Rethinking Physician Wellness: The Role of Artificial Intelligence in Addressing Burnout in Canada

Repenser le bien-être des médecins : le rôle de l'intelligence artificielle dans la lutte contre l'épuisement professionnel au Canada

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Abstract | Résumé

Burnout among Canadian physicians, and medical trainees is a pressing issue although the drivers, and manifestations of burnout differ across these groups. Worsening workforce shortages, and deteriorating patient care quality underscore the urgency. Traditional wellness programs have shown inconsistent success, highlighting the need for innovation. This review explores how artificial intelligence (AI) could support mental health across the medical education, and practice continuum. The current evidence base spans multiple stages of development: initial pilot studies, and feasibility trials demonstrate promising engagement, and symptom reduction, while a smaller number of randomized controlled trials provide early support for effectiveness. However, large-scale implementation studies remain limited, and many tools have yet to be validated in real-world clinical environments. Current findings should therefore be interpreted as preliminary rather than definitive. Some machine learning models have shown early promise in identifying healthcare workers at risk of burnout, though the evidence remains preliminary, and warrants cautious interpretation. Combining wearables with workplace data offers continuous monitoring. AI may strengthen wellness strategies with earlier detection, and tailored support; however, ethical considerations remain critical, including data privacy, algorithmic bias, informed consent for monitoring technologies, and the risk of a surveillance-oriented culture, all of which require robust institutional governance.

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L'épuisement professionnel parmi les médecins canadiens et les stagiaires en médecine est un problème est urgent, même si les facteurs et les manifestations de l'épuisement professionnel diffèrent selon les groupes. L'aggravation de la pénurie de personnel et la détérioration de la qualité des soins aux patients soulignent l'urgence de la situation. Les programmes de bien-être traditionnels ont connu un succès inconsistant, ce qui met en évidence la nécessité d'innover. Cet article de synthèse explore comment l'intelligence artificielle (IA) pourrait soutenir la santé mentale tout au long du parcours de formation et de pratique médicale. Les données probantes actuelles couvrent plusieurs stades de développement : des études pilotes initiales et des essais de faisabilité démontrent un engagement prometteur et une réduction des symptômes, tandis qu'un nombre plus restreint d'essais contrôlés randomisés apportent des preuves préliminaires d'efficacité. Cependant, les études d'implantation à grande échelle restent peu nombreuses et de nombreux outils doivent encore être validés en situation clinique réelle. Les résultats actuels doivent donc être interprétés comme préliminaires et non comme définitifs. Certains modèles d'apprentissage automatique se sont révélés prometteurs pour identifier les professionnels de santé à risque d'épuisement professionnel, mais ces résultats demeurent préliminaires et nécessitent une interprétation prudente. L'association des objets connectés aux données du lieu de travail permet une surveillance continue. L'IA peut renforcer les stratégies de bien-être grâce à une détection plus précoce et un accompagnement personnalisé ; toutefois, les considérations éthiques demeurent essentielles, notamment la protection des données, les biais algorithmiques, le consentement éclairé pour les technologies de surveillance et le risque d'une culture de la surveillance, autant d'éléments qui nécessitent une gouvernance institutionnelle rigoureuse.

Keywords: Physician burnout, medical trainees, Artificial intelligence, Wellness programs, Predictive analytics

Introduction

The Canadian medical community is becoming increasingly concerned about the well-being of doctors, and medical students. The Canadian Medical Association (CMA) has formally identified physician wellness as an essential issue, citing its growing impact on patient care, healthcare costs, and workforce sustainability (1). Recent studies underscore the urgency of this issue. In 2019, a

survey of Canadian physicians highlighted concerning levels of burnout, with the majority meeting criteria for overall burnout, and reporting high rates of emotional exhaustion, depersonalization, and diminished personal accomplishment (2). Similarly, the 2021 National Physician Health Survey (NPHS) reported comparable results, further linking high burnout rates to the ongoing physician shortage in Canada (3). This has led to more than half of family doctors saying they are likely to cut back on or change their clinical hours (4), and some are retiring early or quitting altogether (5, 6).

Aside from the physician departures, fewer medical students are pursuing family medicine (7). This is taking place as the population in Canada ages, and patient dem, ands get more complex (8), hospitals all around the nation are fighting to keep their emergency departments open, an estimated 6.5 million people lack a regular family doctor (9).

These trends paint a concerning picture of a workforce under significant strain. Physician burnout carries profound consequences, not only for the physicians themselves, but for the patients they serve, and the sustainability of Canada's health system. As traditional wellness programs continue to fall short, there is a growing need for innovative, evidence-based approaches that can identify at-risk physicians earlier, and provide more targeted support (2, 10). This article argues that while systemic reforms remain essential, artificial intelligence (AI)-enabled interventions represent an underexplored yet promising adjunct to improve wellness among medical learners, and physicians in Canada.

A. Limitation of current approaches

Despite increased awareness, many wellness programs now in place, like peer support groups, resilience training, and counseling services face major obstacles to providing effective support to doctors (11-14).

