

Physician Burnout: Evidence-Based Roadmaps to Prioritizing and Supporting Personal Wellbeing

Louise Underdahl ^{1,*}, Mary Ditri^{2,*}, Lunthita M Duthely ^{3,*}

¹College of Doctoral Studies, University of Phoenix, Phoenix, AZ, USA; ²Community Health, New Jersey Hospital Association, Princeton, NJ, USA; ³Obstetrics, Gynecology and Reproductive Sciences and the Department of Public Health Sciences, University of Miami Health System, Miami, FL, USA

*These authors contributed equally to this work

Correspondence: Louise Underdahl, College of Doctoral Studies, University of Phoenix, 4025 S. Riverpoint Pkwy, Mail Stop CF-K601, Phoenix, AZ, 85040, USA, Email lunderdahl@email.phoenix.edu

Abstract: Current literature validates the magnitude of physician burnout as a complex challenge affecting physicians, patients, and healthcare delivery that mandates science-informed intervention. Physician burnout affects both individual practitioners and patient care delivery. Interventions, defined as roadmaps, to prioritizing and supporting personal wellbeing encompass organizational, individual, and moral injury, with virtually no consensus on optimal approaches. The purpose of this conceptual review is to present evidence-based innovative insights on contributing factors, mitigation, and designing adaptive systems to combat and prevent burnout. Science-informed policy initiatives that support long-term organizational changes endorsed by both leadership and institutional stakeholders are keys to sustaining personal wellbeing and ending burnout.

Keywords: moral injury, depersonalization, organizational respect, healthcare

Introduction

With approximately 63% of US physicians reporting burnout at least once a week, reducing, alleviating, and preventing burnout has generated massive research and science-informed recommendations.¹⁻³ The term burnout was introduced in the 1970s by Herbert Freudenberger and added to the World Health Organization's International Disease Classification - ICD 11 as an "occupational phenomenon and not a medical condition" in 2019.⁴⁻⁶ Affecting both the individual practitioner and the quality of patient care delivery, the ramifications of physician burnout encompass emotional exhaustion, depersonalization, adverse clinical outcomes, and reduced institutional financial performance. Since agreement on optimal strategies to prevent burnout has not been achieved to date, there is an opportunity to bridge the "gap between what is known and what is applied to personal, population and professional health care practices"⁷⁻¹¹ The purpose of this conceptual review is to present evidence-based insights on contributing factors, mitigation strategies, and holistic approaches to preventing burnout.

Contributing Factors

Physician burnout has become a distressing issue in recent years, with rates among those in general and academic medicine increasing, prompting the reality that emotional health is a complex problem without a singular consequence or solution.^{12,13} Understanding this phenomenon should not be limited to the community of practice but should also include understanding medical trainees, such as medical students, in addition to residents and physicians extending their training in medical fellowship programs.

Contributing factors of physician burnout are multifaceted. For example, Shakir et al in seeking to understand the relationship between burnout, grit, and resilience of neurosurgery residents, found (among 1,385 individuals) a burnout prevalence of 33.0%.¹⁴ While higher burnout was associated with more significant social/personal stressors, clinical

rotations, and other factors, international and married graduates demonstrated higher grit. What begins in academia, the foundation of physician emotional health and wellbeing, affects education, patient care, and research similar to and dissimilar from the community practice of medicine.¹⁵ This early observation of burnout is not uncommon compared to non-medical student counterparts.¹⁶

As rates of burnout among physicians – students or the community of practice - have risen rapidly in recent years, researchers, institutions, and healthcare professionals are actively seeking to understand better the causes and consequences to inform solutions. Burnout is not identified through diagnostics but instead is self-reported. It can be challenging to accurately measure stress since most research relies heavily on self-reported data.¹⁷ An accurate estimate of burnout among physicians would have significant health policy implications, but the overall prevalence is unknown.¹²

The intricate interplay of individual, organizational, and systemic elements contributes to the complex nature of this pervasive issue.¹⁸ Dyrbye et al suggest lack of autonomy, inadequate social support, and the emotional demands of patient care further exacerbate the problem.¹⁹ Mata et al point to a flawed healthcare system needing more resources and support, driving physicians to navigate complex administrative tasks while striving to deliver quality patient care.²⁰

As early as 1974, Freudenberger documented evidence of burnout related to introducing the electronic health record (EHR).⁴ The unintended consequences of EHR implementation led to increased burnout rates among physicians resulting in escalated administrative workload and diminished direct patient engagement and consequently linked to elevated stress levels and emotional exhaustion among medical professionals.²¹ And, while researchers of late are studying the heightened consequences of COVID-19 on burnout and physician wellbeing, a deeper understanding of the long-term effect is needed to examine early signs of burnout and to develop effective coping strategies.^{22–25}

In Patel et al, researchers discussed the unique internal and external pressures physicians face that contribute to burnout in medicine.²⁶ Sleep deprivation, unhealthy coping mechanisms, lack of self-care, social support, and self-critical tendencies are more prevalent among physicians. Gazelle et al suggested that inherent traits such as perfectionism, denial of personal vulnerability, and delayed gratification create a predisposition to burnout.²⁷

Maslach and Leiter described six areas of work life that are associated with work engagement and are predictive of burnout when there is an imbalance: workload, control, reward, community, fairness, and values.¹³ Systemic factors in healthcare organizations play a significant role and the disconnect between patient care needs and staffing resources has been identified as an important contributing factor.^{28,29}

Stewart et al discussed burnout in the context of conceptual models representing complex systems in a simplified fashion to facilitate and understand those systems.³⁰ The comprehensive models of physician wellbeing acknowledge its complex nature, avoid focusing solely on burnout and acknowledge shared responsibility between the individual and systems that influence work conditions. Recognizing that the explanations for manifestations of burnout can vary significantly across demographics, this discussion is limited to a fixed set of unique talks on the topic.

The COVID-19 Pandemic

Physician burnout has emerged as a critical concern exacerbated by the COVID-19 pandemic. The healthcare industry reported the COVID-19 pandemic was devastatingly impacting frontline healthcare workers' emotional capacity and resilience.³¹ The overwhelming patient influx, coupled with the emotional toll of witnessing severe illness and mortality, was a significant factor in physician burnout.³² Evidence includes increased reports of anxiety, depression, job fatigue, and emotional drain.³³ Burnout definitions, assessment tools, and reporting mechanisms differ; mental health, cultural differences, and consistent diagnostic indices make scoring and interpretation difficult.³⁴ Researchers anticipate poor emotional wellbeing to be higher during the pandemic, and the epidemiology of burnout will take time to understand fully. Additionally, adopting new technologies and rapid changes in healthcare delivery to accommodate remote consultations and telemedicine has further strained physicians' work-life balance.³⁵ The lack of personal protective equipment (PPE) during the initial stages of the pandemic and the heightened risk of exposure to the virus has also added to the stressors faced by healthcare providers. Addressing these challenges necessitates comprehensive support systems, including mental health resources, clear communication, and strategies for workload management to mitigate the impact of COVID-19 on physician burnout and sustain the healthcare workforce.³⁶

