

Burnout and Sleep Health: Epidemiology and Policy Implications in Healthcare Workers

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Abstract

Burnout and sleep disturbance are increasingly recognized as interconnected occupational health problems among healthcare workers, particularly in professions characterized by shift work, prolonged working hours, high emotional demands, and insufficient recovery time. This narrative review aimed to synthesize current evidence regarding the bidirectional relationship between burnout and sleep disturbance, describe potential biological, circadian, and cognitive-behavioral mechanisms underlying this interaction, and discuss organizational and policy implications relevant to healthcare workforce sustainability and patient safety. A structured literature search was conducted using PubMed, Scopus, and Google Scholar for studies published up to January 2026. The review included systematic reviews, meta-analyses, narrative reviews, mechanistic studies, cross-sectional studies, and organizational and policy-related literature relevant to burnout and sleep among healthcare workers. Current evidence suggests that chronic occupational stress and burnout are associated with poor sleep quality, insomnia symptoms, circadian disruption, and impaired recovery, while persistent sleep disturbance may further increase stress vulnerability, emotional exhaustion, and reduced coping capacity. Proposed mechanisms include HPA-axis dysregulation, autonomic hyperarousal, inflammatory activation, circadian misalignment, rumination, and pre-sleep cognitive arousal. Epidemiological evidence consistently shows higher burnout and sleep-related problems among nurses, resident physicians, and shift-working healthcare personnel. Burnout-related sleep impairment has also been associated with reduced work performance, absenteeism, medical errors, and workforce instability. From an organizational perspective, burnout prevention should not rely solely on individual resilience strategies. Practical approaches may include adequate rest periods between shifts, circadian-informed scheduling, fatigue risk management systems, supportive leadership, staffing support, and workplace cultures that recognize sleep and recovery as important components of patient safety and workforce sustainability. However, most currently available evidence remains cross-sectional or mechanistic in nature. Further longitudinal and interventional research is needed, particularly in healthcare settings in Thailand.

Keywords: Burnout, Sleep disturbance, Shift work, Occupational stress, Healthcare workers

Introduction

Burnout is a work-related syndrome characterized by emotional exhaustion, depersonalization or cynicism, and reduced professional efficacy, particularly in occupations with high interpersonal demands and heavy workloads (World Health Organization (WHO), 2019). Burnout is increasingly recognized as an important occupational health issue affecting workforce well-being, organizational performance, and healthcare sustainability (Conceição & Palma-Moreira, 2025; Maslach & Jackson, 1981). Inadequate rest and sleep have been identified as important contributors to occupational burnout (Salvagioni et al., 2017). Previous studies have shown that burnout may negatively affect organizational culture, work performance, job satisfaction, and absenteeism (Chienwattanasook & Jermisittiparsert, 2019; Sangperm, 2019; Siriwan, 2020). Hospital-based

evidence has also reported significant associations between poor sleep quality and burnout symptoms among healthcare workers (Sadangrit, 2022).

Sleep is essential for cognitive performance, emotional regulation, immune function, and physiological recovery (Baranwal et al., 2023). Epidemiological studies across healthcare settings have consistently reported high rates of burnout symptoms, poor sleep quality, insomnia, and fatigue among physicians, nurses, residents, and other hospital personnel (Alhassan et al., 2025; Chahal & Matwala, 2024; Saintila et al., 2023). Healthcare workers performing rotating shifts, night shifts, or prolonged working hours appear to be at particularly high risk, as circadian disruption and insufficient recovery have been associated with fatigue, emotional exhaustion, psychological distress, and impaired occupational functioning (Lin et al., 2021; Stewart & Arora, 2019; Zhao et al., 2025). Previous systematic reviews and cross-sectional studies have further shown that nurses and resident physicians are especially vulnerable to heavy workload, staffing shortages, irregular schedules, and continuous patient-care responsibilities (Chahal & Matwala, 2024; Li et al., 2024).

Evidence from Thailand supports similar concerns. Studies among Thai healthcare workers have reported associations between poor sleep quality, burnout symptoms, long working hours, and adverse mental health outcomes, particularly among younger healthcare professionals and those with fewer years of experience (Chatlaong, 2020; Chinvararak et al., 2022; Kunno et al., 2022; Runglirdsittikul, 2022). Similar findings have also been observed among Thai nurses and anesthesiology residents, whose shift work, shorter sleep duration, and job dissatisfaction were associated with poorer sleep quality and higher burnout prevalence (Sirinara et al., 2023; Soonthornkes et al., 2023). In primary care settings, burnout has also been reported among healthcare workers in sub-district Health Promoting Hospitals, with high stress, limited opportunities for skill development, and poor work-life balance identified as associated factors (Boonthep et al., 2025). In addition, increasing healthcare demand, workforce limitations, and digital transformation may further contribute to occupational stress and workload in the Thai healthcare system (Kanha et al., 2026; Prasit et al., 2026).

The accumulated evidence suggests a close and potentially bidirectional relationship between burnout and sleep disturbance. Chronic occupational stress and burnout symptoms have been associated with insomnia symptoms, short sleep duration, and poor sleep quality (Vela-Bueno et al., 2008), while persistent sleep impairment may further reduce recovery and coping capacity, potentially worsening burnout symptoms over time (Grossi et al., 2015). Circadian disruption has also been proposed as an important mechanistic pathway linking occupational stress, behavioral factors, and adverse mental and physical health outcomes (Stewart & Arora, 2019; Zhao et al., 2025). Meanwhile, these studies suggest that sleep and circadian health may represent important goals. But these outcomes were often not recognized as the targets for burnout prevention strategies in healthcare settings.

