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Addressing Clinician Burnout: A Unifying Systems Medicine Model with Meditation as a Heart-mind Intervention

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Burnout in Cardiologists and Other Physicians

Physicians Are More Burned Out Than Ever – Here’s What Can Be Done About It was a *Journal of the American Medical Association (JAMA)* headline in 2023 highlighting the alarming rates of burnout among physicians and health care professionals.^[1] Among all physician specialties in the United States (US), more than 50% report at least one symptom of burnout. This is twice the general population’s rate. Less than half of the physicians were satisfied with their work-life balance.^[2–4]

At least 50% of the US cardiologists are stressed.^[5] Cardiologists around the globe suffer from high rates of mental health conditions that put them at risk for burnout. According to a 2023 study in the *Journal of the American College of Cardiology (JACC)*, 28% of cardiologists reported mental health conditions – psychological distress, substance abuse disorder, suicidal ideation, or clinical psychiatric disorder.^[6,7] These mental health conditions exacerbate burnout.^[7] These conditions existed before COVID-19; however, the pandemic intensified rates and recognition of burnout and mental health conditions of anxiety, depression, and stress disorders in healthcare providers.^[8,9] Besides the costs to physician and patient health, the economic cost of physician burnout is estimated at \$4.6 billion annually in the US healthcare system alone.^[10]

Burnout in medicine knows no national boundaries. After reviewing international reports, a *Lancet* editorial declared *physician burnout is a global crisis*.^[11]

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Conflict of interest

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In its International Classification of Diseases-11, the World Health Organization (WHO) defines burnout as a syndrome resulting from chronic workplace stress that has not been successfully managed and is characterized by three dimensions: (1) feelings of energy depletion or exhaustion, (2) increased mental distance from one's job, or feelings of negativism or cynicism related to one's job, and (3) reduced professional efficacy.^[12] This echoes the US Surgeon General's Advisory on clinician burnout.^[10] Summing up the evidence in *JAMA Health Forum* in March 2023, Khular concluded that, *Physician burnout is a major threat to health care quality, patient outcomes, and the vitality of the medical workforce.*^[13]

Burnout, Mental Health Conditions, and Cardiovascular Disease

In addition to impacting the quality of life of physicians and healthcare providers, quality of patient care, and healthcare costs, burnout is recognized as a risk factor for cardiovascular disease (CVD).^[14] Vital exhaustion is closely related to burnout and has been recognized for many years in risk for CVD. Burnout adds to other mental health conditions associated with CVD, namely depression, anxiety, hostility, anger, pessimism, stress and low social support, and loneliness.^[15]

Pathophysiological mechanisms for the CVD risk conferred by burnout and other mental health conditions have been well described. They include sympathetic nervous system activation, parasympathetic nervous system deactivation, hypothalamic–pituitary–adrenal dysregulation, amygdala hyperactivation, endothelial dysfunction, inflammation, microcirculatory dysfunction, platelet aggregation, and thrombosis.^[16–18]

In *Heart and Mind*, Theorell reviewed psychosocial stressors in CVD and Jiang considered the history of neuropsychocardiology.^[19,20] While in JACC, Kubzansky *et al.* evaluated the role of positive psychosocial factors in CVD that may ameliorate burnout and related mental health conditions.^[21]

In terms of practice guidelines, the 2021 European Society of Cardiology Guidelines for CVD Prevention in Clinical Practice acknowledged the role of psychosocial stress in CVD as do the American College of Cardiology recommendations for prevention of CVD in women.^[22,23] While the latter guidelines addressed women's health, there is no evidence that men are immune from the cardiovascular effects of stress.

Cardiology Associations call to Enhance Clinician Resilience and Prevent Burnout

Despite the profound consequences of burnout among physicians and other healthcare providers, *few steps have been taken to address the problem*, in terms of policies and programs.^[24] Recognizing the seriousness of burnout and mental health conditions in cardiology clinicians, the World Heart Federation, European Society of Cardiology, American College of Cardiology, and American Heart Association (AHA) jointly called for efforts to augment clinician resilience and well-being, in addition to structural changes in health care.^[5] The US National Academy of Medicine issued its plan for health workforce

well-being for strategies to improve well-being and resilience.^[25] This culminated in the enactment of the Dr. Lorna Breen, Health Care Provider Protection Act as groundbreaking legislation to establish and share evidence-based strategies to improve mental health of clinicians and prevent its untoward health and healthcare sequelae.^[24] The present editorial advance the spirit of this initiative.