Workload, Work Environment, and Meaning in Work

Excessive workload and an unfavorable work environment contribute to physician burnout.³⁷ Long working hours, high patient volumes, administrative tasks, and limited control over work schedules amplify stress levels among physicians. While intended to improve efficiency, EHR systems often lead to increased documentation demands and reduced time for patient interaction.³⁸

Meaning in work promotes physician resilience against burnout. However, research has only minimally explored the impact of patient-physician relationships, focusing mainly on patient perspectives. Shortell et al address this knowledge gap, exploring the elements of relationships with patients that physicians find meaningful and their perceptions of how those relationships influence their experiences.³⁹ Messinger and Das propose physician-centric approaches alone may be insufficient in addressing burnout and that a person-oriented system is vital for patient wellbeing and physician wellness.⁴⁰

Healthcare institutions play a pivotal role in either exacerbating or alleviating physician burnout. Organizational culture, including values, expectations, and leadership practices, significantly impacts burnout rates.⁴¹ Institutions prioritizing physician wellbeing by offering resources such as counseling, wellness programs, and professional development opportunities have reported lower burnout rates.⁴²

Lack of Work-Life Balance

Maintaining a healthy work-life balance is challenging for physicians due to the demanding nature of their profession. For residents, the pressure of intense training schedules based on specialty, disproportionate demand on minority resident physicians' time, and ethnic-conscious professionalism, coupled with irregular schedules, can result in high emotional exhaustion.^{21,43} Differences in working arrangements (full-time/part-time, employed/contracted), ability to respond to and cope with discrimination, harassment or mistreatment, and inherent characteristics of the individual that directly contribute to one's susceptibility to burnout contribute to the balance of work and life.⁴⁴⁻⁴⁶

Emotional and Psychological Factors

The demanding nature of medical practice, characterized by long working hours, high patient volumes, and administrative burdens, contributes significantly to the emotional exhaustion experienced by physicians.⁴⁷ In a study by Shanafelt et al, researchers opined the erosion of a sense of personal accomplishment and decreased job satisfaction have been associated with burnout, often stemming from the perceived disconnect between physicians' aspirations and the reality of their practice.¹⁸ The emotional toll of patient suffering and the responsibility of making life-altering decisions place physicians at risk for compassion fatigue.⁴⁸ Chronic exposure to distress and crisis response are professional predictors of this phenomenon, and physicians' mental health challenges, including anxiety and depression, could exacerbate symptoms.^{20,49}

The ever-increasing pressure to provide optimal patient care while navigating intricate medical decisions can evoke feelings of inadequacy and self-doubt, contributing to emotional distress.⁵⁰ As these emotional and psychological factors interplay, they exacerbate physician burnout, underscoring the urgency for comprehensive interventions to safeguard the wellbeing of healthcare professionals.

Lack of Support and Autonomy

The early work of Gagné and Deci placed motivation in two categories – intrinsic or extrinsic.⁵¹ Their work proposed people engage in activities because they find them exciting and therefore are satisfied with the activity itself or the tangible reward that comes from the action. However, they also suggest that the same extrinsic motivators could undermine intrinsic motivation. Under this theory, autonomy means having the right to act with a sense of choice. Supportive leadership and a sense of independence – or choice – are vital for mitigating anxiety, depression, and burnout.⁵² When physicians perceive a lack of support from their organizations or feel that their opinions are not valued, burnout rates increase.⁵³ Autonomy in decision-making and involvement in organizational changes can enhance job satisfaction and reduce burnout risk.⁵⁴

Interpersonal Relationships and Patient Engagement

Hours spent in documentation and workflow are responsible for the sense of loss of autonomy, lack of work-life balance, lack of control of one's schedule, cognitive fatigue, a general loss of autonomy, and poor relationships with colleagues.^{55,56} Kruse et al point to drivers of poor emotional health in the healthcare professional workforce.²³ Conversely, conflicts and strained colleague relationships can increase stress and emotional exhaustion.⁵⁷ Positive relationships with colleagues and a renewed emphasis on nurturing the doctor-patient relationship play a role in restoring professional wellbeing.²¹ Coupled with a cohesive healthcare team and effective communication, all foster a sense of belonging and camaraderie that buffers against burnout.⁵⁸

Mitigation Strategies

Reacting to the high rates of burnout recently reported—namely that post COVID-19 Pandemic, physician burnout was at an all-time high—the American Medical Association (AMA) committed to addressing the American physician burnout “epidemic”.^{59,60} The AMA cites system inefficiencies, administrative burden, regulations and hospital and clinic-related technology as the driving factors contributing to physician burnout and emphasizes physician wellness as a way to avoid the downstream effects of burnout on direct patient care.⁶⁰

At the national level, the US Surgeon General reported that the COVID-10 pandemic elevated the important relationship between wellbeing and work—tackling individual mental health requires improving workplace mental health.⁶¹ The Department of Health and Human Services (HHS) reported that many US workers are experiencing mental health challenges resulting directly from workplace challenges. HHS proposes that interventions consider the five main tenants of wellbeing, which are based on basic human needs: protection from harm, connection and community, work-life harmony, mattering at work, and opportunity for growth.⁶¹ Taken together, ie recognizing both the systems level causes and human personal need, effective approaches to mitigate burnout will intervene systemically and at the individual level.⁶² As posited by Eskander et al, successful burnout interventions will be voluntary, will emphasize strengthening and building protective factors, and will be integrated into a curriculum that is offered during the workday / work week.⁶³ Interventions geared at minimizing burnout will vary and might include mind-body practices, such as meditation, or target specific skills, such as building resilience or emotional intelligence.^{63,64} Other interventions might be relationship-centered, where mentorship in the professional environment is facilitated, or a team approach to patient care where steps are taken to reduce physician burnout.^{63,65}

Organizational Support

One of the first things required to address physician burnout at the organizational level is to measure or assess the extent to which burnout may be occurring. Some tools to use are Maslach Burnout Inventory, which assesses emotional exhaustion, depersonalization, and personal accomplishment; the Mini Z, which assesses satisfaction, stress, burnout, work control, chaos, values alignment, teamwork, documentation time pressure, excessive EMR use at home, and EMR proficiency; the Oldenburg Burnout Inventory, which, assesses exhaustion and disengagement from work and the Copenhagen Burnout Inventory, which assesses personal, work, and client-related burnout.^{66–70}

Factors contributing to burnout may be out of physician control, and so system level solutions that address workload, administrative and peer support are needed to mitigate physician burnout.⁷¹ Also, organizations may need to consider tailoring interventions to individual-level differences, like physician gender.⁷² Even interventions administered at the organization level must be tailored to the organization's individual characteristics, and so a “one size fits all” strategies may not be effective.⁶⁵

Healthcare organizations are creating organized efforts, either in the form of workgroups or offices, focused on diversity and inclusion aimed at addressing specific issues faced by those underrepresented in medicine, as they are more likely to experience burnout.⁶² At the institutional level, burnout may extend to program directors and other staff supporting physicians and residents. Khesroh et al suggested that improving skills such as emotional intelligence may be a way to mitigate burnout amongst physicians.⁶⁴ Given the important relationship identified between nutrition and

chronic stress, Esquivel suggested institutions support the availability of healthy foods, and provide nutrition education to trainees that promotes healthy eating habits amongst physicians and health care professionals.⁷³

Individual Focus

Individuals can mitigate burnout, first, by recognizing its occurrence and launching proactive mitigation.^{74–77} Initiatives to enhance wellbeing may target modifiable factors like better food choices or encompass individually focused institutional strategies such as strengthening connection and community.^{73,78}

Eskander et al's review of resident wellness interventions (published until 2019), found that most interventions focused on stress management and included discussion groups.⁶³ The majority (61%) demonstrated a significant change over time across one or more measured constructs (eg, emotional exhaustion, depersonalization, stress, mindfulness). Bradford and Glaser's review found that factors correlated to burnout, which lend themselves as targets for interventions, include insufficient sleep, anxiety, depression, and low cognitive function.⁷⁹ Here we highlight a few interventions at the individual level (eg, resident, fellow), published 2019 and later.