Based on the evidence reviewed in this article, burnout and sleep disturbance may interact in a bidirectional cycle. Specifically, chronic occupational stress and burnout symptoms are associated with impaired sleep and reduced recovery. Conversely, persistent sleep disturbance may further increase vulnerability to stress, emotional exhaustion, and reduced coping capacity. These interactions may involve biological stress responses, circadian disruption, and cognitive-behavioral factors, and the interactions may also be influenced by organizational working conditions, particularly in healthcare settings characterized by shift work, prolonged working hours, high emotional demands, and increasing digital workload. This narrative review integrates current evidence from epidemiological, biological, behavioral, and organizational studies to provide a broader understanding of the

relationship between burnout and sleep disturbance among healthcare workers, while also highlighting some important research gaps and potential implications for healthcare systems, particularly in Thailand and similar settings.

Content

1. Objectives

The objective of this narrative review is to synthesize the current evidence regarding the bidirectional relationship between burnout and sleep disturbances among healthcare workers, to describe the biological, circadian, and cognitive-behavioral mechanisms that may underlie the interaction between burnout and sleep health, and to discuss the organizational and policy implications of fatigue management in relation to healthcare workforce well-being, patient safety, and long-term workforce sustainability.

This narrative review was conducted using a structured literature search to identify relevant evidence related to burnout, sleep disturbance, circadian disruption, fatigue, and occupational health outcomes among healthcare workers. Electronic databases, including PubMed, Scopus, and Google Scholar, were searched for articles published up to January 2026. Search terms included combinations of “burnout,” “occupational burnout,” “sleep disturbance,” “sleep quality,” “circadian disruption,” “shift work,” “healthcare workers,” “occupational stress,” “fatigue,” and “fatigue risk management.” Additional references were identified through manual review of reference lists from relevant publications.

The review included systematic reviews, meta-analyses, narrative reviews, cross-sectional studies, mechanistic and physiological studies, occupational psychology research, organizational and policy-related literature, and original research articles relevant to burnout and sleep among healthcare workers. The literature reviewed in this article focused on epidemiological findings, biological and circadian mechanisms, cognitive-behavioral factors, organizational safety, workforce well-being, fatigue management, and healthcare policy implications. Articles not directly related to the objectives of the review were excluded from the primary synthesis. During manuscript preparation, approximately 66 references were reviewed, of which approximately 45–50 references were considered directly relevant to the relationship between burnout and sleep disturbance and were used in the narrative synthesis.

2. Conceptual Framework: Burnout–Sleep as a Bidirectional Cycle

A useful way to conceptualize the relationship between burnout and sleep is to view it as a reinforcing cycle (Fig.1): occupational stressors and burnout symptoms disrupt sleep; sleep loss then amplifies stress reactivity, impairs emotional regulation, and reduces coping capacity—thereby worsening burnout. This cycle may be moderated by individual factors (e.g., chronotype, resilience, comorbid depression/anxiety), job conditions (e.g., shift work, staffing ratios), and organizational culture (e.g., psychological safety, leadership support).



Figure 1 Burnout–Sleep as a Bidirectional Cycle

3. Epidemiological Evidence in Healthcare Workers

Burnout and sleep disturbance are increasingly recognized as major occupational health concerns among healthcare workers, particularly in those professions that are characterized by high emotional demands, prolonged working hours, and shift-based schedules. Epidemiological studies across healthcare settings have consistently reported high rates of burnout symptoms, poor sleep quality, insomnia, and fatigue among physicians, nurses, residents, and other hospital personnel (Alhassan et al., 2025; Chahal & Matwala, 2024; Saintila et al., 2023).

Healthcare workers performing rotating shifts, night shifts, or extended working hours may be at particularly high risk of both burnout and sleep disturbance. Shift work and circadian rhythm disruption have been associated with poorer sleep quality, fatigue, emotional exhaustion, and psychological distress among healthcare professionals (Stewart & Arora, 2019; Zhao et al., 2025). In addition, prolonged working hours may reduce opportunities for physical and psychological recovery, contributing to sleep deprivation, burnout symptoms, and impaired occupational functioning (Lin et al., 2021).

Among healthcare professionals, nurses and resident physicians appear to be especially vulnerable to heavy workload, irregular schedules, staffing shortages, and continuous patient-care responsibilities. Previous systematic reviews and cross-sectional studies have reported high levels of emotional exhaustion and sleep-related problems among these groups (Chahal & Matwala, 2024; Li et al., 2024). Evidence from Thailand supports similar concerns. A study among residents in training at Prince of Songkla University reported a high

prevalence of burnout syndrome. It demonstrated significant associations between poor sleep quality and burnout symptoms among medical trainees (Chatlaong, 2020).