Spirituality in Burnout and Cardiovascular Disease

One potentially powerful dimension that is often overlooked in clinician burnout is spirituality.^[26] Dalle Ave and Sulmasy in JAMA point out that the WHO declared spirituality an element of overall health in 1995, yet nearly 20 years later, it is still neglected. An international and national consensus defined the spiritual dimension of whole person health as a *dynamic and intrinsic aspect of humanity through which persons seek ultimate meaning, purpose, and transcendence, and experience relationship to self, family, others, community, society, nature, and the significant or sacred.*^[27]

These authors advocate incorporating the spiritual dimension for healthcare providers (as well as healthcare consumers) to cope with stressful demands and prevent burnout.^[26] As VanderWeele *et al.* in JAMA observe, *Clinicians regularly overlook dimensions of spirituality when considering the health of others – or even themselves.*^[28]

A multidisciplinary expert panel conducted a systematic review of the highest quality evidence on spirituality in illness and health reported in JAMA 2022. The panel concluded that incorporating spirituality into health care would enhance the mental health and well-being of healthcare providers, patients, and population health.^[29] To provide a framework for these initiatives, the National Competencies in Spirituality and Health were developed for medical education.^[27]

Spirituality is not only relevant to burnout and mental health. This dimension predicts hard CVD outcomes. An integrative review entitled *Heart, Mind, and Soul* found that spiritual experiences and practices affected cardiovascular outcomes, namely major adverse cardiovascular events (MACE), and CVD risk factors – hypertension, metabolic syndrome, and inflammatory markers. Plausible neurologic, neuroendocrine, and neuroimmune mechanisms were proposed.^[30]

Environmental Stress Leads to Burnout and Cardiovascular Disease

Another emerging level of risk to the heart and mind is environmental stress. Several potentially modifiable environmental factors contribute to clinician burnout. Occupational stressors include workload, work hours, lack of control over work environment and resources, administrative burdens, and circadian rhythm sleep disorders.^[31] Theorell elegantly described how environmental stressors, such as work conditions, family conflicts, life changes, and psychophysiological reactions contribute to CVD.^[19] In response to the demands of the time, the American Medical Association highlighted time constraints, technology, and regulations as factors causing and fueling physician burnout.^[32]

The emerging field of environmental cardiology identifies stressors in the geophysical, built, and social environments that increase the risk for CVD.^[33] Among these are exposure to air pollution, noise pollution, light pollution, climate change, poor urban planning, and social stressors such as violent crime in the community and war, all of which have been associated with excess risk of CVD.^[33,34] These findings suggest that either modifying the environment, reducing exposure to environmental stressors, or modifying reactivity to these stressors may reduce the burden of both burnout and CVD in healthcare providers, their patients, and communities. Cardiologists of the future will likely consider environmental stress routinely.^[35]

Evidence for Meditation in Enhancing Clinician Resilience and Preventing Burnout

The Transcendental Meditation (TM) technique is a standardized, validated, and widely practiced mind-body technique reported to reduce stress, related mental health conditions and physical disorders, and promote positive health and well-being.^[36,37] In *Transcendence*, psychiatrist and researcher, Rosenthal describes the experience of TM practice as one's mind easily settling inward, through quieter levels of thought, until one experiences the most silent and peaceful level of awareness, characterized by a sense of unity, peace, and transcendence of time and space.^[36] It is the physiological and psychological correlates of this transcendental experience that are proposed to counter the effects of stress.^[36]

Over the past 2 years, four studies evaluated the efficacy of TM programs on stress, burnout, and mental health conditions in physicians and healthcare providers.

The first study, in the *Journal of the American College of Emergency Physicians* in 2021 by Azizoddin *et al.*, evaluated the feasibility, acceptability, and efficacy of a TM program in emergency clinicians during the COVID-19 pandemic. The study found that TM was feasible and acceptable among emergency clinicians and associated with reductions in stress, burnout, and anxiety symptoms. The authors concluded that TM may be a valuable tool for emergency clinicians during times of crisis.^[38]

The second study, published in *JAMA Network Open* in 2022 by Joshi *et al.*, was a randomized controlled trial to evaluate the effects of TM among 80 healthcare providers. While there was a nonsignificant between-group difference in the primary outcome of acute stress, the TM group showed significant improvements in chronic stress, burnout, and insomnia after 3 months of intervention.^[39]

The third study, in *Journal for Continuing Education in the Health Professions* 2023 by Loiselle *et al.*, was a randomized controlled trial in 40 physicians to investigate the effects of TM on burnout and mental health in an academic medical center. The trial found that the TM technique was efficacious in reducing symptoms of total burnout, emotional exhaustion, depression, and personal accomplishment.^[40]