Quinn et al's pilot curriculum, focused on cultivating empathy (for others) and self-care, reported a significant improvement in burnout, which improved increasingly with each session attended.⁸⁰ In another self-care intervention, Belfi et al found that story-telling and journaling with the intention to share those expressions, fostered a sense of community, and sharing these experiences fostered connection, increased hopefulness and decreased burnout.⁸⁰ In one of the more complex designs, Medisauskaite and Kamau tested four intervention components (eg managing stress, managing burnout, dealing with death and loss) against a control group, and found significant improvements in emotional exhaustion, depersonalization and anxiety.⁸¹ Rich et al's mixed-methods study reported that their intervention improved disengagement and exhaustion.⁸² A common theme that emerged in the qualitative interviews was that participants also employed digital apps which promoted self-care, such as mindfulness practices.⁸² Ghannam et al's stress management intervention implemented amongst residents significantly improved emotional exhaustion, depersonalization and work satisfaction.⁸³

The Future

While researchers continue to explore underlying factors contributing to burnout and approaches to remediation, a growing number of practitioners advocate rethinking current practice models to optimize “production line” work to promote the physician-patient connection reflected in the Hippocratic Oath: “May I long experience the joy of healing those who seek my help.”^{84,85} Structural and procedural changes can promote “joy in practice” by opening opportunities to develop therapeutic alliance and interpersonal trust, as antidotes to burnout.^{85–87} This section focuses on remediating systemic problems through institutional approaches such as digital transformation, artificial intelligence, frameshifts, and learning healthcare systems.

Digital Transformation

As the largest integrated health system in the United States, the Veterans Health Administration has pioneered digital innovation strategies to improve healthcare delivery.⁸⁸ Examples include:

- Artificial intelligence and machine learning - Streamline workforce management and contribute to precision medicine
- Electronic health records - Collaborate with industry and vendors to improve usability for clinicians
- Virtual, augmented, and mixed reality - Create experiential learning and training environments
- Mobile health applications - mHealth requires regulatory oversight and evidence-based validation
- Connected sensor technology - Use algorithms to calibrate behavioral and physiological data; research on data integrations is needed
- Digital therapeutics - Software-based treatment modality using clinical evidence
- Virtual care - Live and asynchronous approaches to patient care
- Patient engagement and social media - Combat misinformation from non-credible sources with accurate public health information⁸⁸

In 2022, University students in Madrid, Spain were invited to “devise technological solutions to identify, prevent, and mitigate employee burnout.”⁸⁹ Requirements included describing associated costs, functional and non-functional elements, analysis and design of the innovation, and video presentation not exceeding 6 minutes.^{89,90} Students submitted twelve proposals; eight utilized mobile applications and four used a web-based approach. Digital transformation initiatives focused on proactive detection and mitigation of burnout by monitoring individuals as delineated in Table 1.

Lessons learned included:

- Burnout mitigations encompass a wide range of approaches
- Burnout comprises personal and institutional dimensions
- Incorporating devices already in use promotes exchange of information, defined as stress indicators received and advice is sent
- An innovative model attracts more user attention.
- Solutions should be feasible for both users and employers.
- Incorporating existing tools and standards enhances contribution to existing and future research.
- Technological solutions should be user-friendly and device-generic
- One-year development period is typical

Artificial Intelligence

Artificial intelligence approaches streamline existing clinical and administrative processes to reduce time and labor-intensive components, thereby enabling clinicians to improve health care delivery and enhance intrinsic satisfaction by interacting with patients. Additionally, artificial intelligence tools enable healthcare systems to calibrate administrative burden and how it affects physician burnout. Responses to utilizing artificial intelligence in healthcare delivery range from “ChatGPT is not the solution” to “Hey chatbot, write me an H&P”^{92–95} Intermediate perspectives reaffirm the “new

Table 1 Digital Apps to Promote Self-Care

	Initiative	Description
1	Virtual Personal Assistant	Detects early signs of burnout by analyzing user’s interaction with the device.
2	BonusBreak	Prevents burnout by encouraging healthy habits.
3	Mental Health Monitor	Uses AI to monitor user’s habits; scoring system identifies burnout risk.suppl
4	Free Time Booking	Book time off from work, spending time in a rented room to play games or practice individual or group meditation.
5	Break Buddies	Encourages employees to take breaks while connecting with others by organizing participants’ interests and preferences.
6	Field Day	Proposes a game with a specific theme every month; employees play the game once a week.
7	Light-Up	Wristband collects data to identify potential burnout risk.
8	WellTech	AI interprets data and generates report to employee and HR; corporate medical service is notified and intervenes, as appropriate.
9	TrusTec	Collects, stores, and synthesizes useful information to prevent employee fatigue.
10	Bright Software	Various tools to give user more positive work experience.
11	Hubture	Monitors employee stress; employees create an account and receive monthly “burnout reports.”
12	Burnband	Smart wearable bracelet or wristband to measure physical activity, heart rate, and blood pressure to detect symptoms of burnout.

Notes: Adapted from Sanchez-Segura, MI, Dugarte-Peña, GL, Medina-Dominguez, F et al. Digital transformation in organizational health and safety to mitigate burnout syndrome. *Front Public Health*. 2023;11:1080620.⁸⁹

Quintuple Aim of Equity and Inclusion for health and health care” and differentiating between artificial and augmented intelligence.^{96–98} While Matheny et al contended “near-term focus should be on augmented intelligence rather than full automation”, others offer actionable recommendations on enlisting “ambient artificial intelligence” and artificial intelligence to reduce physician burnout.^{96,99–101} Ambient intelligence has been described “sensitive, responsive, adaptive, transparent, ubiquitous, and intelligent”.¹⁰² Ambient artificial intelligence applications can facilitate early warning systems to promote patient safety, improve clinical decision making, enhance clinical workflow and operational efficiencies, and reduce administrative burden for physicians.