Studies conducted among Thai healthcare workers during the COVID-19 pandemic further showed that younger healthcare professionals, those with fewer years of experience, and those working longer hours were more likely to experience adverse mental health outcomes (Chinvararak et al., 2022; Kunno et al., 2022; Runglirdsittikul, 2022). The prevalence of burnout among healthcare workers during the pandemic was reported to be approximately 10.81% (Runglirdsittikul, 2022). Similar findings were observed among Thai nurses, in whom shift work was significantly associated with poorer sleep quality than non-shift schedules, with approximately 67.6%–73% of shift-working nurses reporting poor sleep quality (Sirinara et al., 2023). Furthermore, studies among Thai anesthesiology residents reported a high prevalence of burnout, particularly among those sleeping less than 7 hours per day and those experiencing job dissatisfaction (Soonthornkes et al., 2023).

Although epidemiological data from Thailand remain relatively limited, existing evidence suggests that several contextual factors within the Thai healthcare system may contribute to burnout and sleep-related risks among healthcare professionals. These factors include workforce shortages, high patient volume, prolonged working hours, rotating shift schedules, and increasing expectations regarding healthcare quality and service efficiency. Such conditions may intensify workload burden, particularly among physicians working in public hospitals and non-urban settings, and the conditions may negatively affect mental well-being, job satisfaction, and quality of work life. Emerging evidence also suggests that physician dissatisfaction and intentions to leave practice may increasingly relate to adverse working conditions and psychological distress rather than financial factors alone. International studies have consistently demonstrated higher levels of burnout among physicians compared with the general population, commonly associated with prolonged working hours, administrative burden, and impaired work-life balance (Sadangrit, 2022; Paradis et al., 2024; Pitanupong & Jatchavala, 2018; Surawattanasakul et al., 2024; Tonboota et al., 2023).

In addition, burnout and insufficient sleep among healthcare workers have been associated with reduced work performance, increased absenteeism, and higher risks of medical errors and patient safety incidents (Dyrbye et al., 2019; Garcia et al., 2019; Surawattanasakul et al., 2025). Furthermore, these studies indicate that burnout and insufficient sleep are significant health problems among healthcare professionals, especially in environments characterized by shift work, prolonged working hours, and sustained emotional demands.

4. Sleep Mechanisms and Pathophysiology Linking Burnout to Sleep Disturbance

4.1 Neuroendocrine stress response and HPA axis dysregulation

Chronic occupational stress and burnout have been consistently associated to dysregulation of the hypothalamic-pituitary-adrenal axis, a central component of the physiological stress response (Danhof-Pont et al., 2011; Smith & Vale, 2006). Individuals experiencing burnout have frequently been reported to demonstrate alterations in diurnal cortisol patterns, including a flattened diurnal slope, elevated evening cortisol levels, or blunted cortisol awakening responses, reflecting impaired stress adaptation (Danhof-Pont et al., 2011). These neuroendocrine changes may increase physiological arousal during the night, hinder sleep onset, and cause fragmented rest (Meerlo et al., 2008). Research indicates HPA axis hyperactivity sustains arousal in chronic insomnia cases (Buckley & Schatzberg, 2005). Evidence from studies on work-related stress and sleep indicates

that HPA axis dysregulation resulting from burnout is a key biological mechanism linking chronic work stress and persistent sleep problems.

Overall, current evidence from systematic reviews and mechanistic studies suggests that HPA-axis dysregulation may contribute to persistent physiological arousal and impaired stress recovery, which may in turn be associated with insomnia symptoms and disturbed sleep. Altered cortisol regulation has been observed in individuals exposed to chronic occupational stress; however, longitudinal evidence remains limited, and the temporal relationship between these factors is not yet fully understood.

4.2 Autonomic nervous system

Besides influencing hormone systems, burnout is also linked to autonomic nervous system functions by increasing the activity of the sympathetic nervous system and decreasing the activity of the parasympathetic nervous system (de Vente et al., 2015; von Känel et al., 2023).

The experimental study by de Vente et al. (2015) demonstrated that greater burnout symptoms were associated with lower vagal activity, suggesting a reduced capacity for physiological recovery. These findings support the hypothesis that burnout may contribute to cardiovascular disease risk through dysregulation of the sympathetic and parasympathetic nervous systems as well as the hypothalamic–pituitary–adrenal axis. (de Vente et al., 2015). These findings align with the hyperarousal model of insomnia, which proposes that persistent heightened autonomic activity can disrupt both the process of falling asleep and maintaining restorative sleep (Riemann et al., 2010). Similarly, physiological studies by Bonnet & Arand in 2010 reported that individuals with insomnia tend to increase sympathetic nervous system activity and other signs of chronic autonomic arousal. These findings support the hypothesis that autonomic dysregulation is a possible mechanism linking burnout to persistent sleep disturbances (Bonnet & Arand, 2010). These findings, derived mainly from mechanistic and cross-sectional studies, suggest that autonomic hyperarousal may be involved in the relationship between chronic occupational stress and poor sleep quality. Persistent sympathetic activation, together with reduced parasympathetic recovery, may impair physiological restoration during sleep and contribute to fatigue and burnout-related symptoms over time.

4.3 Inflammation and immune pathways

While numerous studies have explored the impact of burnout on the endocrine and immune systems, current findings are inconsistent and insufficient to define a distinct biological signature of burnout that could be suitable as a clinical biomarker (Jonsdottir & Sjörs Dahlman, 2019). However, a growing body of evidence demonstrates that both sleep disturbances and chronic stress are linked to low-grade systemic inflammation, as indicated by the increased levels of inflammatory markers such as C-reactive protein (Toker et al., 2005).

