Implementation Strategies to Mitigate Burnout Among Resident Physicians: A Scoping Review

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AUTHOR NOTE
We acknowledge that unless otherwise explicitly indicated, the statements and ideas presented in this manuscript are our own, and this manuscript is not derived from another similar one that any of us has previously developed for another course.

ABSTRACT
Resident physicians have completed medical school and are undergoing specialized training in a specific area of medicine. The demanding workload of residency, high levels of responsibility, and exposure to traumatic events can lead to chronic stress and fatigue, which can increase the risk of developing burnout syndrome, a psychological state characterized by feelings of exhaustion, detachment, and cynicism toward one's work. This has significant implications for the well-being of resident physicians and the quality of patient care they provide. Our scoping review identifies implementation strategies to reduce resident burnout within U.S. healthcare settings. Using PubMed and CINAHL databases and key search terms, eligible studies underwent review and assessment based on inclusion (i.e., must include residents, must take place in a healthcare setting) and exclusion criteria (i.e., non-U.S. studies, gray literature). The search identified 215 articles and following the removal of duplicates and our inclusion/exclusion criteria, 9 papers were eligible for inclusion. Researchers utilized ERIC and Proctor implementation frameworks to extract relevant characteristics and themes. Emergent themes included the importance of stakeholder feedback to interventions; the criticality of adapting interventions; implementing support-based interventions; the importance of education and training to implementation; and the consequences of non-adherence to implementation strategy criteria. The strategies and outcomes identified can help inform the curriculum of residency programs, the guidance of implementing burnout-mitigating interventions among residents, and the development of workplace initiatives to combat burnout.

KEYWORDS
Burnout, psychological; burnout, professional; internship and residency; physicians

INTRODUCTION
The World Health Organization’s International Statistical Classification of Diseases and Related Health Problems (ICD) provides important information about the scope, causes, and impacts of disease. ICD defines burnout as a chronic workplace stress-related syndrome, characterized by feeling exhausted or drained of energy, increasingly distancing oneself mentally from one job or feeling cynical or negative toward their work, and diminished efficacy in the workplace (World Health Organization, 2019; World Health Organization, 2023). Burnout is complex, involving a combination of individual (e.g., poor self-esteem and insufficient coping skills) and organizational factors (i.e., stressful organizational climate) (Green et al., 2014; Maslach et al., 2001). There are also disparities with regard to burnout, likely due to the stigma and discrimination that certain communities face (Barboza-Wilkes et al., 2023; Rabelo & Cortina, 2014). For example, one study found that young women of color are especially vulnerable to experiencing burnout, while another study found that sexual minority individuals had higher job burnout ratings on surveys (Barboza-Wilkes et al., 2023; Rabelo & Cortina, 2014).

A systematic review of the effects of burnout caused by chronic workplace stress found that the syndrome has several negative consequences that impact employees’ mental and physical health (Salvagioni et al., 2017). It significantly predicted many adverse health impacts, including high cholesterol, heart disease, cardiac-related hospitalizations, stomach issues, chronic fatigue, insomnia, symptoms of depression, and mental health-related hospitalizations (Salvagioni et al., 2017). Despite physicians treating these ailments daily, they are not immune to burnout syndrome.

According to the American Academy of Family Physicians and the American Medical...
Having a common language for expressing key aspects and terms relating to implementation strategy is key to integrating interventions and operationalizing strategy (Grol & Grimshaw, 1999; McNutt et al., 2020; Powell et al., 2019). The Expert Recommendations for Implementing Change (ERIC) is a framework that allows for the classification of implementation strategies for replication and adaptation in other settings (Powell et al., 2015). Thus, implementation research can be effectively employed to design policy, empower communities, and support beneficiaries (such as resident physicians), and frameworks are key to understanding critical aspects of the implementation process (Theobald et al., 2018). According to the World Health Organization (2023), in order to address burnout among resident physicians, it is important to recognize that this is a pressing public health issue with significant consequences such as reduced quality of patient care, increased medical errors, lower job satisfaction and retention rates, negative impact on mental and physical health, and decreased productivity. Fortunately, there are preventative and therapeutic responses and interventions that may be effective for mitigating burnout, including modifying work processes and helping new physicians develop resilience and other health-protective behaviors (Kumar, 2016).

Despite the necessity of reducing resident burnout and establishing evidence-based best practices such as developing mindfulness, or the “the awareness that emerges through paying attention, on purpose, and non-judgmentally to the unfolding of experience moment by moment,” the scholarship surrounding the implementation of burnout-mitigating interventions is limited (Kabat-Zinn, 2003; Malik, & Annabi, 2022). This scoping review identifies implementation strategies utilized in successfully reducing resident burnout among U.S. resident physicians. We aim to assess implementation strategies and interventions to reduce resident burnout within U.S. healthcare settings by analyzing implementation processes and outcomes, classifying them according to ERIC and Proctor parameters, and making recommendations about burnout interventions to mitigate burnout and associated symptoms.

METHODS

Protocol and registration

This scoping review was conducted following the Preferred Reporting Items for Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist (Appendix 1). On June 4, 2023, the protocol for this scoping review was preregistered...
with the Open Science Framework (OSF) (osf.io/fgv6p).

Eligibility criteria

Eligibility criteria were used to select studies for this scoping review. First, publication dates had to be between 2017 and 2022 (5 years) to include the most up-to-date literature. We also wanted burnout intervention studies focused on adult human subjects who are medical residents located within a U.S. healthcare system setting, such as hospitals or clinics, as this is where the population of interest works. We also sought peer-reviewed journal articles, which have been assessed by experts in the field prior to publication, and studies in English, as both reviewers are English-speaking. We excluded reviews or editorials, as scoping reviews focus on the implementation of interventions, and studies involving children.