Javanmardian and Lingampally suggested AI applications expedite assembly, analysis, and validation of electronic health record compliance with regulatory guidelines, simultaneously assessing patient clinical data and administrative details.¹⁰³ Healthcare applications for chatbot technology reduce administrative workload for primary care and dermatology clinicians. Diamond et al and Dyrbye et al quantified challenges and opportunities associated with electronic medical records interfacing with patient portals:^{8,95}

- From 2013 to 2018, primary care provider message responses increased from 153 to 322 per provider per year, a 110% change.¹⁰⁴
- For multispecialty providers, a 348% increase in annual portal message threads, increasing from 108,121 threads in 2008 to 484,374 in 2010.¹⁰⁵
- Dermatology ranked second in growth rate of message utilization and reported an 84.4% probability of using online messaging, with dermatology practitioners receiving a higher proportion of messages with image attachments.^{106,107}
- On multivariable analysis, number of In Basket messages received per day and time spent in the EHR outside scheduled patient were associated with burnout.⁸

Antiquated, generic, disconnected workforce management systems fail to deploy flexible scheduling that accommodates shift swapping, unanticipated absences, and leave requests.¹⁰⁸ In a study of 60 anesthesiologists, AI-based scheduling significantly improved physician engagement scores from 3.3 to 4.2 out of 5 on a Press Ganey survey and reduce burnout by creating fair and flexible schedules that support work-life balance. The AI scheduling system optimally allocated ICU and operating room shifts and accommodated physician preferences, thereby reducing staff stress.¹⁰⁰ Higher engagement scores reflect optimized physician/organization relationship, resulting in enhanced clinical care, reduced operational costs, improved efficiency and greater physician retention.¹⁰⁹

Frameshift

Panagioti et al’s meta-analysis of 20 controlled interventions on 1550 physicians indicated organization-directed interventions for reducing physician burnout were most effective but rare.¹¹⁰ The study provided evidence-based support for viewing burnout as a problem of the whole healthcare organization, rather than individuals. The “three-legged stool” model of physician wellness further corroborated organizational perspectives, attributing responsibility for resilience to individuals, and workplace efficiency and environmental factors to organizations.⁸⁶ The National Academies of Sciences, Engineering and Medicine 2019 report advocated “a systemic approach to burnout that focuses on the structure, organization, and culture of health care” using systems thinking and design principles to address clinician burnout.⁹¹ Organizational responsibility for creating efficiency of practice and a culture of wellness is the context for researchers advocating framework shifts or “frameshifts” designed to focus practitioner time and attention on “the nuanced work of problem solving, medical decision making, and relationship building.”^{84,111} Research conducted under the auspices of the American Medical Association validates Sinsky’s view that “while burnout manifests in individuals, it originates in systems”.¹¹² Burnout correlates to system inefficiencies, administrative burdens, regulation complexity, and technology.¹¹³ As Resnick and Backus et al attested, physician burnout is a whole system problem and requires a whole system solution.^{114,115}

AMA STEPS Forward[®] “top down” practice innovation strategy is a roadmap for medical directors, practice managers, operations leaders, C-suite executives.¹¹² Directives for eliminating physician burnout include eliminating inconsequential tasks, rethinking the rationale for process requirements, distributing work among team members, and

orchestrating timesaving initiatives “from the top down” to engage leadership in launching major changes.¹¹² Institutional initiatives to improve electronic health record usability through design, implementation, and regulation can reduce burnout.¹¹⁶ Eliminating excessive “bureaucratic tasks” such as the paperwork and charting requirements that demand 90 minutes of “pajama time” (work outside of normal working hours) per day can reduce burnout.¹¹⁷ Workplace physician stressors associated with technology, such as the electronic health record, can be mitigated by improved usability and training, enlisting scribes to handle documentation, system compatibility, and reallocating clerical responsibilities.¹¹⁸ Organizations can implement “targeted interventions” and identify specific factors that may be expeditiously altered to improve physician burnout, promote community at work, use incentives, align values and strengthen culture, and validate work/life balance.¹¹⁹

The American Medical Association Recovery Plan delineates solutions encompassing system reform and burden reduction:¹²⁰

- Reducing physician burnout
- Fixing prior authorization
- Reforming Medicare payment
- Fighting scope creep (practice expansions that threaten patient safety)
- Supporting telehealth

Organizational frameshifts are complemented by the 2022 US Surgeon General’s report reaffirming the cruciality of reducing administrative burdens contributing to burnout.¹²¹

- Examine reporting requirements and identify opportunities for aligning policy, improving health professional licensing processes, and ensuring equitable and increased access to telemedicine and other virtual care. This may include a timely, formal review of policy changes that were enacted under the COVID-19 public health emergency to reduce administrative burdens and ensure minimal disruptions in patient care delivery.
- Partner with health care delivery organizations, professional associations, and other stakeholders to reduce documentation burden by 75% by 2025. This includes clarification of regulations and documentation requirements, optimization of the prior authorization process, and review of additional challenges with stakeholders, such as coding validations and electronic health record (EHR) technology.
- Sustain support for CDC’s Data Modernization Initiative. This initiative is an ambitious, multi-billion-dollar program with a goal to create a connected, resilient, adaptable, and sustainable “response-ready” public health infrastructure that works across diseases and conditions and enables access to the right data at the right time to better serve patients, communities, and populations.¹²¹

Learning Health Care Systems

Medscape’s “I Cry but No One Cares”: *Physician Burnout & Depression Report 2023* consolidated data collected from 9,175 physicians in 29+ specialties from June 28, 2022 through October 3, 2022 and accentuated ramifications of systemic healthcare challenges.^{11,122} In the same spirit, Wendy Dean, MD, co-founder of Fixmoralinjury.org, advocated systemwide transformation to mitigate “systemic barriers related to the business side of healthcare.”¹¹

According to the Institute of Medicine, “the foundation for a learning health care system is continuous knowledge development, improvement, and application”.¹²³ Learning health care systems have potential to eliminate “systemic barriers related to the business side of healthcare” through use of “rapid-cycle, randomized quality improvement projects”.¹²⁴ Advantages of this approach include capacity to empirically test and monitor interventions to calibrate effectiveness and modifying as appropriate. Horwitz’s team used randomization to improve existing programs and implement new programs with electronic health records and care-coordination activities.¹²⁴ Structure and process initiatives are promising because they are suitable for “before and after” metrics.¹²⁵ Health care systems should consider establishing a chief wellness officer position, with a dedicated budget and resources, or monitoring the number of hours physicians work without time off in various shift schedule configurations. As Rotenstein et al postulate, learning health

Table 2 Summary of Main Points

Contributing factors	COVID-19 pandemic Workload, work environment, and meaning in work Lack of work/life balance Emotional and psychological factors Lack of support and autonomy Interpersonal relationships and patient engagement
Mitigation strategies	Organizational support Individual focus
The future	Digital transformation Artificial intelligence Frameshift Learning health care systems
Implications	Solve systemic healthcare problems through institutional approaches

systems epitomize continuous evaluation, innovation, and improvement, complemented by rigorous performance monitoring.¹²⁶ Refer to [Table 2](#) – Summary of main points.

Conclusion

The literature aligns with industry concerns that physician burnout, emotional exhaustion, and depersonalization arising from job fatigue and dissatisfaction are reaching a crisis point without a sustainable solution. Its causes and manifestations vary greatly, with disproportionate rates evident based on gender, race, and social support. Promising practices for early intervention and solving systemic problems through institutional approaches may offer a positive and sustainable framework to address emotional health in physicians.^{31,127}

Disclosure

Dr Mary Ditri reports is employed by New Jersey Hospital Association. The authors report no other conflicts of interest in this work.