The fourth study, published in *PLoS ONE* in 2023 by Nestor *et al.*, investigated the effects of TM on mental health and well-being in 65 healthcare providers during the COVID-19

pandemic using a parallel group design. The study found that the TM program was associated with reduced symptoms of stress, anxiety, and depression, with greater resilience and overall mental well-being.^[41]

When considered together, these studies in contemporary medical settings suggest that the practice of the TM technique is acceptable and feasible for physicians and healthcare providers and may be an effective tool for ameliorating symptoms of burnout, stress, anxiety, and depression while promoting mental health and resilience.^[38–42]

Neural Mechanisms of Transcendental Meditation in Burnout

Neural mechanisms of TM practice contrast with neural correlates of burnout. Notably, greater frontal alpha electroencephalogram coherence, blood flow, and activity in the anterior cingulate cortex (ACC) are reported during the TM technique compared to decreased activity in these same regions during burnout.^[43–45] Lower activity in the ACC is tied to disrupted emotional regulation.^[46] In a controlled prospective study, Orme-Johnson *et al.* tested the response to a laboratory stressor and found that TM practice was associated with reduced reactivity in the prefrontal cortex (PFC), ACC, and thalamus. These neural changes are consistent with reduced neural reactivity to stress and potential prevention of burnout in practitioners.^[47] Furthermore, these and related neural correlates differentiate TM from other common meditation practices.^[48,49]

Evidence for Meditation in Cardiovascular Disease – Primary and Secondary Prevention

Given these connections between the heart and mind, it is relevant that a series of randomized controlled trials demonstrated that TM practice was associated with reductions in traditional CVD risk factors such as hypertension,^[50–53] metabolic syndrome,^[54] smoking and substance abuse,^[55] surrogate markers of CVD including carotid intima-media thickness,^[56] left ventricular hypertrophy,^[57] and stress-induced myocardial ischemia^[58] as well as long-term mortality and morbidity.^[59,60] These findings suggest that TM may be a valuable tool for cardiologists, healthcare providers, and their patients in the primary and secondary prevention of CVD.^[53]

The mechanisms for these clinical effects likely involve a combination of physiological and behavioral consequences. Chronic stress has been linked to the development of CVD through sympathetic nervous system activation, adrenocortical hormones, inflammation, endothelial dysfunction, and oxidative stress, all which can lead to atherosclerosis and other CVD-related pathologies. By reducing stress and improving mental and physical health, the TM technique may help to mitigate these risk factors and prevent the development of CVD.^[16]

The AHA reviewed this literature and issued three scientific statements on alternative methods, including meditation to lower blood pressure and cardiovascular risk. In 2013, the AHA issued a scientific statement on using alternative approaches, including meditation, to lower blood pressure, which concluded that TM may be considered in clinical practice to

lower blood pressure in those with hypertension.^[51] In 2017, the AHA issued a scientific statement on meditation to reduce cardiovascular risk, which stated that there is a potentially significant reduction in blood pressure and CVD risk with TM.^[61] The third AHA scientific statement in 2021 synthesized relationships between the mind and heart and included a section on the role of meditation in improving cardiovascular health.^[62] These scientific statements developed by consensus of AHA expert panels suggested that the TM technique may be a useful mind-body approach in the primary and secondary prevention of CVD.

Systems Medicine of Burnout and Cardiovascular Disease

In 2021, Listopad *et al.* systematically reviewed factors related to burnout. They identified relevant biological, psychological, spiritual, and socio-environmental factors.^[63] In essence, Listopad and team anticipated a systems medicine model of burnout and health.

Systems medicine is an application of systems science to health and disease.^[64] It is an interdisciplinary field of study that views the systems of the human body as part of an integrated whole, incorporating networks of biochemical, physiological, psychosocial, and environmental interactions. In their *New England Journal of Medicine* article, Greene and Loscalzo “put the patient back together” as they advocated replacing molecular reductionism, which began in 18th century science, with postgenomic holism of the 21st century. They argue that biomedical reductionism misses crucial aspects of human disease and that a systems approach recognizes the complex interplay between genes, behavior, and environment in all their levels.^[65] Lets say, Federoff and colleagues echoed this proposition in their article, *Systems healthcare: A holistic paradigm for tomorrow*, where information from molecules, cells, organs, the individual, families, and communities, to man-made and natural environments, are integrated into a whole dynamic portrait.^[66]