In this context, burnout has been linked to altered immune and inflammatory responses. Previous studies have reported that the reduced interleukin-6 (IL-6) reactivity among individuals with burnout (Woolley et al., 2025), suggests dysregulation of inflammatory signaling pathways. Furthermore, the increasing severity of burnout symptoms has been associated with the higher circulating levels of tumor necrosis factor- α (TNF- α) and a tendency toward the lower interleukin-4 (IL-4) concentrations, resulting in an elevated TNF- α /IL-4 ratio. This shift toward a predominantly pro-inflammatory profile supports the concept that burnout is associated with low-grade systemic inflammation, even when no evident clinical manifestations of physical disease (von Känel et al., 2008).

Sleep plays a critical role in regulating immune function and inflammation. The disrupted sleep may trigger a chronic low-grade inflammation. Notably, there is a bidirectional relationship between sleep and the immune system: disturbances in sleep can increase inflammatory responses and susceptibility to infections due to immune activation, while inflammation and infectious processes can alter sleep architecture and reduce sleep quality. Recent evidence indicates that burnout is linked to systemic inflammatory activation (Feuth, 2024), which may serve as a crucial biological mediator connecting occupational stress and sleep disruption to subsequent cardiometabolic and mental health outcomes (Jonsdottir & Sjörs Dahlman, 2019). However, the direction and clinical relevance of these relationships remain incompletely understood, underscoring the need for longitudinal and mechanistic studies. These findings from narrative reviews, the mechanistic and cross-sectional studies suggest that a low-grade inflammation may play a role in the relationship between chronic occupational stress, fatigue, sleep problems, and mood-related symptoms. Changes in the immune system and inflammation can affect physiological recovery and lead to alterations in mood and energy levels. However, the current evidence is still heterogeneous, while the existing studies are insufficient to confirm inflammation as a specific biomarker or direct causal mechanism of burnout.

4.4 Cognitive-behavioral mechanisms: rumination, worry, and maladaptive coping

While there is strong evidence linking burnout to sleep disturbances, physiological factors alone do not fully account for this connection (Salvagioni et al., 2017). From a cognitive-behavioral perspective, burnout may contribute to sleep problems by promoting unhelpful thought patterns, such as ongoing rumination, anticipatory anxiety, and negative views of work-related demands.

People experiencing burnout often report repetitive and intrusive thoughts about unfinished tasks, feelings of inadequacy, or concerns about upcoming job-related challenges. Work-related rumination, particularly affective rumination, is associated with poorer sleep quality and increased work-related fatigue, suggesting that persistently mentally active thoughts about work may contribute to difficulties in psychosocial recovery after work (Querstret & Cropley, 2012). This repetitive thinking often becomes stronger before sleep, when fewer distractions make it harder to mentally detach from work, thereby increasing pre-sleep cognitive arousal (Kalmbach et al., 2020).

Heightened cognitive arousal during the pre-sleep period has been linked to prolonged sleep onset latency and other objective indicators of sleep disturbance, which are central features of insomnia symptoms (Kalmbach et al., 2020). Beyond cognitive processes, individuals exposed to chronic occupational stress may engage in lifestyle and behavioral patterns that are known to adversely affect sleep. Behavioral sleep research has consistently identified increased alcohol or caffeine consumption, reduced physical activity, irregular sleep-wake schedules, and other suboptimal sleep hygiene practices as factors associated with poorer sleep quality and greater sleep disturbance (Jiyeon et al., 2026). In addition, the use of electronic devices in the evening, especially before bedtime, has been associated with delayed sleep onset and reduced sleep quality, likely through increased pre-sleep arousal and prolonged cognitive engagement (Pham et al., 2021). These actions can interfere with falling asleep and staying asleep, potentially leading to ongoing sleep problems. When considered together, an increased cognitive activity before bedtime and unhealthy sleep-related habits may increase pre-sleep arousal, making it more difficult to fall asleep or remain asleep. These cognitive and behavioral factors may partly explain how the stress-related behaviors contribute to sleep disruption. Previous studies have also

reported that the use of electronic devices before bedtime is associated with poorer sleep quality and longer sleep latency, possibly due to increased alertness and suppression of melatonin production (Jiyeon et al., 2026).

In summary, the reviewed evidence from systematic review and cross sectional suggests that persistent rumination and worry may increase pre-sleep cognitive arousal, which can interfere with sleep initiation and contribute to delayed sleep onset. Over time, inadequate recovery and poor sleep quality may further maintain the cycle of occupational stress and burnout.

4.5 Circadian disruption, shift work, and sleep structure

Circadian dysregulation represents another important pathway linking burnout and sleep disturbance, particularly in occupations characterized by shift work and long working hours in healthcare workers (Stewart & Arora, 2019). Rotating shifts, night work, and insufficient recovery time can disrupt circadian rhythms, reduce total sleep duration, and impair sleep quality, with burnout reported more frequently in work environments with irregular schedules and high workload demands (Zhao et al., 2025). Alterations in sleep architecture, including reductions in slow-wave sleep and fragmentation of rapid eye movement sleep, have been proposed in chronically stressed or sleep-deprived populations (Zhao et al., 2025). However, evidence directly linking burnout to specific sleep stage alterations remains limited and largely cross-sectional, highlighting an important area for future research.