A scoping review approach was adopted to synthesize data from across a variety of research designs (Arksey & O'Malley, 2005). The Population/Concept/Context (PCC) framework is often leveraged when conducting scoping reviews because it helps identify research questions and refine search strategies, making it important to this review (University of South Australia, 2023). In this paper, only primary research studies that implemented interventions within a U.S. healthcare setting such as a hospital or clinic (the context) to lessen resident physician burnout (the concept) were included in this review to collect peer-reviewed best practices published in academic journals. While this paper initially focused on implementation strategies to mitigate burnout among resident nurses and physicians, our focus became solely on resident physicians (the population), as nurse residency programs are not required and do not need to be accredited, unlike physician residency programs within the United States (Munday, 2023).

United States healthcare settings (hospitals, clinics) were selected due to ongoing physician shortages and burnout being at an all-time high due to the COVID-19 pandemic, affecting ⅔ of physicians (Whang, 2022). Chronic job stress-related burnout has been demonstrated to have a number of detrimental effects on both the mental and physical health of workers, also making this an important area of focus (Salvagioni et al., 2017). Resident physicians in particular are vulnerable to burnout syndrome, since they experience a lack of sleep, a hard job with numerous duties, and low compensation while they study and build abilities in their specialist field, making this a key issue for action (Thomas, 2004). This study was exempt from University of Nevada, Las Vegas Institutional Review Board approval because it involves secondary research analysis with no identifiable human subjects.

Search strategy

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-ScR) standards for scoping reviews, which were established by the Enhancing the Quality and Transparency of Health Research Network to establish review guidelines, we carried out a systematic search and evaluation of the literature (Carpiano, & Daley, 2006; Moher et al., 2010) (Figure 1). The NIH National Library of Medicine MeSH platform was utilized to search identified relevant terms, keywords, and synonyms using PubMed-linked keywords in related studies and AND/OR Boolean search strategy for maximizing results. One of us met with Xan Goodman, Health Sciences Librarian at UNLV, who approved the final search strategy and keywords:

(((((((((("Professional Burnout" OR "Occupational Burnout" OR "Burnout, Occupational" OR "Career Burnout" OR "Burnout, Career") AND ("nurse" OR "nurses" OR "nursing" OR "physician" OR "physicians" OR "doctor" OR "doctors")(AND ("clinic" OR "clinics" OR "hospital" OR "hospitals" OR "health setting" OR "health settings" OR "healthcare setting" OR "healthcare settings" OR "Emergency" OR "urgent") AND ("Strategy" OR "strategies" OR "intervention" OR "interventions" OR "program" OR "programs" OR "pilot" OR "pilots" OR "trial" OR "trials"))

Given that CINAHL indexes the best nursing and health sciences-related published literature, including nursing journals and articles, and that PubMed is a free web browser that primarily accesses the MEDLINE dataset of bibliography and abstracts on biological sciences and biomedical subjects, these two databases were selected. Selecting articles published in English between 2017 to 2022 within the PubMed and CINAHL filter options limited sources to the most current interventions in the language both researchers share (Brazier & Begley, 1996). While the CINAHL database allowed for filtering out articles that did not originate in the U.S., it is important to note that the PubMed database did not include this geographic option in their filters. After applying the search strategy and database filtered, we exported the articles (n = 215) into the reference management platform Rayyan and then the Rayyan blind review platform, which detected...
Selection of sources of evidence

Inclusion criteria for study selection included adult human participants, peer-reviewed journal articles/studies, healthcare system setting, implementation strategies (trials, pilot studies, etc.), resident physicians, and publication in the U.S. (for PubMed articles). Articles outside of the timeframe, study designs outside of our scope of interest such as reviews, gray literature, articles without resident physicians, articles outside of the U.S., and non-human studies comprised the exclusion criteria. Utilizing these factors, we reviewed the titles and abstracts for each of the non-duplicative papers imported into Rayyan (n = 210) and screened for exclusion and inclusion criteria. The screening was completed independently and blindly by reviewers. Reviewers first screened all titles and abstracts. After, all included full texts were independently screened and reviewed, and conflicts were discussed for consensus.

Data extraction and data analysis

We created a shared Excel sheet used to extract data from each article following three implementation frameworks. ERIC’s 73 implementation strategies fall under nine clusters: uses evaluative and iterative strategies (e.g. solicits and provides feedback, assesses readiness), provides interactive assistance (e.g. provides local technical support, centralizes technical support), adapts and tailors to context (e.g. tailors to context, utilizes data experts), develops stakeholder interrelationships (e.g., identifies and trains advocates, uses advisory boards), trains and educates stakeholders (e.g., offers ongoing training, develops educational collateral), supports clinicians (e.g., reminds providers, changes professional duties), engages consumers (e.g., increases demand, leverages media), utilizes financial strategies (e.g., streamlines billing, offers incentives), and changes infrastructure (e.g., mandates change, alters record systems) (Waltz et al., 2014). In addition, we used Proctor et al. (2013) protocol for “naming, defining, and operationalizing implementation strategies,” which includes seven dimensions, as implementation strategies must be described by their components and usage to be applied in real-world settings or research settings. This method includes defining implementation strategies’ actor (who is leading the strategy), action (what the strategy entails), the target of the action (what the action should do), temporality (how often the strategy should take place), dose (the amount of the intervention), implementation outcome (what happened), and the justification (research supporting the intervention).

Lastly, we used the Proctor et al. (2011) framework for classifying six implementation outcomes: acceptability (“perception among implementation stakeholders that a given treatment, service, practice, or innovation is agreeable, palatable, or satisfactory”), adoption (“the intention, initial decision, or action to try or employ an innovation or evidence-based practice”), appropriateness (“the perceived fit, relevance, or compatibility of the innovation or evidence-based practice for a given practice setting, provider, or consumer; and/or perceived fit of the innovation to address a particular issue or problem”), costs (“the cost impact of an implementation effort”), feasibility (“the extent to which a new treatment, or an innovation, can be successfully used or carried out within a given agency or setting”), and fidelity (“the degree to which an intervention was implemented as it was prescribed in the original protocol or as it was intended by the program developers”).