Similarly, the National Institute of Mental Health Research Domain Criteria (RDoC) is a systems-oriented framework of interconnected domains affecting mental health, comprising emotional, cognitive, biological, behavioral, and environmental influences. Importantly, not explicit in other models, the RDoC framework expressed the influence of the dynamics of time. That is, changes may occur in each of the domains over the individual’s lifespan and life course development.^[67]

In their Whole Person Health strategic initiative, the National Institutes of Health (NIH) National Center for Complementary and Integrative Health calls for exploring how an individual’s physical, mental, emotional, and spiritual dimensions together form a whole health system.^[68]

Considering these developments in postmodern system-oriented medicine, McKinsey Health Institute, recommends to its government, corporate and organizational clients *a modernized understanding of health* that comprises four dimensions: physical, mental, spiritual and social. Personal attributes, lifestyle behaviors, clinical interventions, and environmental factors influence these domains. Simulations of this model suggest that implementing this approach could add at least 6 years of higher quality life for every individual and as many as 45 billion extra years of higher quality life globally.^[69] This has major practical significance.

A Systems Medicine Model for Burnout, Stress, Cardiovascular Disease, and Meditation

In *JAMA Health Forum*, Chokshi described mental models as simplified but profound ways to understand how the world (in this case, of health) works.^[70] A model is a conceptual framework to interpret and act within the world. As described above in Section 9, there is growing recognition of the limitations of the traditional reductionist model of health. Instead, an increasing number and range of healthcare professionals are embracing a more holistic, systems-oriented view of health that acknowledges the interdependence of biological, psychological, social, spiritual, and environmental dimensions.

As reviewed in Section 9, numerous system models have been suggested to navigate health and disease's multifactorial, interdependent nature. We propose a whole health system model incorporating these developments and elaborate the model with spiritual, mental, physical, and environmental health levels [Figure 1].

This proposed model responds to the growing interest in the role of transcendence, spirituality, and consciousness in medicine or as Mills and Bushell describe, *returning the transcendent aspects of human awareness to wholeness of health*.^[71] Quantum physicist and educator, Hagelin proposes a direct relationship between the unified field described by quantum physics and a unified field of consciousness.^[72] According to this explication of quantum field theory, the unified field is a single, universal field that is at the basis of physiology and all the laws of nature that structure the physics, chemistry, biology, ecology, and astrophysics of the universe.^[73]

Hagelin further proposes that the unified field described by quantum physics is also the basis of human awareness or mind. As such, it is a field of *transcendental* consciousness or pure consciousness. That is, this unified field of consciousness is the common basis for mind, body, and environment. He suggests that understanding this relationship may help explain the observed effects of consciousness technologies, particularly the TM technique on individual health as well as field effects of consciousness on public health.^[74]

Neuroscientist and physician, Nader takes this understanding further, proposing that consciousness is the fundamental reality and that the internal dynamics of this field of consciousness appear as the structures and functions of our minds, bodies, environments, and the whole universe. He argues that aligning our individual consciousness more clearly with the fundamental consciousness of the universe is key to achieving balance, coherence, and integration at all levels of health.^[75,76] The experience of the full range of consciousness through these four domains is a target of human development which has been described across cultures variously as nondual awareness, self-actualization, or whole health.^[75,76]

Based on the theory and empirical findings reviewed in Sections 1–9 above, we propose an integrated systems medicine model of burnout and CVD and health and disease generally called the *Connectome of Health* [Figure 1]. This model builds on concepts from multi-omics in neuroscience, psychiatry, and other systems medicine.^[77] Our *connectome of health* model proposes that the unified field described by quantum physics is the basis

of human health, and the four domains of the *connectome of health* – transcendental consciousness or spiritual, mental, physiological, and environmental – are interconnected and interdependent. Promoting balance, coherence, and integration within and amongst these domains can reduce the risk of burnout, stress, and CVD and promote health generally.

Evidence for meditation, particularly TM, has shown salutary effects on each of the four domains of the connectome model, which fulfills the criteria for a whole system, all-domain approach. Below we elaborate on this proposition.