Evidence from clinical, occupational, and mechanistic studies consistently indicates that disturbances in sleep and circadian regulation play an important role in the development and maintenance of burnout, particularly in high-demand and shift-based work environments. Cross-sectional studies in healthcare professionals have demonstrated that higher levels of burnout are associated with poor sleep quality and a greater prevalence of insomnia symptoms, highlighting sleep disturbance as a common correlate of burnout in clinical populations (Lin et al., 2021; Vela-Bueno et al., 2008). Importantly, long working hours, a frequent feature of healthcare and shift-based occupations, have been shown to contribute to burnout partly through reduced sleep duration, suggesting that sleep loss may act as a mediating pathway linking occupational demands to burnout symptoms (Lin et al., 2021).

Beyond sleep quantity, circadian disruption appears to be a key factor shaping vulnerability to both sleep disturbance and psychological strain. Studies in shift-working nurses indicate that a mismatch between circadian rhythm type and work schedules is associated with poorer sleep quality and increased psychological symptoms, highlighting the role of circadian mismatch in stress-related outcomes among shift workers (Zhao et al., 2025). Narrative and integrative reviews in physician populations further support that circadian rhythm disruption and sleep problems frequently co-occur with burnout. These findings suggest the clinical relevance of circadian disruption in occupational burnout (Stewart & Arora, 2019).

Evidence from mechanistic studies also supports these associations. Experimental and narrative reviews have demonstrated that sleep restriction and circadian disruption may alter neuroendocrine stress systems, including the hypothalamic pituitary adrenal axis and autonomic regulation, thereby increasing physiological stress responsivity (Buckley & Schatzberg, 2005; Meerlo et al., 2008). These alterations are consistent with conceptual models of insomnia that emphasize a state of hyperarousal, in which heightened physiological and cognitive activation may interfere with normal sleep processes (Bonnet & Arand, 2010; Riemann et al., 2010). From this perspective, circadian disruption and insufficient sleep may increase stress reactivity and impair recovery, creating conditions that increase the risk of burnout or make recovery more difficult.

Current reviewed evidence, based mainly on cross-sectional and mechanistic studies, suggests that circadian disruption may contribute to sleep debt and inadequate recovery, which may increase vulnerability to burnout, especially among healthcare workers working shifts or long hours. Poor circadian alignment and insufficient sleep may also affect emotional regulation and the ability to cope with stress. However, most of the available evidence comes from cross-sectional and mechanistic studies, and further longitudinal research is needed to better understand how these factors interact over time.

Table 1 Summary of Evidence on the Association Between Burnout, Sleep Disturbance, and Circadian Disruption

Reference	Population	Study design	Burnout measure	Sleep / Circadian outcome	Direction of association
Vela-Bueno et al., 2008	Primary care physicians	Cross-sectional	Maslach Burnout Inventory (MBI)	Insomnia, sleep quality	Higher burnout → poorer sleep quality / more insomnia
Zhao et al., 2025	Shift-working nurses	Cross-sectional	Burnout not primary (psychological distress/depressive symptoms)	Sleep quality, circadian rhythm type	Circadian misalignment & shift work → poorer sleep, psychological symptoms ↑
Stewart & Arora, 2019	Physicians	Narrative review	Burnout (conceptual/clinical)	Insomnia, circadian rhythm disruption	Sleep & circadian disorders associated with physician burnout
Lin et al., 2021	Health-care workers	Cross-sectional with mediation analysis	Burnout scale (emotional exhaustion)	Sleep duration	Long working hours → reduced sleep → higher burnout
Meerlo et al., 2008	Human & animal models	Narrative review	Not measured	Sleep restriction, circadian disruption	Sleep/circadian disruption → altered stress systems
Buckley & Schatzberg, 2005	Human (review)	Narrative review	Not measured	Circadian rhythm, HPA axis, sleep	Circadian-sleep interaction with stress systems
Riemann et al., 2010	Insomnia populations	Review	Not burnout-specific	Insomnia, hyperarousal	Hyperarousal ↔ sleep disturbance
Bonnet & Arand, 2010	Insomnia populations	Review	Not measured	Sleep continuity, arousal	Hyperarousal ↔ insomnia
Querstret & Cropley, 2012	Working adults	Cross-sectional	Work-related fatigue / stress	Sleep quality	Work-related rumination → poorer sleep quality and greater fatigue

Table 1 (Cont.)

Reference	Population	Study design	Burnout measure	Sleep / Circadian outcome	Direction of association
Kalmbach et al., 2020	Good sleepers and insomnia populations	Cross-sectional / physiological	Not burnout-specific	Pre-sleep cognitive arousal, objective sleep disturbance	Higher cognitive arousal → delayed sleep onset and sleep disturbance
Zhao et al., 2025	Shift-working nurses	Cross-sectional	Depressive symptoms / psychological distress (burnout not primary outcome)	Sleep quality, circadian rhythm type, shift work hours	Circadian misalignment and higher shift work demands were associated with poorer sleep quality and increased depressive symptoms
Lin et al., 2021	Healthcare workers	Cross-sectional with mediation analysis	Copenhagen Burnout Inventory (CBI)	Sleep duration / sleeping hours	Longer working hours were associated with higher burnout levels, partly mediated by reduced sleep duration
Riemann et al., 2010	Insomnia populations	Narrative review	Not burnout-specific	Insomnia, hyperarousal, sleep initiation and maintenance	Hyperarousal, worry, and cognitive arousal were associated with insomnia and persistent sleep disturbance
Jiyeon et al., 2026	General adult populations	Narrative review	Not burnout-specific	Sleep hygiene and behavioral factors	Poor sleep behaviors associated with poorer sleep quality and recovery