Both authors worked together to gather relevant data from each article, working collaboratively to ensure the accuracy of data extraction. Finally, after all data was extracted and charted, the authors conducted a descriptive analysis as well as a thematic analysis by grouping together studies by their commonalities and underlying messages to facilitate the generation of broad themes (Ezezika et al., 2021). Using both ERIC and Proctor frameworks further developed our comfort with implementation factors, while also adding complexity and structure to the data extraction. Echoing the work of Ezezika et al. (2021), grouping implementation strategies and outcomes within the articles could allow us to distill important themes using standardized implementation tools in order to better understand what implementation factors are associated with reducing burnout among residents. Classifications and themes were confirmed and validated by the third author.

RESULTS

Our search identified 210 articles. A total of 148 (n = 148) articles were excluded by title screening, leaving 62 for full screening. Among those, 53 articles were eliminated after a full-text review for not including resident physicians. The final sample size of this scoping review includes nine articles (n = 9) (Figure 2). Of the articles included in the scoping review, the majority were published between 2020 to 2022 (n = 7, 78%), while two were published in 2017 and 2019 (n = 2, 22%). For all articles, data collection occurred at least a year prior to
After coding the articles for adherence to the Proctor framework, the studies averaged an inclusion score of 2.78 out of 6 overarching outcomes themes. On the high end of the spectrum, adoption, appropriateness, and feasibility were present in five studies (n = 5, 55%). On the low end, implementation cost was addressed in just two studies (n = 2, 22%). Below, we present the following five concepts that emerged following our thematic analysis.

**Theme 1: Importance of stakeholder feedback to interventions**

Stakeholder feedback is important to implementing and sustaining interventions, as input from employees and stakeholders is gathered to assess how effectively the intervention is working and how it performs overall (Dyrbye, & Shanafelt, 2016). The operation and performance of the intervention can be adjusted and improved by paying attention to and appreciating the opinions and feedback of stakeholders (Vudriko et al., 2018). The importance of stakeholder feedback to interventions reflects the use of evaluative and iterative strategies of the ERIC framework during the implementation process, and it can also lend insights into the Proctor outcome evaluation process by providing insight into whether the intervention was a good fit for those it serves (Waltz et al., 2014).

Five articles mentioned that they utilized stakeholder feedback within their interventions and changed their protocol in response. For instance, one study implemented burnout-mitigating, compassion workshops for residents (Neff et al., 2020). When they solicited feedback from residents, the researchers found that residents felt that the program was rushed, so they increased the session durations. At the study’s conclusion, participants reported significant increases in well-being and a decrease in burnout, and these results were sustained for three months (Neff et al., 2020).

For example, in their work, Kesselheim et al. (2020) implemented a new educational curriculum within residency programs, and it included teachings on how to mitigate burnout. Feedback surveys from the residents indicated that over 90% were satisfied with the curriculum, and they tested higher on the study’s satisfaction scale surrounding physician burnout. The feedback helped researchers to understand that the curriculum resonated with residents and helped to explain why the program is still in use within some sites, while other residency programs were inspired by the curriculum and created their own resources, and aligns with the Proctor outcomes framework (Kesselheim et al., 2020; Proctor et al., 2011).
Theme 2: Adaptation of interventions

An implementation strategy of the ERIC framework is adapting and tailoring interventions to the appropriate context (Shelef et al., 2016). This is important because each community is unique, and a one-size-fits-all approach may not be appropriate. Of the nine studies included in this review, five studies crafted their strategies according to their population and context. For example, the hospital in Kline et al. (2020) expanded their patient-focused animal therapy department to also provide support to physicians as a way to combat burnout. While they could have selected various other interventions, they leveraged resources that were already available, effectively reducing stress among providers (Kline et al., 2020).

Similarly, Keyser et al. (2021) adapted an existing, evidence-based peer support intervention that trains providers to facilitate peer support sessions. Prior to this work, the program had not been implemented in large hospitals and had not been used in military hospitals, which have additional stressors such as deployments and high staff turnover rates. They further adapted the program by scaling it up to include smaller military healthcare facilities nearby after identifying this as a need (Keyser et al., 2021). This speaks to ERIC’s emphasis on tailoring implementation strategies to fit the context in question and likely contributed to the success of the program in reducing burnout. Moreover, because the peer support network rapidly spread across several hospitals within the military health system, its adaptability supports its overall feasibility and the fact that it can be effectively translated from large to small, military and non-military health systems to improve burnout among resident physicians (Proctor et al., 2011; Waltz et al., 2014).

Theme 3: Implementation of support-based interventions

Support-based interventions can take various forms, including active listening and basic therapy for mental and other disorders. Coaching and peer support groups are two significant types of supportive interventions. According to research, effective interventions to increase well-being often involve providing support to those who need it (Cooke et al., 2001). Three studies implemented support-based interventions by utilizing group-based training, coaching, and/or peer support programs (Chaukos et al., 2018; Fainstad et al., 2022; Keyser et al., 2021).

The use of professional coaching to lessen burnout among resident doctors is supported by research (Malling et al., 2020). Further, studies where providers utilize wellbeing coaching services have been found to improve some, but not all, components of physician well-being. Fainstad et al. (2022) noted that female resident physicians are disproportionately impacted by burnout. While professional coaching can reduce burnout among residents, individual coaching may not be feasible or affordable for residency programs. To address this, they implemented an online group coaching intervention for female resident physicians, and this reduced key burnout factors, such as emotional exhaustion (Fainstad et al., 2022).

