongst those with lower self-compassion at baseline. MBSR also was shown to improve perceived stress, but did not change

resilience. Of those that measured burnout no study showed a significant decrease in burnout amongst medical students who underwent a mindfulness-based intervention. A number of other curricula were also trialed in medical students, the least effective of which appears to be the compassion fatigue workout - showing increased burnout and decreased compassion amongst student participants between the start and end of third year [38]. A standard communication training program and CBCT course seemed more effective at mitigating negative impacts of medical school on a student's health and wellbeing, with both increasing compassion, and the CBCT course also resulting in decreased stress. As seen in the resident population, the outcomes for the mindfulness-based courses were variable, however we again see that an MBSR course can be useful in increasing self-compassion and reducing stress, indicating that this type of course might be useful in mitigating negative psychosocial impacts of clinical training across both the medical school and resident populations. Video modules can also be implemented with ebenefts to the medical student population, and may be more easily accessible and readily taken up due to the increased flexibility that this medium provides. However, further studies would need to be conducted to truly assess this.

A mindfulness-based yoga course was implemented for both medical students and residents. It was shown to improve compassion and one of the three manifestations of burnout that was measured (improved personal resilience, but did not change exhaustion or depersonalization). Again, this intervention indicates that a mindfulness/meditation-based intervention is effective in improving compassion and may have some impact on burnout.

4.1 Future Directions

Considering the recent challenges in healthcare in regards to clinician and trainee burnout and decline in compassion, it is imperative that we create programs and methods to mitigate burnout and compassion fatigue. Whilst there are some studies being done on mental health outcomes and compassionate care after targeted interventions - in particular mindfulness or meditation based interventions - the tools that are used to measure outcomes are widely varied and the findings of these studies are not necessarily concordant, possibly owing to varied sample sizes and participant uptake of the interventions. These studies can therefore provide insight into methods that may be effective, but further study in larger cohorts with standardized outcome variables is needed to determine which of these interventions is most effective and most easily introduced and maintained within this population. This review focused on how these interventions affected the medical students and residents who were studied, it did not look at how improvement in mental health outcomes and compassion in this population then impacted work performance, patient care, and patient satisfaction. It would be important to study these outcomes. Pertinent literature studies could also have been excluded by our review criteria; we included only literature that was written or available in English.

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