1.Stigma

Despite the existence of wellness programs, poor participation rates are frequently caused by deeply ingrained stigma, and confidentiality issues. Systematic research found that medical professionals, and students are severely discouraged from getting help due to both self-stigma, and public stigma, which hinders the effectiveness of wellness programs (11, 12).

2.Limited evidence of impact

Another significant limitation of current wellness programs is the quality, and consistency of evidence supporting their impact. Systematic reviews, and meta-analyses have shown that interventions such as resilience training, mindfulness workshops, and peer support often produce only small or short-term improvements in stress, and burnout, and their long-term effectiveness remains uncertain (13, 14). These limitations point to the need for complementary approaches.

B. Role of AI

Integration of AI into wellness programs has the potential to address the limitations described above across multiple dimensions: reducing barriers to access, improving measurement, and enabling earlier intervention.

The following figure summarizes how each AI intervention type addresses a corresponding limitation in current wellness programs (Figure 1).

1. Stigma Reduction

AI-based solutions, such as chatbots for mental health, and conversational agents, provide private assistance 24/7. When compared to control groups, randomized trials have shown that AI

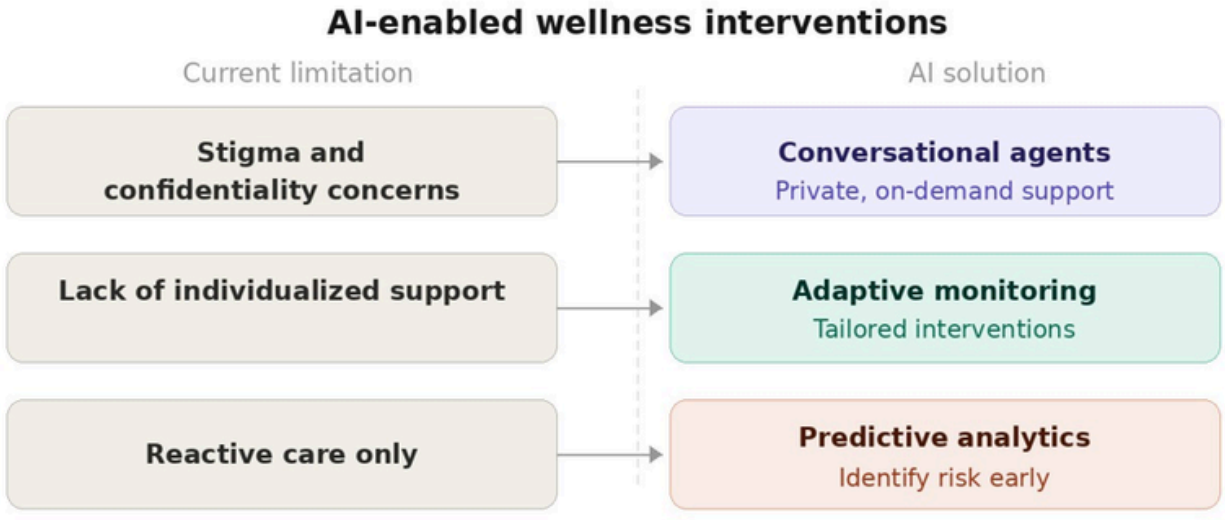

Figure 1. AI-enabled interventions addressing key limitations of current wellness programs.

chatbots can provide cognitive behavioral therapy (CBT)-based interventions that dramatically reduce symptoms of anxiety, and depression (15, 16). A randomized controlled trial in Hong Kong compared an AI chatbot with a nurse hotline. Although overall satisfaction levels of both services were similar, AI chatbot groups showed significant reduction in depression, and anxiety when pre-post scores were compared, while the nurse hotline demonstrated no significant change in the scores (17). Moreover, according to a recent meta-analysis of AI conversational agents, these technologies can offer significant help in ways that are more approachable, and less stigmatizing than in-person counseling (18). AI-enabled platforms that provide private, on-dem, and access could potentially inspire doctors, and students who might otherwise shy away from institutional wellness programs out of concern for confidentiality violations or social stigma to seek care.

2. Personalization

Beyond accessibility, AI can provide unbiased, customized, and trustworthy proof of wellness benefits. In contrast to conventional workshops that rely on self-reports at the group level, AI systems can continuously monitor, and assess user involvement, mood swings, and stress indicators in real time (18). A significant shortcoming of current wellness programs is addressed by this data-driven capability, which makes it possible to standardize outcome measurements across various programs, and circumstances.

AI can also customize interventions by adjusting to each person's unique requirements. Learning resources or coping mechanisms, for instance, can be modified based on usage trends, and monitored stress levels. Research indicates that this kind of flexible personalization not only improves user involvement but also reinforces the long-term viability of wellness advantages (19). These discoveries can be used in wellness programs of many universities. AI integration into the academic calendar or clinical rotation schedule could be greatly beneficial for tracking the student's wellbeing.

3. Early Detection & Preventive Monitoring

AI systems allow for early detection of burnout by monitoring the activity of physicians, and students. A study demonstrates that HiPAL, which is a burnout prediction model based on activity logs, can use AI-driven predictive analytics to identify doctors who are at risk of burnout.