Implementing a peer support program (PSP) is another strategy to combat the growing rate of physician burnout, as clinicians who are under a lot of emotional stress find support within such programs (Keyser et al., 2021; Shanafelt et al., 2010). While Keyser et al. (2021) found that their implementation of a PSP rapidly spread to other military hospitals, Chaukos et al. (2018) implemented a resident-led, resident-developed group curriculum that taught meditation, behavioral skills, and mindfulness techniques. In line with the ERIC implementation strategy, they changed the infrastructure of the residency program by acquiring protected curricular time (Chaukos et al., 2018; Waltz et al., 2014). Additionally, the program had high fidelity due to its formal, regimented structure, ensuring proper delivery and thus aligning with key Proctor implementation assessment outcomes (Chaukos et al., 2018; Proctor et al., 2011).

Theme 4: Criticality of education and training to implementation

Notably, Chaukos et al. (2018) conducted a needs assessment to determine resident needs prior to developing and training them to facilitate a peer curriculum focused on well-being. Kesselheim et al. (2020) similarly conducted a national needs assessment before creating and implementing resident well-being modules within various residency programs. This work is in line with ERIC’s recommendation of using iterative, evaluative implementation strategies and speaks to the importance of tailoring resources and educational materials to best serve the communities they are meant to impact (Waltz et al., 2014).

Both Chaukos et al. (2018) and Kesselheim et al. (2020) focused on developing stakeholder relationships by creating academic partnerships, and both modified the infrastructure of the programs by mandating curriculum changes (Waltz et al., 2014). Their adherence to key ERIC principles in the implementation stages undoubtedly influenced their successful resonance among participants. With regard to Proctor outcomes framework (2011), Kesselheim et al. (2020) and Chaukos et al. (2018) satisfied acceptability, adoption, appropriateness, feasibility, and fidelity outcomes. For example, Kesselheim et al.
(2020) satisfied appropriateness criteria with the intervention’s smooth integration into the program curriculum and its positive feedback from participants, while Chaukos et al. (2018) satisfied adoption criteria, with 88% of all residents at a large teaching hospital volunteering to participate in the intervention.

**Theme 5: Consequences of non-adherence to implementation strategy criteria**

The above articles demonstrate the efficacy of certain interventions to mitigate burnout among resident physicians, which is a pressing issue. Our scoping review also shows the importance of thorough implementation science to achieving intervention success and highlights studies that may serve as cautionary tales of what non-adherence looks like. For example, Hart et al. (2019) implemented The Happiness Practice program, a program that has been successfully used to reduce burnout among nurses by building their resilience. They had one of the lower adherence scores for ERIC strategies (33%), and consequently, they satisfied 0 of 6 Proctor criteria for evaluating outcomes. The intervention increased key burnout factors such as emotional exhaustion, and only two of seventeen feedback responses were positive.

Similarly, Fraiman et al. (2022) implemented a mindfulness program to decrease burnout among residents. The training did not involve training facilitators in advance to administer the program, citing that this is an obstacle to implementing such workshops within residency programs. However, the researchers had one of the lowest adherences to ERIC strategies, satisfying 2 out of 9 criteria. They did not achieve significant burnout-reducing results, and they also met 0 of 6 Proctor criteria for outcomes evaluation. Perhaps advanced communication, needs assessments, relationship-building, and soliciting feedback during the intervention would have allowed for stronger outcomes.

Lastly, Luu et al. (2022) noted that physician workflow is often interrupted through traditional means of communication between physicians and nurses, such as phone calls and paging, contributing to stress, workload, and burnout. Their hospital implemented an electronic messaging system to reduce interruptions. However, while non-emergent calls decreased, physician burnout was unimpacted. This may be related to ERIC strategies, of which only 3 out of 9 were included. For example, the intervention was seemingly implemented without feedback from providers that they wanted the new system or that the existing one was a problem, and training on the new system was limited to emails and team huddles. Proctor adherence was also relatively low, with only 2 out of 6 outcome criteria being satisfied. Together, the lack of sound implementation strategy may in part explain why burnout rates did not decline despite having fewer workflow interruptions.

**DISCUSSION**

These studies highlight the criticality of solid implementation to the success of interventions focused on reducing resident burnout. Studies with higher adherence to ERIC and Proctor criteria tended to achieve burnout-reducing outcomes, as evidenced by research highlighted above that worked collaboratively and in partnership with key stakeholders. As demonstrated by studies such as Neff et al. (2020), interventions that solicit feedback and incorporate changes can increase successful intervention outcomes. Similarly, interventions that are adapted and customized to their context can also increase positive quality outcomes, as observed in the PSP implemented in military hospitals by Keyser et al. (2021).

Further, implementations of support-based interventions, and creating educational collateral and training stakeholders, contributed to burnout reduction in several studies. The Fainstad et al. (2022) study’s online group support program lessened burnout rates among resident female physicians, while Kesselheim et al. (2020) developed a new curriculum that addressed physician mental health, leading to participants having higher satisfaction scores on scales related to burnout and other measures of well-being. Studies that emphasized mindfulness and support tended to lower burnout among residents, which aligns with a past scoping review and systematic review that supports the efficacy of mindfulness, meditation interventions, and self-care workshops to reduce physician burnout (Busireddy et al., 2017; Malik & Annabi, 2022). Unfortunately, the limited number of studies that addressed sociodemographic information about participants highlights a significant barrier to understanding the effectiveness of implementation strategies for reducing burnout among resident physicians who are traditionally underrepresented in the discipline and who may be disproportionately impacted by burnout (Barboza-Wilkes et al., 2023; Rabelo & Cortina, 2014).