Across all these mechanisms, burnout and sleep disturbance appear to interact through multiple biological, behavioral, and occupational pathways. HPA-axis dysregulation and autonomic hyperarousal may increase physiological arousal, while inflammatory activation may contribute to fatigue and mood disturbance. Cognitive-behavioral mechanisms, particularly rumination and pre-sleep arousal, may interfere with sleep initiation, whereas circadian disruption and shift work may reduce sleep opportunity and recovery. Although these pathways are biologically plausible and supported by mechanistic, cross-sectional, and review evidence, causal interpretation remains limited because much of the available literature is observational, self-reported, or not specific to healthcare workers.

5. Consequences relevant to health systems

Burnout-related sleep problems have been associated with poorer cognitive performance, a higher risk of work-related errors, reduced empathy toward patients, and increased absenteeism. In addition to individual factors, workplace conditions may also influence burnout severity and the ability to recover from stress. These findings are consistent with recent evidence from Thailand showing that burnout among healthcare workers is associated with limited opportunities for skill development, high levels of occupational stress, and poor work-life balance. Taken together, these findings underscore that comprehensive burnout prevention requires a balance between individual fatigue and sleep health management with institutional strategies such as workforce development, stress reduction, and flexible scheduling (Boonthep et al., 2025).

In addition, the broader health-system factors may also be related to burnout and sleep health among healthcare workers. A provincial-level study in Thailand found that service congestion, physician availability, population density, and socioeconomic conditions can influence the perceived quality of care among older adults. These findings suggest that healthcare worker fatigue and burnout should be considered together with issues related to system responsiveness, bed capacity, and equitable distribution of the healthcare workforce (Prasit et al., 2026). At the system level, these effects may lead to staff turnover, decreased service capacity, and increased costs. Finally, they undermine organizational safety and contribute to a significant economic burden, as outlined below.

5.1 Impact on Organizational Safety

Burnout can substantially undermine an organization's security infrastructure and overall operational preparedness:

- **Cognitive Decline:** Professionals with burnout experience may struggle with concentration, reduced mental agility, and poor decision-making skills (Chodyka et al., 2025; Saintila et al., 2023). These issues can directly reduce their ability to perform tasks efficiently (Saintila et al., 2023).
- **Increased Accidents and Errors:** Stress and lack of concentration make employees more prone to mistakes and work-related accidents (Chodyka et al., 2025; Saintila et al., 2023). Research indicates that employees who report "always working under pressure" have accident rates approximately five times higher than those who are not subject to such pressure (Milczarek, 2014).
- **Vulnerability in High-Risk Sectors:** In sectors like healthcare, burnout is directly associated with more medical errors, safety incidents, and a decrease in the quality of care provided (Chodyka et al., 2025; Garcia et al., 2019). For example, between 37.7% and 39.9% of physicians have reported that sleep deprivation and burnout are associated with medical mistakes or patient harm (Saintila et al., 2023; Shaik et al., 2022).
- **Loss of Alertness:** Burnout, along with related states like "rust-out" (boredom from underutilization), leads to apathy and decreased alertness. This weakens the organization's readiness to respond to crises (Chodyka et al., 2025).

5.2 Economic Costs and Financial Burden

The financial implications of burnout are manifest across individual, organizational, and societal levels:

5.2.1. Organizational Level:

- Absenteeism: Burnout leads to significant lost working days due to illness or recovery needs (Dyrbye et al., 2019; Saintila et al., 2023). In the United Kingdom, work-related stress caused the loss of 10.4 million working days, with an average of 24 days lost per affected worker (Milczarek et al., 2014)
- Presenteeism: This occurs when employees are physically present but performing at subpar capacity due to poor health. Evidence shows that presenteeism is often multiple times costlier than absenteeism. In the UK, the annual cost per employee for presenteeism was estimated at £605 (€710), compared to £335 (€400) for absenteeism (Milczarek et al., 2014).
- Staff Turnover: Burnout is a major driver of "intentions to leave," causing high turnover that forces organizations to incur substantial replacement and training costs (Dyrbye, 2019; Leiter & Maslach, 2009; Saintila et al., 2023). Approximately one-fifth (20%) of staff turnover can be attributed to workplace stress (Milczarek et al., 2014).

5.2.2. Individual Level

Affected individuals face increased medical and insurance costs. Leaving a profession due to stress-related injury or mental health disorders also leads to a significant reduction in personal income (Milczarek et al., 2014).