These techniques enable early diagnosis, and initiative-taking support, in contrast to traditional approaches that respond only after symptoms appear. However, predictive models carry important limitations that must be acknowledged: false positives may unnecessarily alarm or stigmatize individuals, false negatives may create a false sense of security, and models trained on specific populations may not generalize across institutions with different demographics, workflows, or cultural norms. External validation across diverse settings remains limited (20). In 2025, researchers conducted a study to see if burnout among medical professionals could be predicted using AI. They collected information through a standardized burnout questionnaire along with basic demographic, and workplace data. This dataset was then used to train different machine learning models to recognize patterns that separate staff with high burnout risk from those with minimal risk. Among these, some models achieved the strongest performance, with prediction accuracies close to 80% in classifying healthcare workers at high versus minimal risk for burnout. Although, accuracy alone is an incomplete metric, and must be interpreted alongside sensitivity, specificity, and external validation, this study demonstrates the feasibility of applying artificial intelligence methods to clinician wellness by moving beyond descriptive statistics, and toward predictive modeling (21).
The *Burnout Prediction Using Wearables, and Artificial Intelligence* (BROWNIE) study protocol introduces an innovative approach that combines occupational, psychological, and physiological data in an AI framework to present a novel method of predicting burnout among registered nurses. This is decentralized, divided into three cohorts for training, testing, and validation. A smartwatch will be worn by each participant to continuously record information about their heart rate, sleep habits, and level of physical activity. BROWNIE has not yet reported outcome data, as the trial remains ongoing; nonetheless, it illustrates the potential of AI-enhanced wearable monitoring to move beyond retrospective surveys toward continuous, objective burnout prediction.

These findings have important implications for physician wellness at the institutional level.

Similar tools could be embedded into hospital systems or occupational health platforms, combining wearable metrics, workload indicators, and periodic wellness check-ins to proactively identify physicians at risk. This predictive capacity represents a meaningful shift from reactive crisis management toward preventive support, giving healthcare organizations the ability to intervene before burnout escalates (22). Furthermore, by connecting early burnout detection to patient outcomes, and institutional costs, these tools present a compelling case for health systems to invest in AI-enabled physician wellness monitoring as a matter of both workforce sustainability, and patient safety.

Conclusion

Physician's burnout is not simply an individual issue but a systemic challenge with wide-reaching implications for patient care, workforce stability, and the sustainability of Canada's health system. The persistence of high burnout rates demonstrates that current approaches are insufficient. Traditional initiatives such as peer support groups, resilience workshops, counseling remain hindered by stigma, inconsistent engagement, and limited evidence of durable outcomes (11-14).

Multiple studies demonstrated how AI can intervene at multiple points in the wellness continuum. Conversational agents offer a private, stigma-free entry point to mental health support, while predictive models demonstrate that burnout risk can be identified with increasing accuracy before symptoms escalate. Together,

these developments point to an emerging paradigm where AI shifts wellness from reactive treatment toward proactive prevention (15-22).

Nevertheless, enthusiasm for AI must be tempered with caution (23). The use of sensitive mental health data introduces concerns regarding privacy, data security, and the appropriate handling of personal health information. Algorithmic bias is also a key concern, as models trained on non-representative datasets may inaccurately assess burnout risk across different demographic groups, potentially reinforcing existing disparities. Furthermore, the use of continuous monitoring tools, such as wearable devices or digital activity logs, raises questions about informed consent, and the extent to which individuals are aware of, and agree to how their data are collected, and used (23,24).

There is also a risk that such systems may contribute to a culture of surveillance, particularly if data are used by institutions to monitor performance rather than to support well-being. This highlights the importance of clearly defining institutional responsibility, ensuring that data are used ethically, transparently, and solely for supportive purposes. As such, robust governance frameworks, transparency in algorithm design, and strict safeguards around data use are essential to ensure that AI-enabled wellness interventions are implemented in a manner that is ethical, equitable, and aligned with the interests of healthcare workers, and trainees (25).

Beyond individual-level tools, it is important to acknowledge that burnout is fundamentally driven by structural conditions, excessive workloads, staffing shortages, EMR burden, and organizational culture, that AI alone cannot resolve. While AI can monitor physician well-being, and flag early signs of distress, these signals must be received by institutions willing to act on them: redistributing workloads, addressing staffing gaps, reducing administrative burden, and fostering cultures of psychological safety. Without this institutional responsiveness, AI risks becoming a sophisticated monitoring system that identifies suffering without addressing its root causes. The value of AI in physician wellness therefore lies not in replacing structural reform, but in making the need for it visible, and urgent (25, 26).

Looking forward, investment in rigorous, large-scale trials will be critical to validate effectiveness, identify best practices, and build trust among physicians, learners, and institutions. If guided by evidence, and implemented responsibly, AI-enabled interventions have the potential to transform wellness initiatives from fragmented, short-term fixes into sustainable, system-level solutions. In doing so, they can help secure not only the resilience of Canada's medical workforce but also the quality, and accessibility of patient care for the generations ahead.

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