This above underscores the necessity of inclusive and sound, evidence-based implementation strategies to improve burnout among resident physicians. It is important to note, however, that high adherence does not guarantee reduced burnout among resident participants. While Chaukos et al. (2018) had relatively high ERIC and Proctor criteria satisfaction
(6 out of 9 and 5 out of 6, respectively), they found that burnout was not significantly reduced among participants. However, the participants greatly appreciated and valued the intervention, presumably because the researchers did their legwork in conducting a needs assessment, soliciting feedback, and providing training and support to ensure its relevance and resonance. Their high level of engagement and relationship-building leaves the door open for working with this teaching hospital in the future. This contrasts with Hart et al. (2019), an intervention that applied a program effective at combating nurse burnout in a resident population, seemingly without stakeholder participation to ensure the program was customized to residents. This program was unsurprisingly negatively received and increased burnout.

Adherence to implementation science and standardized practices can help elicit better outcomes to address resident burnout. While there were exceptions in some cases, in which some studies had high adherence with unchanged burnout scores, the researchers still did the legwork to collaborate with residents and other stakeholders, earning high satisfaction scores. However, it is important to note that this relationship-building likely helped with certain interventions achieving high satisfaction scores among participants, even though burnout was unchanged. Even when interventions were ineffective at decreasing burnout, participants indicating that they gained valuable tools and resources is still extremely valuable. In these cases, adherence to implementation strategies undoubtedly helped position the researchers to maintain a solid working relationship with their stakeholders, allowing them to continue to try and implement evidence-based, burnout-mitigating interventions in the future.

In summary, these studies highlight the criticality of solid implementation practices to the success of interventions focused on reducing resident burnout. Studies with higher adherence to ERIC and Proctor criteria tended to achieve burnout-reducing outcomes, as evidenced by the research highlighted above, while non-adherence tended to lead to reduced outcomes in most cases. Arguably, even studies that did not see burnout decreases despite high adherence put in the effort to build relationships, collaborate, and modify based on feedback, creating future opportunities for continued collaboration.

Limitations

This study had several limitations that should be considered when evaluating our results. Our review was limited by several factors, including search terms, the number of databases and selection of databases, the time frame, and focusing only on the United States. For example, while 2017 - 2022 allowed us to limit our results to the timeliest articles, we may have missed past implementation strategies with valuable insights. Further, only focusing on the U.S. eliminates lessons gleaned from international burnout intervention implementation studies. Additionally, as we only extracted processes and outcomes data, our study may have limited information and lessons learned if we used a framework different from ERIC and Proctor.

CONCLUSION

The results of this scoping review study can assist in the creation of implementation plans that are expressly intended to lower physician resident burnout in U.S. healthcare settings. Based on applying the ERIC framework, we found that training and educating stakeholders was a strategy used in eight of the articles. However, using financial strategies was incorporated in none of the studies. Given that studies with higher adherence tended to have better burnout-reducing results, implementation efforts to reduce burnout may want to consider utilizing financial strategies in the future. For example, given that residents tend to be overworked and underpaid, perhaps participation in interventions can be incentivized to potentially increase participation. Similarly, based on the Proctor framework adoption, appropriateness and feasibility had the highest utilization, while implementation cost was addressed in just two studies. In order for residency programs to implement evidence-based interventions, it is important to know the financial impacts in advance.

This scoping review found that implementation strategies with high adherence to ERIC and Proctor criteria tended to lead to reductions in burnout. Effective strategies tended to incorporate training and educational material development, modified based on feedback, and focused on promoting mindfulness and support. Based on the limited sample size of studies included in our review, and the inefficacy of some strategies despite high adherence, we argue that these findings can be rated as “moderate.”

Given the high rates of pandemic-related burnout, future studies should focus on implementation strategies to reduce burnout among healthcare providers during COVID-19 (Whang, 2022). Moreover, future research should include more rigor and transparency surrounding the cost of implementing burnout-mitigating interventions, as this will potentially increase intervention implementation and resultant uptake. Cost appears to be an understudied topic but is critical to assist hospitals and residency programs with adopting...
Key policy implications

- Burnout is a huge issue among resident physicians, potentially exacerbating the physician shortage crisis the U.S. is currently facing. Mitigating burnout is an area for focus and intervention, and developing a greater understanding of what interventions can best support underrepresented resident physicians is critical for both future research and implementation efforts.

- Implementation of evidence-based interventions should benefit from high adherence to ERIC strategy and Proctor outcomes criteria and should include, but not be limited to, creating educational and training resources, soliciting feedback at all stages, and analyzing program feasibility and other important facets.

- Hospitals and resident programs should consider mandating curriculum and workplace training that includes peer support, mindfulness, and/or coaching to effectively reduce burnout among resident physicians.

ACKNOWLEDGEMENTS

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Whang, O. (2022, September 29). Physician burnout has reached distressing levels, new research