References

- Banerjee G, Mitchell JD, Brzezinski M, et al. Burnout in academic physicians. *Permanente J.* 2023;27(2):142. doi:10.7812/TPP/23.032
- DePorre A, Banerjee G, Mitchell JD, et al. Burnout in medicine: are we asking the right questions? *Permanente J.* 2023;27(2):123. doi:10.7812/TPP/23.033
- American Medical Association. Physician burnout. Available from: <https://www.ama-assn.org/topics/physician-burnout?page=4>. Accessed November 30, 2023.
- Freudenberger HJ. Staff burn-out. *J Socl Issues.* 1974;30(1):159–165. doi:10.1111/j.1540-4560.1974.tb00706.x
- World Health Organization. International disease classification ICD-11. 2022. Available from: <https://www.who.int/classifications/icd/en/>. Accessed August 15, 2023.
- Berg S. WHO adds burnout to ICD-11. What it means for physicians. American Medical Association, Physician Health; 2019.
- Nordgren L, Schonthal D. *The Human Element: Overcoming the Resistance That Awaits New Ideas*. Hoboken: Wiley; 2022.
- Dyrbye LN, Gordon J, O'Horo J, et al. Relationships between EHR-based audit log data and physician burnout and clinical practice process measures. *Mayo Clin Proc.* 2023;98(3):398–409. doi:10.1016/j.mayocp.2022.10.027
- Moss J. Burnout is about your workplace, not your people. *Harvard Bus Rev.* 2019;1(1):1–10.
- Slavkin HC, Dubois PA, Kleinman DV, Fuccillo R. Science-informed health policies for oral and systemic health. *J Healthc Leadersh.* 2023;31:43–57. doi:10.2147/JHL.S363657
- Aljazeera. Burned out doctors or broken healthcare system? 2020. Available from <https://www.aljazeera.com/program/the-stream/2020/2/20/burned-out-doctors-or-broken-healthcare-system>. Accessed August 21, 2023.
- Rotenstein LS, Torre M, Ramos MA, et al. Prevalence of burnout among physicians. *JAMA.* 2018;320(11):1131. doi:10.1001/jama.2018.12777
- Maslach C, Leiter M. Understanding burnout: new models. In: *The Handbook of Stress and Health: A Guide to Research and Practice*. Wiley Online Library; 2017:36–56. doi:10.1002/9781118993811.ch3
- Shakir HJ, Cappuzzo JM, Shallwani H, et al. Relationship of grit and resilience to burnout among U.S. neurosurgery residents. *World Neurosurg.* 2020;134:e224–e236. doi:10.1016/j.wneu.2019.10.043

15. Wisniewska I, Holt GR. Burnout in academic medicine: a peripandemic assessment. *Permanente J.* 2023;27(2):150–159. doi:10.7812/tp/23.042
16. Jumat MR, Chow PKH, Allen JC, et al. Grit protects medical students from burnout: a longitudinal study. *BMC Med Educ.* 2020;20(1). doi:10.1186/s12909-020-02187-1
17. Kaczor EE, Carreiro S, Stapp J, Chapman B, Indic P Objective measurement of physician stress in the emergency department using a wearable sensor. Proceedings of the Annual Hawaii International Conference on System Sciences Annual Hawaii International Conference on System Sciences; 2020:3729–3738. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6996921/>.
18. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Intern Med.* 2012;172(18):1377. doi:10.1001/archinternmed.2012.3199
19. Dyrbye LN, Shanafelt TD, Sinsky CA, et al. Burnout among health care professionals: a call to explore and address this underrecognized threat to safe, high-quality care. NAM Perspectives. Washington, DC: Discussion Paper, National Academy of Medicine; 2017. doi:10.31478/201707b
20. Mata DA, Ramos MA, Bansal N, et al. Prevalence of depression and depressive symptoms among resident physicians. *JAMA.* 2015;314(22):2373. doi:10.1001/jama.2015.15845
21. Shanafelt TD, West CP, Sinsky C, et al. Changes in burnout and satisfaction with work-life balance in physicians and the general US working population between 2011 and 2017. *Mayo Clin Proc.* 2019;94(9):1681–1694. doi:10.1016/j.mayocp.2018.10.023
22. Amanullah S, Ramesh Shankar R. The impact of COVID-19 on physician burnout globally: a review. *Healthcare.* 2020;8(4):421. doi:10.3390/healthcare8040421
23. Kruse CS, Mileski M, Dray G, Johnson Z, Shaw C, Shirodkar H. Physician burnout and the electronic health record leading up to and during the first year of COVID-19: a systematic review (Preprint). *J Med Internet Res.* 2022;24(3). doi:10.2196/36200
24. Macaron MM, Segun-Omosehin OA, Matar RH, et al. A systematic review and meta analysis on burnout in physicians during the COVID-19 pandemic: a hidden healthcare crisis. *Front Psychiatry.* 2023;13:1071397. doi:10.3389/fpsy.2022.1071397
25. Melnikow J, Padovani A, Miller M. Frontline physician burnout during the COVID-19 pandemic: national survey findings. *BMC Health Serv Res.* 2022;22(1). doi:10.1186/s12913-022-07728-6
26. Patel R, Bachu R, Adikey A, Malik M, Shah M. Factors related to physician burnout and its consequences: a review. *Behav Sci.* 2018;8(11):98. doi:10.3390/bs8110098
27. Gazelle G, Liebschutz JM, Riess H. Physician burnout: coaching a way out. *J Gen Intern Med.* 2015;30(4):508–513. doi:10.1007/s11606-014-3144-y
28. Grossman Z, Chodick G, Kushnir T, Cohen HA, Chapnick G, Ashkenazi S. Burnout and intentions to quit the practice among community pediatricians: associations with specific professional activities. *Isr J Health Policy Res.* 2019;8(1):1–9. doi:10.1186/s13584-018-0268-2
29. Grow HM, McPhillips HA, Batra M. Understanding physician burnout. *Curr Probl Pediatr Adolesc Health Care.* 2019;49(11):100656. doi:10.1016/j.cppeds.2019.100656
30. Stewart MT, Reed S, Reese J, Galligan MM, Mahan JD. Conceptual models for understanding physician burnout, professional fulfillment, and well-being. *Curr Probl Pediatr Adolesc Health Care.* 2019;49(11):100658. doi:10.1016/j.cppeds.2019.100658
31. Yeluru H, Newton HL, Kapoor R. Physician burnout through the female lens: a silent crisis. *Front Public Health.* 2022;10:880061. doi:10.3389/fpubh.2022.880061
32. Hlubocky FJ, Symington BE, McFarland DC, et al. Impact of the COVID-19 pandemic on oncologist burnout, emotional well-being, and moral distress: considerations for the cancer organization’s response for readiness, mitigation, and resilience. *JCO Oncol Pract.* 2021;17(7):365–374. doi:10.1200/op.20.00937
33. Hagemann TM, Reed BN, Bradley BA, et al. Burnout among clinical pharmacists: causes, interventions, and a call to action. *J Am Coll Clin Pharm.* 2020;3(4):832–842. doi:10.1002/jac5.1256
34. Alkhamees AA, Aljohani MS, Kalani S, et al. Physician’s burnout during the COVID-19 pandemic: a systematic review and meta-analysis. *Int J Environ Res Public Health.* 2023;20(5):4598. doi:10.3390/ijerph20054598
35. Gomez T, Anaya YB, Shih KJ, Tarn DM. A qualitative study of primary care physicians’ experiences with telemedicine during COVID-19. *J Am Board Fam Med.* 2021;34(Supplement):S61–70. doi:10.3122/jabfm.2021.S1.200517
36. American Medical Association. Physician health and well-being during the COVID-19 pandemic: how the AMA can help; 2021. Available from: <https://www.ama-assn.org/member-benefits/ama-physician-health-and-wellness/physician-health-and-well-being-during-covid-19>. Accessed August 25, 2023.
37. Shanafelt TD, West CP, Sinsky C, et al. Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2017. *Mayo Clin Proc.* 2017;94(9):1681–1694.
38. Arndt BG, Beasley JW, Watkinson MD, et al. Tethered to the EHR: primary care physician workload assessment using EHR event log data and time-motion observations. *Ann Fam Med.* 2017;15(5):419–426. doi:10.1370/afm.2121
39. Shortell SM, Burns LR, Hefner JL, editors.. *Responding to the Grand Challenges in Health Care via Organizational Innovation: Needed Advances in Management Research.* Emerald Publishing Limited; 2022.
40. Messinger A, Das S. Erosion of the “ethical” doctor-patient relationship and the rise of physician burn-out. *Med Humanit.* 2022;medhum-2022–012506. doi:10.1136/medhum-2022-012506
41. Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA.* 2020;323(21):2133. doi:10.1001/jama.2020.5893
42. Dzau VJ, Kirch DG, Nasca TJ. To care is human—collectively confronting the clinician-burnout crisis. *N Engl J Med.* 2018;378(4):312–314. doi:10.1056/NEJMp1715127
43. Dyrbye LN, Burke SE, Hardeman RR, et al. Association of clinical specialty with symptoms of burnout and career choice regret among US resident physicians. *JAMA.* 2018;320(11):1114. doi:10.1001/jama.2018.12615
44. Bodendieck E, Jung F, Lupp M, Riedel-Heller S. Burnout and work-privacy conflict – are there differences between full-time and part-time physicians? *BMC Health Serv Res.* 2022;22(1). doi:10.1186/s12913-022-08471-8
45. Hu YY, Ellis RJ, Hewitt DB, et al. Discrimination, abuse, harassment, and burnout in surgical residency training. *N Engl J Med.* 2019;381(18):1741–1752. doi:10.1056/nejmsa1903759
46. Golisch KB, Sanders JM, Rzhetsky A, Tatebe LC. Addressing surgeon burnout through a multi-level approach: a national call to action. *Curr Trauma Rep.* 2023;9(2):28–39. doi:10.1007/s40719-022-00249-x

47. Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annu Rev Psychol.* 2001;52(1):397–422. doi:10.1146/annurev.psych.52.1.397
48. Figley CR. Compassion fatigue: psychotherapists' chronic lack of self care. *J Clin Psychol.* 2002;58(11):1433–1441. doi:10.1002/jclp.10090
49. Gribben JL, Kase SM, Waldman ED, Weintraub AS. A cross-sectional analysis of compassion fatigue, burnout, and compassion satisfaction in pediatric critical care physicians in the United States. *Pediatr Crit Care Med.* 2019;20(3):213–222. doi:10.1097/PCC.0000000000001803
50. Dyrbye NL, West CP, Satele D, et al. Burnout among US medical students, residents, and early career physicians relative to the general US population. *Acad Med.* 2010;89(3):443–451. doi:10.1097/ACM.000000000000134
51. Gagné M, Deci EL. Self-determination theory and work motivation. *J Organ Behav.* 2005;26(4):331–362. doi:10.1002/job.322
52. Pala AN, Chuang JC, Chien A, et al. Depression, anxiety, and burnout among hospital workers during the COVID-19 pandemic: a cross-sectional study. *PLoS One.* 2022;17(12):e0276861. doi:10.1371/journal.pone.0276861
53. Panagioti M, Geraghty K, Johnson J, et al. Association between physician burnout and patient safety, professionalism, and patient satisfaction. *JAMA Intern Med.* 2018;178(10):1317. doi:10.1001/jamainternmed.2018.3713
54. Dyrbye LN, Satele D, West CP. Association of characteristics of the learning environment and US medical student burnout, empathy, and career regret. *JAMA Network Open.* 2021;4(8):e2119110. doi:10.1001/jamanetworkopen.2021.19110
55. Rialon KL, Mueller C, Ottosen M, et al. Drivers of distress and well-being amongst pediatric surgeons. *J Pediatr Surg.* 2021;56(5):841–848. doi:10.1016/j.jpedsurg.2021.01.001
56. Kinslow K, Sutherland M, McKenney M, Elkbuli A. Reported burnout among U.S. general surgery residents: a survey of the association of program directors in surgery members. *Ann Med Surg.* 2020;60:14–19. doi:10.1016/j.amsu.2020.10.012
57. Willard-Grace R, Hessler D, Rogers E, Dube K, Bodenheimer T, Grumbach K. Team structure and culture are associated with lower burnout in primary care. *J Am Board Fam Med.* 2014;27(2):229–238. doi:10.3122/jabfm.2014.02.130215
58. West CP, Dyrbye LN, Erwin PJ, et al. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet.* 2019;394(10193):221–231.
59. Berg S. Pandemic pushes U.S. doctor burnout to all-time high of 63%. American Medical Association; 2022. Available from: <https://www.ama-assn.org/practice-management/physician-health/pandemic-pushes-us-doctor-burnout-all-time-high-63>. Accessed August 11, 2023.
60. AMA-assn.org. 2023. Available from: <https://www.ama-assn.org/practice-management/physician-health/measuring-and-addressing-physician-burnout>. Accessed August 10, 2023.
61. HHS.gov. Available from: <https://www.hhs.gov/surgeongeneral/priorities/workplace-well-being/index.html>. Accessed August 11, 2023.
62. Psenka TM, Freedy JR, Mims LD, et al. A cross-sectional study of United States family medicine residency programme director burnout: implications for mitigation efforts and future research. *Fam Pract.* 2020;37(6):772–778. doi:10.1093/fampra/cmz075
63. Eskander J, Rajaguru PP, Greenberg PB. Evaluating wellness interventions for resident physicians: a systematic review. *J Grad Med Educ.* 2021;13(1):58–69. doi:10.4300/JGME-D-20-00359.1
64. Khesroh E, Butt M, Kalantari A, et al. The use of emotional intelligence skills in combating burnout among residency and fellowship program directors. *BMC Med Educ.* 2022;22(1):127. doi:10.1186/s12909-022-03187-z
65. Norful AA, He Y, Rosenfeld A, Abraham CM, Chang B. Mitigating primary care provider burnout with interdisciplinary dyads and shared care delivery. *J Eval Clin Pract.* 2022;28(3):363–370. doi:10.1111/jep.13642
66. Maslach C, Jackson SE, Leiter MP. *Maslach Burnout Inventory Manual*. 3rd ed. Palo Alto: Consulting Psychologists Press; 1996.
67. American Medical Association. Practice transformation journey. Available from: <https://www.ama-assn.org/system/files/2020-09/practice-transformation-toolkit.pdf>. Accessed August 30, 2023.
68. Demerouti E. Oldenburg burnout inventory. *APA PsychTests.* 1999. doi:10.1037/t01688-000
69. Kristensen TS, Borritz M, Villadsen E, Christensen KB. The Copenhagen Burnout Inventory: a new tool for the assessment of burnout. *Work Stress.* 2005;19(3):192–207. doi:10.1080/02678370500297720
70. Swain JD, Soegaard Ballester JM, Luc JGY, Han JJ. Burning the candle at both ends: mitigating surgeon burnout at the training stages. *J Thorac Cardiovasc Surg.* 2021;162(2):637–642. doi:10.1016/j.jtcvs.2020.06.122
71. Anderson JC, Bilal M, Burke CA, et al. Burnout among US gastroenterologists and fellows in training: identifying contributing factors and offering solutions. *J Clin Gastroenterol.* 2022. doi:10.1097/MCG.0000000000001781
72. Eden AR, Jabbarpour Y, Morgan ZJ, Dai M, Coffman M, Bazemore A. Gender differences in personal and organizational mechanisms to address burnout among family physicians. *J Am Board Fam Med.* 2020;33(3):446–451. doi:10.3122/jabfm.2020.03.190344
73. Esquivel MK. Nutrition strategies for reducing risk of burnout among physicians and health care professionals. *Am J Lifestyle Med.* 2020;15(2):126–129. doi:10.1177/1559827620976538
74. Aman-Ullah A, Ali A, Ariza-Montes A, Mehmood W, Saraih UN. Nexus of workplace incivility, workplace violence and turnover intentions: a mediation study through job burnout. *Kybernetes.* 2023. doi:10.1108/K-02-2023-0299
75. Notice M, Johnson DJ, Caspari J. Using photography to elicit internal medicine physicians' experiences with burnout and wellness. *Trends in Psychology.* 2023;1:1–21.
76. Weissman IA, Van Geertruyden P, Prabhakar AM, Fessell D, Alson M, Lexa FJ. Practice resources to address radiologist burnout. *JACR.* 2023;20(5):494–499. doi:10.1016/j.jacr.2023.03.007
77. Pearl A, Saleh K, Quick JC. Identifying and addressing burnout in the orthopaedic surgeon. *J Am Acad Orthop Surg.* 2023;31(5):229–238. doi:10.5435/JAAOS-D-22-00722
78. Belfi LM, Jordan SG, Chetlen A, et al. Self-care and storytelling for radiologists: a feasibility study. *Curr Probl Diagn Radiol.* 2022;51(4):445–449. doi:10.1067/j.cpradiol.2021.06.010
79. Bradford L, Glaser G. Addressing physician burnout and ensuring high-quality care of the physician workforce. *Obstet Gynecol.* 2021;137(1):3–11. doi:10.1097/AOG.0000000000004197
80. Quinn MA, Grant LM, Sampene E, Zelenski AB. A curriculum to increase empathy and reduce burnout. *WMJ.* 2020;119(4):258–262.
81. Medisaukaite A, Kamau C. Reducing burnout and anxiety among doctors: randomized controlled trial. *Psychiatry Res.* 2019;274:383–390. doi:10.1016/j.psychres.2019.02.075
82. Rich A, Aly A, Cecchinato ME, et al. Evaluation of a novel intervention to reduce burnout in doctors-in-training using self-care and digital wellbeing strategies: a mixed-methods pilot. *BMC Med Educ.* 2020;20(1):1. doi:10.1186/s12909-020-02160-y