5.2.3. Societal and Macroeconomic Level

- GDP and Productivity: Chronic work-related stress strains national health services and reduces overall economic productivity (Milczarek et al., 2014). In the UK, the cost of work-related stress, depression, and anxiety is estimated at 0.7% to 1.2% of the national GDP. In the Netherlands (2001), poor working conditions cost approximately 2.96% of GDP (Milczarek et al., 2014).
- Healthcare Burden: In Europe, the annual cost of work-related depression alone is estimated at €617 billion, which includes costs to employers (€272 billion), productivity loss (€242 billion), and healthcare expenses (€63 billion) (Milczarek et al., 2014)
- Global Loss Estimates: Workplace stress is estimated to cost the United States economy \$300 billion annually (Milczarek et al., 2014).

In summary, burnout should not be viewed as an individual health problem but as an occupational phenomenon that poses significant risks to organizational stability, safety, and financial performance.

6. Policy and Practice Implications

6.1 Strategies to Reduce Burnout Costs

Burnout prevention should be viewed as a worthwhile investment rather than an unnecessary expense, as burnout can lead to significant economic losses through absenteeism, reduced work productivity, and staff turnover (Chodyka et al., 2025). Therefore, sustainably addressing this problem should not focus only on individual-level interventions, but also include changes at the organizational and healthcare system levels.

Organizations that support learning and provide appropriate support systems for staff may play an important role in preventing burnout. These approaches can help strengthen staff capability, encourage knowledge sharing, improve adaptability, and create a more supportive work environment. Previous studies have shown that supportive leadership, mentoring systems, emotional intelligence development, and an ethical organizational culture may contribute to better workplace well-being and improved workforce sustainability. These organizational supports may also help reduce work-related stress, support recovery and sleep health, and promote

safer and more sustainable healthcare systems (Phordee et al., 2025). Framing self-care solely as an individual responsibility overlooks critical systemic factors; organizational cultures that institutionalize overwork and normalize sleep deprivation are primary drivers of chronic occupational stress.

Organizational interventions, like implementing Fatigue Risk Management Systems (FRMS) (Lerman et al., 2012), enable organizations to identify structural causes of errors and fatigue rather than attributing failures to individual employees. These approaches help to reduce workplace accidents and to lower the compensation costs (Caruso et al., 2019). Similarly, the implementation of Employee Assistance Programs (Leape et al., 1991), which include structured support for stress management, has demonstrated positive effects on employee well-being and job performance. These initiatives may also contribute to reducing occupational stress and reducing organizational costs (Employee assistance program, 2024; Zieringer & Zapf, 2024). Maintaining high performance over time requires organization-wide strategies rather than dependence on individual resilience alone (Scott-Marshall, 2024).

Flexible work schedules allow employees to better match their job responsibilities with their natural circadian rhythms, which helps decrease work-life conflict and fatigue. In high-risk fields like healthcare, required rest breaks—such as 10 to 15 minutes every two hours—are vital for lowering emotional exhaustion and preventing clinical mistakes (Dent et al., 2024; Scott-Marshall, 2024).

Workplace culture strongly influences sleep behaviors and perceptions of rest. Previous research has shown that work demands and occupational culture play an important role in shaping how individuals interpret insomnia and sleep problems (Henry et al., 2008). Therefore, organizational leadership may play an important role in promoting healthy work-rest boundaries and encouraging adequate sleep among employees. (Henry et al., 2008).

6.2 Policies Addressing Burnout through a “Sleep Lens”

Poor sleep can cause burnout, so policy should address sleep health. Workplace scheduling policies should ensure sufficient rest periods between shifts. Previous recommendations suggest providing at least 10 consecutive hours off between work periods to allow workers the opportunity to obtain the recommended 7 hours or more of sleep. Organizations should also implement screening protocols for sleep disorders, such as obstructive sleep apnea, supported by clear referral processes and adjust workplace environments, such as lighting for night shifts, to help manage fatigue among at-risk employees (Caruso et al., 2019).

6.3 Policy implications for Thailand

Although local evidence remains limited, international frameworks and policies may still be adapted to the Thai context. In particular, the concept of the “Right to Disconnect” may help establish clearer legal or organizational boundaries to reduce work-related communication during off-hours and support mental well-being and recovery time among healthcare workers (Pansu, 2018; Murray, 2020).

At the same time, digital transformation in healthcare may introduce new forms of occupational stress. The expansion of eHealth systems has increased screen time, digital workload, and cognitive demands among healthcare workers. Therefore, policies aimed at preventing burnout and promoting sleep health should not focus only on working hours or fatigue management, but should also include digital boundary management, screen time regulation, privacy protection, and training to help healthcare workers cope with digital-related stress (Kanha et al., 2026).

Thailand should integrate FRMS as a minimum human resource standard in high-risk sectors such as healthcare, transportation, and security (Chodyka et al., 2025; Lerman et al., 2012). The government can use international ROI benchmarks from the WHO or OECD to promote wellness investment in both private and public sectors (Chodyka et al., 2025). Finally, national awareness campaigns should promote a cultural shift, educating the public that sleep boosts productivity and is not laziness.

7. Research Gaps and Future Directions

The provided sources identify several Research Gaps and Future Directions necessary to deepen the understanding of burnout, sleep health, and organizational safety:

7.1 Research Directions and Methodological Considerations

The evidence reviewed in this article includes epidemiological, biological, behavioral, organizational, and policy-related studies. Epidemiological evidence among healthcare workers consistently shows associations between burnout, sleep disturbance, shift work, and long working hours. However, most available studies are cross-sectional or mechanistic in nature and often rely on self-reported sleep measures, which limit the causal inference and increase the risk of recall and reporting bias. The future research should incorporate more objective sleep assessment methods, such as actigraphy and polysomnography, to better characterize sleep duration, sleep quality, circadian disruption, and physiological recovery among healthcare workers. The integration of physiological stress markers and circadian rhythm measurements may also improve the understanding of the biological relationship between burnout and sleep disturbance.