https://www.who.int/standards/classification/classification-of-diseases

https://doi.org/10.1155/2014/673279
Appendix

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

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<th>SECTION</th>
<th>ITEM</th>
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<td>Implementation Strategies to Mitigate Burnout among Resident Physicians: A Scoping Review</td>
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<tr>
<td>INTRODUCTION</td>
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<td>Physician burnout among physicians is an epidemic in the US, and physician burnout can have grave professional and personal consequences.</td>
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<td>Objectives</td>
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<td>● Assess implementation strategies and interventions to reduce resident burnout within U.S. healthcare settings.</td>
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<td>● Analyze implementation processes and outcomes, classifying them according to ERIC and Proctor parameters to better understand key components of strategies.</td>
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<td>● Make recommendations about burnout interventions to mitigate burnout and associated symptoms.</td>
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<td>● Adult human subjects that are resident physicians or nurses: nurses and physicians are on the frontlines of healthcare</td>
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<td>● Peer-reviewed journal articles: have been assessed by experts in the field prior to publication</td>
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<td>● Not a review or editorial: scoping reviews focus on the implementation of interventions</td>
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<td>● Healthcare system setting (e.g., hospitals, clinics): this is where our population works</td>
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<td>● English language: Reviewers are both English-speaking</td>
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<td>● No children, as they cannot work</td>
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<tr>
<td></td>
<td></td>
<td>● Inside the United States</td>
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<tr>
<td></td>
<td>Eligibility criteria</td>
<td>PubMed and CINAHL: these databases focus on medical research and include health personnel-related studies</td>
<td>6,7</td>
</tr>
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<td></td>
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<td>((((Professional Burnout&quot; OR &quot;Occupational Burnout&quot; OR &quot;Burnout, Occupational&quot; OR &quot;Career Burnout&quot; OR &quot;Burnout, Career&quot;) AND (&quot;nurse&quot; OR &quot;nurses&quot; OR &quot;nursing&quot; OR &quot;physician&quot; OR &quot;physicians&quot; OR &quot;doctor&quot; OR &quot;doctors&quot;)) AND (&quot;clinic&quot; OR &quot;clinics&quot; OR &quot;hospital&quot; OR &quot;hospitals&quot;) OR &quot;health setting&quot; OR &quot;health settings&quot; OR &quot;healthcare setting&quot; OR &quot;healthcare settings&quot; OR...</td>
<td>7</td>
</tr>
<tr>
<td>SECTION</td>
<td>ITEM</td>
<td>PRISMA-ScR CHECKLIST ITEM</td>
<td>REPORTS ON PAGE #</td>
</tr>
<tr>
<td>-------------------------------------</td>
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</tr>
<tr>
<td>Selection of sources of evidence</td>
<td>9</td>
<td>Articles were evaluated based on title and abstract for inclusion criteria and were included for subsequent full-text screening.</td>
<td>7</td>
</tr>
<tr>
<td>Data charting process‡</td>
<td>10</td>
<td>Team members created a chart for relevant variables (below). Articles were each independently assessed based on title and abstract and compared for reviewer agreement. Articles selected for additional screening were reviewed independently, with disagreements discussed together by reviewers.</td>
<td>7,8</td>
</tr>
</tbody>
</table>
| Data items                          | 11   | Article #  
Author(s)  
Year of Publication  
Date of Data Collection  
study design  
Action (implementation of intervention strategy)  
Actor (who leads the initiative)  
Setting (hospital, clinic, etc.)  
Target of Action (population and sample size)  
Goals of the strategy  
Dose/frequency of intervention (how often/when should the strategy occur)  
Implementation outcomes  
Justification for implementing the strategy  
Proctor ERIC                                                                                                                                                                                                                     | 8                 |
| Critical appraisal of individual sources of evidence§ | 12   | N/A                                                                                                                                                                                                                                                                                                                                                       |                   |
| Synthesis of results                | 13   | Reviewers used an online platform (Rayyan) for article management, screening, and review. Google Drive Excel sheet was used to collaboratively extract data from each article.                                                                                                                                                                                  | 7                 |

### RESULTS

| Selection of sources of evidence    | 14   | We exported the articles (n = 215) into the reference management platform RefWorks and then the Rayyan blind review platform, in which 5 articles were (n = 5) duplicates for elimination, leaving 210 articles for title and abstract screening.                                                                                               | 7,8               |
| Characteristics of sources of evidence | 15   | Characteristics for each source of evidence, characteristics addressed for which data were charted and citations were provided.                                                                                                                                                                                                                     | 10-14             |
| Critical appraisal within sources of evidence | 16   | N/A                                                                                                                                                                                                                                                                                                                                       |                   |
| Results of individual sources of evidence | 17   | Individual sources of evidence have been addressed and researchers presented the relevant data related to the review questions, with objectives mentioned.                                                                                                                                                                                                     | 8,9,10            |
| Synthesis of results                | 18   | 5 studies taught residents key burnout-reducing skills such as                                                                                                                                                                                                                                                                                  | 9,10              |
mindfulness, humanism, and wellness strategies. Studies showed the importance of stakeholder feedback to interventions and the importance of support-based interventions. Also, it was illustrated that training and educating stakeholders is an important implementation strategy to these interventions.

### DISCUSSION

**Summary of evidence**

19 Adherence to implementation science and standardized practices can help elicit better outcomes to address resident burnout. 15,16

**Limitations**

20 Our review was limited by several factors, including search terms, the number of databases and selection of databases, the time frame, and focusing only on the United States. Our study may have limited information and lessons learned than if we used a framework different from ERIC and Proctor. 16,17

**Conclusions**

21 These studies highlight the criticality of solid implementation practices to the success of interventions focused on reducing resident burnout. Studies with higher adherence to ERIC and Proctor criteria tended to achieve burnout-reducing outcomes, while non-adherence tended to lead to reduced outcomes in most cases. Arguably, even studies that did not see burnout decreases despite high adherence put in the effort to build relationships, collaborate, and modify based on feedback, creating future opportunities for continued collaboration. Future research is needed on strategies to combat burnout in traditionally underrepresented physician residents. 17,18

### FUNDING

**Funding**

22 Most articles included in the review were funded through grants to conduct their research. This scoping review is not funded. N/A
Figure 2: PRISMA 2020 flow diagram

Identification of studies via PubMed and CINAHL databases

Records identified from:
PubMed (n = 44)
CINAHL (n = 171)

Records removed before screening:
Duplicate records removed (n = 5)

Records screened (n = 210)

Full texts assessed for eligibility (n = 62)

Records excluded:
- No intervention implemented (n = 69)
- Non-U.S. (n = 46)
- Grey literature (n = 23)
- Study designs outside scope of interest, i.e. reviews (n = 8)
- Non-physicians or nurses (n = 2)

Reports excluded:
- Non-residents (n = 52)
- Resident nurses article (n = 1)