83. Ghannam J, Afana A, Ho EY, Al-Khal A, Bylund CL. The impact of a stress management intervention on medical residents' stress and burnout. *Int J Stress Manag.* 2020;27(1):65. doi:10.1037/str0000125
84. Sinsky CA, Panzer J. The solution shop and the production line—the case for a frameshift for physician practices. *N Engl J Med.* 2022;386(26):2452–2453. doi:10.1056/NEJMp2202511
85. Sanft T, Winer E. Rekindling joy in medicine through thoughtful communication: a practical guide. *Am Soc Clin Oncol Educ Book.* 2023;43(43):e100034. doi:10.1200/EDBK_100034
86. Bohman B, Dyrbye L, Sinsky CA, et al. Physician well-being: the reciprocity of practice efficiency, culture of wellness, and personal resilience. *NEJM Catal.* 2017;3(4). doi:10.1056/CAT.17.0429
87. Messinger A, Das S. Erosion of the 'ethical' doctor-patient relationship and the rise of physician burn-out. *Med Humanit.* 2022;49(3):390–395. doi:10.1136/medhum-2022-012506
88. Goldsack J. 8 digital health solutions poised to transform care. Healthleadersmedia.com; 2022. Available from <https://www.healthleadersmedia.com/technology/8-digital-health-solutions-poised-transform-care>. Accessed August 15, 2023.
89. Sanchez-Segura MI, Dugarte-Peña GL, Medina-Dominguez F, et al. Digital transformation in organizational health and safety to mitigate burnout syndrome. *Front Public Health.* 2023;11:1080620. doi:10.3389/fpubh.2023.1080620
90. Regional Institute of Occupational Health and Safety (IRSST). Challenge C4DX 2023 – creativity for digital transformation in OHS; 2023. Available from: <https://catedrairsst.uc3m.es/en/challenge-2023-c4dx-in-ohs/>. Accessed August 15, 2023.
91. National Academies of Sciences, Engineering, and Medicine. *Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being*. Washington, DC: National Academies Press; 2019.
92. Preiksaitis C, Sinsky CA, Rose C. ChatGPT is not the solution to physicians' documentation burden. *Nat Med.* 2023;29(6):1296–1297. doi:10.1038/s41591-023-02341-4
93. Ayers JW, Poliak A, Dredze M, et al. Comparing physician and artificial intelligence chatbot responses to patient questions posted to a public social media forum. *JAMA Intern Med.* 2023;183(6):589–596. doi:10.1001/jamainternmed.2023.1838
94. Brender TD. Medicine in the era of artificial intelligence: hey chatbot, write me an H&P. *JAMA Intern Med.* 2023;183(6):507–508. doi:10.1001/jamainternmed.2023.1832
95. Diamond C, Rundle CW, Albrecht JM, Nicholas MW. Chatbot utilization in dermatology: a potential amelioration to burnout in dermatology. *Dermatol Online J.* 2022;28(6). doi:10.5070/D328659734
96. Matheny M, Israni ST, Ahmed M, Whicher D. *Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril*. Washington, DC: National Academy of Medicine; 2019:10.
97. American Medical Association. Augmented intelligence in health care H-480.940; 2018. Available from: <https://policysearch.amaassn.org/policyfinder/detail/augmented%20intelligence?uri=%2FAMADoc%2FHOD.xml-H-480.940.xml>. Accessed August 20, 2023.
98. Crigger E, Khoury C. Making policy on augmented intelligence in health care. *AMA J Ethics.* 2019;21(2):188–189.
99. Nahar JK, Kachnowski S. Current and potential applications of ambient artificial intelligence. *Mayo Clin Proc.* 2023;1(3):241–246.
100. Stephens K. Using AI to create work schedules significantly reduces physician burnout, study shows. *AXIS Imaging News.* 2022.
101. Wu A. Solving healthcare's big epidemic—physician burnout. *Forbes*; 2019. Available from: <https://www.forbes.com/sites/insights-intelai/2019/02/11/solving-healthcares-big-epidemicphysician-burnout/?sh=37d4bed04483>. Accessed August 15, 2023.
102. Cook DJ, Augusto JC, Jakkula VR. Ambient intelligence: technologies, applications, and opportunities. *Pervasive Mobile Comput.* 2009;5(4):277–298. doi:10.1016/j.pmcj.2009.04.001
103. Javanmardian M, Lingampally A. Can AI address health care's red-tape problem? 2018. Available from: <https://hbr.org/2018/11/can-ai-address-health-cares-red-tape-problem>. Accessed August 15, 2023.
104. North F, Luhman KE, Mallmann EA, et al. A retrospective analysis of provider-to-patient secure messages: how much are they increasing, who is doing the work, and is the work happening after hours? *JMIR Med Inform.* 2020;8(7):e16521. doi:10.2196/16521
105. Cronin RM, Davis SE, Shenson JA, et al. Growth of secure messaging through a patient portal as a form of outpatient interaction across clinical specialties. *Appl Clin Inform.* 2015;6(02):288–304. doi:10.4338/ACI-2014-12-RA-0117
106. Bittar PG, Nicholas MW. The burden of inbox-messaging systems and its effect on work-life balance in dermatology. *J Am Acad Dermatol.* 2018;79(2):361–363. doi:10.1016/j.jaad.2017.12.026
107. Borre ED, Nicholas MW. The disproportionate burden of electronic health record messages with image attachments in dermatology. *J Am Acad Dermatol.* 2022;86(2):492–494. doi:10.1016/j.jaad.2021.09.026
108. Qgenda. The impact of outdated systems on healthcare workforce management: a call for change. Healthleadersmedia.com; 2023. Available from: <https://www.healthleadersmedia.com/nursing/impact-outdated-systems-healthcare-workforce-management-call-change>. Accessed August 15, 2023.
109. Glover WJ, Li Z, Pachamanova D. The AI-enhanced future of health care administrative task management. *NEJM Catalyst Innovat Care Deliv.* 2022;3(2). doi:10.1056/CAT.21.0355
110. Panagioti M, Panagopoulou E, Bower P, et al. Controlled interventions to reduce burnout in physicians. *JAMA Intern Med.* 2017;177(2):195. doi:10.1001/jamainternmed.2016.7674
111. Berg S. Q&A: uncovering physicians' needs is key to improving well-being; 2022. Available from: <https://www.ama-assn.org/practice-management/physician-health/qa-uncovering-physicians-needs-key-improving-well-being>. Accessed August 19, 2023.
112. American Medical Association. AMA STEPS Forward saving time playbook for physicians; 2022. Available from: <https://www.ama-assn.org/practice-management/sustainability/amasteps-forward-saving-time-playbook-physicians>. Accessed August 20, 2023.
113. American Medical Association. Measuring and addressing physician burnout; 2023. Available from: <https://www.ama-assn.org/practice-management/physician-health/measuring-and-addressing-physician-burnout>. Accessed August 20, 2023.
114. Resneck J. Burnout is a health crisis for doctors--and patients; 2023. Available from: <https://www.ama-assn.org/about/leadership/burnout-health-crisis-doctors-and-patients>. Accessed August 15, 2023.
115. Backus BE, Slagmolen K, May NM. A system based approach on burnout prevention of healthcare professionals. *Eur J Emerg Med.* 2022;29(2):101–102. doi:10.1097/MEJ.0000000000000873
116. Melnick ER, Sinsky CA, Dyrbye LN, et al. Association of perceived electronic health record usability with patient interactions and work-life integration among US physicians. *JAMA Network Open.* 2020;3(6):e207374. doi:10.1001/jamanetworkopen.2020.7374