Mechanistic studies suggest possible pathways involving circadian disruption, HPA-axis dysregulation, autonomic imbalance, inflammation, rumination, and pre-sleep cognitive arousal. However, longitudinal evidence remains limited. Future prospective cohort and intervention studies are warranted to delineate these temporal relationships. Specifically, research should evaluate whether targeted strategies such as fatigue management, circadian-informed scheduling, protected rest periods, and institutional support can mitigate burnout risk and facilitate recovery within Thai healthcare settings.

7.2 Population Scope and Healthcare Workforce Diversity

Currently, research frequently focuses on nurses, interns, residents, and other healthcare trainees, while relatively limited evidence is available for attending physicians, shift working nurses, on-call physicians, and other healthcare personnel working in high-intensity clinical environments such as intensive care units, emergency departments, and operating rooms. Future studies should include broader and more diverse healthcare populations, particularly within healthcare systems facing workforce shortages and prolonged working hours.

Additional research is also needed among healthcare workers in Thailand and similar healthcare systems to better understand the interaction between occupational workload, shift schedules, sleep opportunity, burnout risk, and patient safety outcomes within local healthcare contexts.

7.3 System-Level and Organizational Outcomes

Future studies should further evaluate the effects of burnout and sleep disturbance on system-level outcomes, including medical errors, absenteeism, turnover intention, workforce retention, organizational costs, and patient safety indicators. Comparative studies between public and private hospitals, as well as between urban and rural healthcare settings, may provide some important insights into the organizational and structural factors associated with burnout and sleep-related risks. Such findings may be useful for workforce planning, fatigue-management policies, and occupational health strategies in healthcare systems.

Conclusion and Suggestions

This narrative review highlights the bidirectional relationship between burnout and sleep disturbance among healthcare workers and summarizes the biological, behavioral, circadian, and organizational factors that may be involved in this interaction. The current evidence from systematic reviews, cross-sectional studies, narrative reviews, and mechanistic studies suggests that chronic occupational stress and burnout are associated with poor sleep quality, while sleep disturbance may impair recovery and resilience, potentially contributing to burnout symptoms over time. These interactions likely reflect a combination of individual vulnerability, biological stress responses, behavioral factors, and workplace conditions.

At the healthcare system level, burnout and poor sleep may be associated with reduced work performance, lower alertness, impaired empathic capacity, absenteeism, presenteeism, and staff turnover, particularly in high-demand and shift-based professions such as healthcare. Together, these findings suggest that burnout may represent not only an individual concern, but also a broader organizational and workforce challenge with the potential operational and economic consequences.

From a policy and practice perspective, this review highlights the potential value of approaching burnout prevention through a sleep health perspective. Organizational approaches such as adequate rest opportunities, circadian-informed scheduling, fatigue management strategies, and supportive workplace cultures may support the healthcare workers' well-being and patient safety. However, the important research gaps remain, especially regarding causal directionality, objective sleep measurement, and underrepresented occupational groups. Most currently available evidence remains cross-sectional or mechanistic in nature, limiting causal interpretation. Further longitudinal, interdisciplinary, and policy-focused research is needed to better understand these relationships and to evaluate whether improving sleep health may serve as a practical strategy for burnout prevention in Thailand and similar settings.

Suggestions for Practice and Organizational Policy

Healthcare organizations should recognize sleep health and fatigue recovery as the foundational pillars of occupational health, patient safety, and long-term workforce sustainability. The practical organizational strategies may include ensuring adequate rest periods between shifts, reviewing work schedules that contribute to cumulative fatigue, and reducing excessive consecutive working hours, particularly among shift-based healthcare personnel.

Healthcare institutions may also consider implementing screening or early identification programs for healthcare workers at high risk of sleep disturbance, fatigue, or burnout symptoms, especially among nurses, resident physicians, on-call physicians, and personnel working in high-intensity clinical settings. Organizational policies addressing work-related communication during off-hours and the protected recovery time may further support psychological recovery and reduce chronic occupational stress. In addition, workplace cultures that recognize rest, recovery, and sleep health as essential components of professional performance and patient safety may help reduce stigma related to fatigue and encourage better, healthier occupational practices. Organizational support systems, staffing adequacy, fatigue risk management strategies, and circadian-informed scheduling approaches may therefore represent important areas for future healthcare policy development.

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Author Contributions

Kanjana Namnama: Conceptualization of the review framework, literature search and selection, data synthesis and interpretation, drafting of the original manuscript, and final approval of the version to be published.

Kawalee Sadangrit: Contribution to literature screening and data synthesis, critical revision of the manuscript for important intellectual content, and final approval.

Srirat Lormphongs: Assistance with literature review, manuscript editing, and final approval of the manuscript.

Conflict of Interests

The authors declare that there is no conflict of interest.

Declaration of Generative AI and AI-assisted Technologies

Generative AI tools were used only for language editing and improving the readability of the manuscript. The authors take full responsibility for the content of this article.

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