Studies included in review (n = 9)
<table>
<thead>
<tr>
<th>Table 1: Article characteristics and Proctor criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Article Title</strong></td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Randomized Trial of Therapy Dogs vs. No Deliberative Coloring (Art Therapy) in Reduce Stress in Emergency Medicine Providers</td>
</tr>
<tr>
<td>Citing for others without facing yourself: A meta-analysis of the Mindful Self-Compassion Program for Healthcare Providers</td>
</tr>
<tr>
<td>Human rights and professionalism training for pediatric hematology-oncology fellows: Results of a multicenter randomized trial</td>
</tr>
</tbody>
</table>
### Table 1: Article characteristics and Proctor criteria (continued)

| Article Title | Author(s) | Year of Publication | Date of Data Collection, Format, and COVID-19 Status | Study Design | Action (Implementation of intervention strategy - brief overview) | Actor (Who initiated the strategy) | Setting (hospital, etc.) | Target of action (population, N sample size, n = ) | Goals of the strategy | Dosage and frequency of intervention | Implementation outcomes (what happened specifically) | Justification for implementing the strategy | Proctor criteria | Acceptability, NA Adoption - Acceptance, NA-Adaptability, NA-Implementation in Context, NA-Exemplifiers | Measurable training can reduce physician burnout, however implementing these programs creates challenges to allocate resources for other programs for factors.

| Effect of a Novel Mindfulness Curriculum on Burnout During interns rotation: A Cluster Randomized Clinical Trial | Yeoh S. Feinman, Christina C. Clanton, Howard J. Cohen, Jennifer G. Aman, Amelia E. Mularski, William L. Leber, Thomas A. Behr, Patricia A. McGee, Daniel J. LaVergne, C. Michael M. Miller, Catherine A. McLaughlin, Sara E. Foote, Mark A. Vittitoe, Katherine I. Mavrin, C. Michael M. Miller | 2022-01-24 | June 14, 2017 to February 28, 2018, No | Cluster-randomized clinical trial | During residency, residents used an empathetic mindfulness curriculum, which was delivered in small groups to enhance empathy and reduce burnout. | Proctor resident training programs | Proctor residency programs | 15 programs representing 180 interns with 104 interns assigned to the intervention and 140 assigned to the control (N = 1.9, p = 0.140). | The goal was to determine if an empathetic mindfulness curriculum program introduced during the first six months of internship decreased burnout. | The program was offered once a month over the course of six months. Surveys were given at the beginning, sixth month, and at the end of the intervention. | 346 of the 355 invited interns responded to the intervention. 273 interns responded at month 6, and 156 responded at month 16. There were 130 in the control group and 144 in the intervention group. The interventional group had a statistically significant difference in EE scores between the two groups. | NA-Adaptability, NA-Implementation in Context, NA-Exemplifiers |  | |

| Effect of a Novel Online Group-Coaching Program to Reduce Burnout in Female Resident Physicians: A Randomized Clinical Trial | Tina Fatima, Adrienne Marie, Kristi Schleder, Paul Shih, Nathalie Diamant, Kristi Schleder, and Crystal D. Sexton. | 2022-05-02 | January 1 to June 30, 2021, No | Randomized Clinical Trial | A 1.2 algorithm was created to randomly allocate participants to intervention and control groups. The intervention was a web-based program for group coaching, which was given to the intervention group. The program was provided to the control group after the data were collected. | Certificated physician coaches | University of Colorado | 101 female resident physicians were assigned to the intervention and 100 assigned to the control (N = 1.01). | The objective was to determine if a formal, professional group coaching program would reduce burnout among female resident physicians. | Participants in the 6-month intervention might take part in 1) Two weekly live group coaching calls; 2) monthly anonymous coaching; and weekly self-care videos. | Intentional interventions had increased in the intervention group after 6 months of professional coaching as expected compared to the control group. Comparing the intervention group to controls, burnout was significantly reduced in the intervention group. In controls, to the intervention group, the intervention group’s self-completion scores improved. | NA-Adaptability, NA-Implementation in Context, NA-Exemplifiers |  | |

| Extending Peer Support Across the Military Health System to Decrease Resident Burnout | Erin A. Kowsky, Larissa P. Weis, Michelle M. Veldar, James K. Addy, and Nicole L. Sharp | 2021-01-27 | December 2013 to December 2016, No | Descriptive study | The Brigham and Women’s Hospital (BWH) and the US Navy’s work inspired the San Antonio Uniformed Services Health Education Consortium to create the Peer Health Program (PHP), a peer-to-peer project that includes education for other programs to support colleagues one-on-one. | Nationally recognized experts | Large military teaching hospital | 254 healthcare providers among 625 residents (N = 254, r = 0.52). | The determinants of Peer Support were the military context and the support of military personnel. | Two 5-hour training sessions were offered. | 254 physicians were seen 3-4 times per month by the PHP during the 2-year intervention. 68% of participants were satisfied with the PHP. 67% of participants were very satisfied with the PHP. | NA-Adaptability, NA-Implementation in Context, NA-Exemplifiers |  | |

| SMARTER: A Prospective Cohort Study of a Resilience Curriculum by Residents | Danae C. Flakness, Emma D. Fleck, Kaitlyn H. S. Hender, Lauren S. Hays, and Melinda D. Ceballos, Thomas B. McCullough, and John W. Rittenberg | 2017-11-02 | NA, No | Prospective cohort study | The Center for Resilience in Health Care (SMARTER) curriculum includes workshops on the resilience framework. The SMARTER program was designed to improve residents’ resilience, which is critical for addressing professional burnout. | Residents and nurses team | Large US teaching hospital | 75% of the residents in the medical and psychiatric residency programs completed the SMARTER curriculum. | The SMARTER curriculum was divided into four 1-2 hour sessions. | The program received positive feedback from 31 of 57 participants (91.6%) and 30 out of 57 residents (52.6%) reported the program to be beneficial. | NA-Adaptability, NA-Implementation in Context, NA-Exemplifiers |  | |
Table 1: Article characteristics and Proctor criteria (continued)