117. Bacigalupo A. Clinical workflow efficiencies to alleviate physician burnout and reduce work after clinic. *Fam Pract Manag.* 2023;30(3):21–25.
118. Thomas Craig KJ, Willis VC, Gruen D, Rhee K, Jackson GP. The burden of the digital environment: a systematic review on organization-directed workplace interventions to mitigate physician burnout. *J Am Med Inform Assoc.* 2021;28(5):985–997. doi:10.1093/jamia/ocaa301
119. Shanafelt TD, Noseworthy JH. Executive leadership and physician well-being: nine organizational strategies to promote engagement and reduce burnout. *Mayo Clin Proc.* 2017;92(1):129–146. doi:10.1016/j.mayocp.2016.10.004
120. American Medical Association. AMA recovery plan; 2023. Available from: <https://www.ama-assn.org/amaone/ama-recovery-plan-america-s-physicians>. Accessed August 20, 2023.
121. Office of the Surgeon General. *U. S. Surgeon General. Addressing health care worker burnout;* 2022.
122. Kane L. “I cry but no one cares”: physician burnout & depression report 2023. Available from <https://www.medscape.com/slideshow/2023-lifestyle-burnout-6016058>. Accessed August 14, 2023.
123. Committee on the Learning Health Care System in America. The Institute of Medicine. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America.* Washington, DC: National Academies Press; 2013.
124. Horwitz LI, Kuznetsova M, Jones SA. Creating a learning health system through rapid-cycle, randomized testing. *N Engl J Med.* 2019;381(12):1175–1179. doi:10.1056/NEJMs1900856
125. Rotenstein LS, Sinsky C, Cassel CK. How to measure progress in addressing physician well-being: beyond burnout. *JAMA.* 2021;326(21):2129–2130. doi:10.1001/jama.2021.20175
126. Rotenstein LS, Melnick ER, Sinsky CA. A learning health system agenda for organizational approaches to enhancing occupational well-being among clinicians. *JAMA.* 2022;327(21):2079–2080. doi:10.1001/jama.2022.7461
127. Obregon M, Luo J, Shelton J, Blevins T, MacDowell M. Assessment of burnout in medical students using the Maslach Burnout Inventory-Student Survey: a cross-sectional data analysis. *BMC Med Ed.* 2020;20(1). doi:10.1186/s12909-020-02274-3

Journal of Healthcare Leadership

Dovepress

Publish your work in this journal

The Journal of Healthcare Leadership is an international, peer-reviewed, open access journal focusing on leadership for the health profession. The journal is committed to the rapid publication of research focusing on but not limited to: Healthcare policy and law; Theoretical and practical aspects healthcare delivery; Interactions between healthcare and society and evidence-based practices; Interdisciplinary decision-making; Philosophical and ethical issues; Hazard management; Research and opinion for health leadership; Leadership assessment. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/journal-of-healthcare-leadership-journal>