First, at the spiritual or consciousness level, TM is described as a technique for experiencing a unique state of restful alertness that allows the mind to transcend mental activity and experience a profound state of silent wakefulness, called transcendental consciousness or simply, consciousness.^[78,79] This corresponds with the unified field proposed by Hagelin and Nader.^[72,75] This state of consciousness is proposed to arise from the unique neurophysiological functioning during and after the meditation practice, which is characterized by increased coherence and integration in key neural networks, promoting greater resilience and adaptability to stressors in daily life.^[36,78]

Second, at the mental level, research has shown that TM can reduce burnout, anxiety, depression, and posttraumatic stress disorder. This may be due in part to the practice's ability to reduce activity in the amygdala, ACC, and other brain regions involved in the processing of negative emotions, and increase activity in the PFC, a brain region associated with higher-order cognitive functions such as attention and decision-making.^[43–49]

Third, at the physical level, research has demonstrated that TM can reduce blood pressure, improve cardiovascular health, and reduce the risk of clinical CVD events – both fatal and nonfatal.^[16,60,80] Mechanisms may be through modulating neural functioning, stress hormones, and autonomic nervous system balance, leading to reduced inflammation and metabolic syndrome and improved endothelial function and myocardial blood flow.^[17,56,60]

Fourth, at the environmental level, empirical research suggests that group practice of the TM program is associated with improving quality of life in communities.^[74] This may be due to the practice's ability to reduce socio-environmental stress and promote social coherence, thus improving public health.

In conclusion, in their 2021 review of schemas of healthcare, Jonas and Rosenbaum lament that *there is no unified theory for whole-person care. More work needs to be done to synthesize and simplify these models into more coherent systems.*^[81] We respond to this imperative by presenting the *Connectome of Health* – a unified theory of whole-person health using a systems medicine perspective. It encompasses meditation and other applied technologies based on the model of a unified field of consciousness at the basis of all the domains of health – mind, body, and environment. This paradigm and its practical applications are consistent with the National Academy of Medicine's 2023 recommendations for *Achieving Whole Health: A New Approach for Veterans and the Nation.*^[82]

By incorporating this approach, we aim to alleviate burnout, mitigate stress-related mental health conditions, and reduce the prevalence of CVD among physicians, patients, and communities. This approach directly addresses the rampant burnout epidemic in healthcare providers and society at large. Furthermore, the *connectome of health* model holds significant potential for disease prevention and the promotion of holistic well-being or in the language of “omics” from disease comes to integrated whole person health.^[65,66] We encourage continued research and collaborative efforts to evaluate and advance the *connectome of health* model, exploring its mechanisms and potential clinical and health systems applications in local, national, and international settings. By doing so, we can help pave the way for integrated whole-person health and transform healthcare systems into a new era of wholeness in health.

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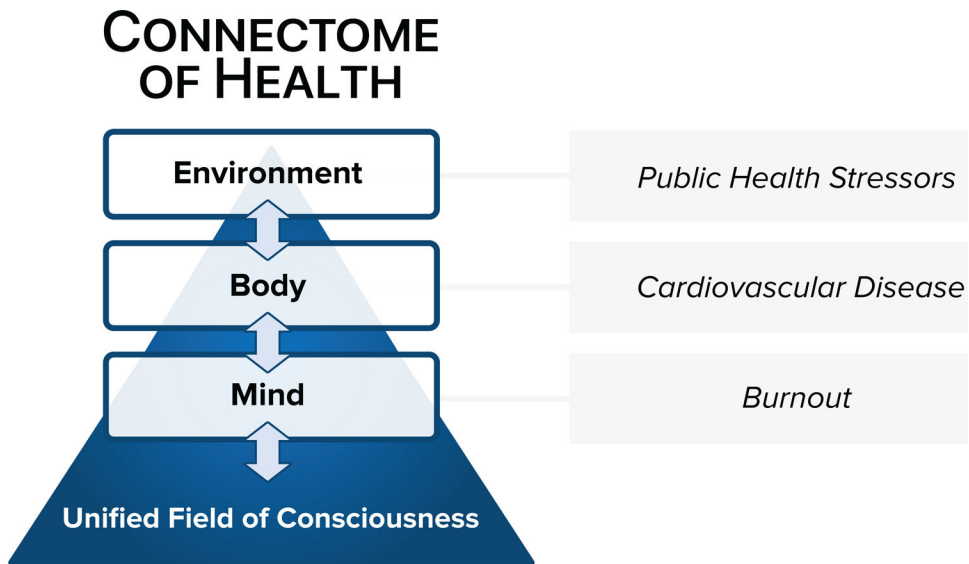


Figure 1:

This figure illustrates our proposed systems medicine model of health, referred to as the *Connectome of Health*. This model incorporates four fundamental domains of health: Environmental Health (Environment), Physical Health (Body), Mental Health (Mind), and Spiritual Health (Unified Field of Consciousness). The spiritual domain corresponds to the unified field of quantum physics. In the *Connectome model*, the unified field is identified as a field of consciousness that underpins both mind and matter. As such, we term it the Unified Field of Consciousness. Each of these four domains interacts with the others, forming an interconnected whole system – The *Connectome of Health*