<table>
<thead>
<tr>
<th>Article Title</th>
<th>Author(s)</th>
<th>Year of Publication</th>
<th>Date of Data Collection, Focus on COVID-19 Pandemic?</th>
<th>Study Design</th>
<th>Action (Implementation of intervention strategy - brief overview)</th>
<th>Actor (who liaise the minute)</th>
<th>Netting (hospital, clinic, etc.)</th>
<th>Target of Action (population, N = , sample size, n = )</th>
<th>Goals of the Strategy</th>
<th>Dose/frequency of intervention</th>
<th>Implementation outcomes (what happened/results)</th>
<th>Proctor</th>
<th>Justification for implementing the strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of an Electronic Health Record-Based Messaging System in the Emergency Department: Enhancing Physician Workflow and Resident Workload</td>
<td>Tiffany Liu, Lindsey Erin Eigeman, David Nolka, Kimberly Altman, Janet Rob, Scott Rudey, and Shannon Todd</td>
<td>2023-03</td>
<td>May 2019 to August 2019</td>
<td>Case study</td>
<td>A major urban university emergency department served as the site of this investigation (LD). With defined message rules in place, sign-out was delivered through email. An electronic survey was used to assess how the change affected resident doctors.</td>
<td>Lead nurse and lead resident physician</td>
<td>Large urban academic ED</td>
<td>Participants were 24 residents, 23 full-time educational faculty, 34 attending physicians (52, n = 2), 17 attending physicians (52, n = 2)</td>
<td>To examine the effect of an EHR-based communication system on non-emergency resident workloads, and the influence of the system on resident burnout and workload</td>
<td>The messaging platform was implemented May 2019 through August 2019.</td>
<td>The number of RNs non-urgent phone calls and the frequency of non-emergency workloads increased. Resident burnout decreased from this change.</td>
<td>Acceptability</td>
<td>NA</td>
</tr>
<tr>
<td>Enhancing Leadership in a Corporate Wellness Initiative: Improving Residency</td>
<td>Danielle Hirt, Glenn Pantone, and Rochelle Zamba</td>
<td>2016-01</td>
<td>2016-2017</td>
<td>Case study with thematic analysis</td>
<td>The Happpiness Practice (THP) program was implemented between 2016 and 2017 during the competency resident seminars for emergency medicine (ED). The project's primary objective was to develop a workplace wellness program that could be adopted in other healthcare providers and to determine whether it can reduce burnout among emergency medicine residents.</td>
<td>Developed and led by two former business executives who co-founded THP</td>
<td>Urban residency training program</td>
<td>Participants were 64 residents (N = 48).</td>
<td>To adopt a workplace wellness program that can be replicated in other healthcare providers and determine whether it can reduce burnout among emergency medicine residents.</td>
<td>Six months, one-hour sessions from September through December with each session lasting 30 minutes focused on different principles (such as communication, team building) followed by an interactive session.</td>
<td>Following the intervention, there was a noticeable increase in emotional resonating and depersonalization rates as well as an increase in personal achievement scores. The program resulted in a 1.5% reduction in burnout. Residents reported that 43% of them felt their overall burnout was significantly reduced as a result of the intervention, and 78% said their burnout did not change at all.</td>
<td>Acceptability</td>
<td>4.0</td>
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<td>Overall score</td>
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<tr>
<td>Article Title</td>
<td>Use evaluative and iterative strategies</td>
<td>Provide interactive assistance</td>
<td>Adapt and tailor to context</td>
<td>Develop stakeholder relationships</td>
<td>Train and educate stakeholders</td>
<td>Support clinicians</td>
<td>Engage consumers</td>
<td>Utilize financial strategies</td>
<td>Change infrastructure</td>
<td>Total</td>
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<tr>
<td>Randomized Trial of Therapy Dogs Versus Deliberative Coloring (Art Therapy) to Reduce Stress in Emergency Medicine Providers</td>
<td>NA</td>
<td>NA</td>
<td>x</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>1/9</td>
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<td>Curing for others without losing yourself: An adaptation of the Mindful Self-Compassion Program for Healthcare Communities</td>
<td>x</td>
<td>NA</td>
<td>x</td>
<td>NA</td>
<td>x</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>4/9</td>
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<td>Humanism and professionalism training for pediatric hematology-oncology fellows: Results of a multicenter randomized trial</td>
<td>x</td>
<td>NA</td>
<td>NA</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Effect of a Novel Mindfulness Curriculum on Burnout During Pediatric Internship: A Cluster Randomized Clinical Trial</td>
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<td>NA</td>
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<td>Effect of a Novel Online Group-Coaching Program to Reduce Burnout in Female Resident Physicians: A Randomized Clinical Trial</td>
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<td>NA</td>
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<tr>
<td>Extending Peer Support Across the Military Health System to Decrease Clinician Burnout</td>
<td>x</td>
<td>NA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>NA</td>
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<td>5/9</td>
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<tr>
<td>SMART-R: A Prospective Cohort Study of a Resilience Curriculum for Residents by Residents</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Implementation of an Electronic Health Record-Based Messaging System in the Emergency Department: Effects on Physician Workflow and Resident Burnout</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>x</td>
<td>x</td>
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<td>NA</td>
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<td>3/9</td>
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<tr>
<td>Does Implementation of a Corporate Wellness Initiative Improve Burnout?</td>
<td>x</td>
<td>NA</td>
<td>x</td>
<td>x</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
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<td>3/9</td>
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</tbody>
</table>

Note: The table entries represent the number of times a particular criterion is met, with the total at the end of the row indicating the total number of criteria met across columns. The entries are marked as 'x' or 'NA' for 'Not Applicable'.