

FINDINGS



BURNOUT:

How the Built Environment Supports Resilience

An Issue Brief on Staff Wellbeing

INSIDE YOU WILL LEARN ABOUT:

The current state of burnout in healthcare.

The impact of burnout on clinicians, patients and organizations.

The role of the built environment in mitigating burnout.

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Burnout: How the Built Environment Can Support Resilience

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Executive Summary

The Triple Aim was introduced in the early 2000s with a focus on improving population health, enhancing the patient experience, and controlling costs (Berwick et al., 2008). By 2014, the plight of caregivers inspired a shift in the initial goals to include work-related burnout and support for the health of care providers resulting in the Quadruple Aim (Bodenheimer & Sinsky, 2014). Addressing clinician burnout requires an all hands approach that includes organizational efforts, the built environment, and individual consideration (Olson et al., 2019).

The term “burnout” is used casually and in a variety of circumstances, but the impact of true burnout is substantial. Burnout manifests as emotional exhaustion, cynicism that leads to job detachment, and perceptions of ineffectiveness that can lead to increases in medication errors, patient falls, infections, decreased patient and family satisfaction, and staff turnover (Dall’Ora et al., 2020; Maslach et al., 2001). High patient acuity, heavy patient loads, staffing shortages, and high stress levels all contribute to caregiver burnout. Nurses, who often spend more than 12-hours a day on their unit are especially at risk. The COVID-19 pandemic added stress to already stretched professions and an unprecedented decline in registered nurses has already been noted (Buerhaus et al., 2022).

Strategies to mitigate the effects of cumulative stress contributing to burnout include work breaks, restorative break areas, outdoor views (specifically views of nature), designs that foster social support, systems that mitigate both interruptions and noise, and strategic napping. These interventions may include assessing unit cultures that foster or inhibit nurses from taking breaks, re-purposing rooms to support uninterrupted breaks, and implementing policies

BURNOUT: A REAL ISSUE

When care providers experience emotional exhaustion, errors can occur. When they feel detached from their jobs, it is more difficult to focus on patient safety. When they feel ineffective, they may wonder if their efforts to advocate for their patients are heard. Combined, the consequences of clinician burnout can impact both patient and organizational outcomes.



that would facilitate exposure to the outdoors. Spaces that allow for collaboration and connection are important for healthcare workers to connect, collaborate, and optimize patient care decisions. Distractions created by interruptions or noise can cause nurses to lose focus when they are engaged in high-risk interventions, such as medication administration. While interruptions and alarms cannot be completely eliminated, policy and design can be leveraged to mitigate non-essential distractions. Finally, strategic napping has shown to restore both physical and cognitive performance, especially in night shift clinicians.

This brief is organized in three sections. The first part provides important background information around burnout in healthcare providers, including research findings that reveal the impact on patient and organizational outcomes. Next, the paper expands on how the acute care work environment contributes to burnout. Lastly, it summarizes recommendations to mitigate burnout and support healthcare workers.

STRATEGIES TO ADDRESS CLINICIAN BURNOUT

- 1 Restorative break areas
- 2 Outdoor views (specifically views of nature)
- 3 Outdoor spaces
- 4 Designs that foster social support
- 5 Systems that mitigate interruptions
- 6 Noise-reducing acoustical design

The Background on Burnout

Because patient care requires distinct knowledge, technical abilities, and soft skills in a demanding and fast-paced environment, caregivers can experience different types of work-related strain (Table 1). Compassion fatigue can occur when caregivers feel depleted as a result of caring for those who are suffering or who experience trauma (Copeland, 2021; Henson, 2020; Peters, 2018). Burnout differs in that it is not specific to patient care, but to the workplace. The term burnout was coined in the early 1970s to explain the experiences of people working in human services and healthcare professions, and has since come to describe the triad of emotional exhaustion, feelings of job detachment, and a sense of inefficacy at work (Dall'Ora et al., 2020; Maslach et al., 2001). According to the World Health Organization (2019), burnout results from unmanaged chronic workplace stress, and due to the nature of their work, frontline healthcare workers are at particular risk. Burnout can result in health problems for individuals and high turnover for organizations (NASEM, 2019; Peng & Rewers, 2021).



Table 1: Stress, Compassion Fatigue and Burnout in Nurses

	Stress	Compassion fatigue	Burnout
Definition	Stress is a physical reaction to change, resulting in physical, emotional and intellectual responses that can become problematic without relief.	Reflects a depletion of compassion due to exposure to suffering and/or trauma.	A syndrome resulting from the accumulation of work-related stress.
Characteristics	<ul style="list-style-type: none"> • Exhaustion • Muscle tension • Irritability • Sensation of heart racing 	<ul style="list-style-type: none"> • Sudden onset • Emotional exhaustion • Perceived failure • Apathy • Helplessness 	<ul style="list-style-type: none"> • Progressive development • Emotional exhaustion • Cynicism • Disengagement from work • Hopelessness • Feelings of ineffectiveness
Causes	<ul style="list-style-type: none"> • Work overload • Inadequate staffing • Lack of support • Time pressure • Lack of proper rest 	<ul style="list-style-type: none"> • Repeated exposure to suffering • Exposure to trauma or witness to traumatic events • High stress environments • Continuous giving of self • Perceived relationship between the nurse and the person suffering • Perceived futility 	<ul style="list-style-type: none"> • Goal-oriented mindset • Work overload • Inadequate staffing • Time pressure • Negative work environment • Loss of autonomy • Imbalance between work effort and recognition
Interventions	<ul style="list-style-type: none"> • Ensuring breaks • Dedicated space • Foster social support • Music 	<ul style="list-style-type: none"> • Outdoor breaks • App-based meditation • Journaling • Breaks without devices 	<ul style="list-style-type: none"> • Outdoor breaks • App-based meditation • Journaling • Breaks without devices
Source	(Happell et al., 2013; <i>Stress</i> , 2021)	(Copeland, 2021; Henson, 2020; Peters, 2018)	(Copeland, 2021; Henson, 2020; Maslach et al., 2001)

Between 2020 and 2021, the number of Registered Nurses employed in the United States shifted from steadily increasing over the past decade to dropping by more than 30,000, demonstrating an unprecedented decline (Buerhaus et al., 2022). Work demands and work-related stressors have led to increasing levels of burnout resulting in hospital turnover rates exceeding 25% (Colosi, 2022).

While most of the world locked down at home with their families during the worst of the COVID-19 pandemic, clinicians separated from their loved ones and continued to labor under intense circumstances (Cha et al., 2022; Sahay & Wei, 2022). Further, healthcare workers have been challenged by shifting policy recommendations and vilified for supporting protection strategies (Gamble, 2021). Nurses are exhausted, distressed, and as of late, fear criminalization for mistakes (Bean et al., 2022). When there are too many accumulating stressors, the capacity to recover is extinguished, resulting in burnout. It's a pivotal time for healthcare, therefore, understanding that burnout is driven by work characteristics provides opportunity to make work environments more supportive (Dall'Ora et al., 2020; Maslach et al., 2001; WHO, 2019).



The Burden of Burnout

Burnout can have negative impacts on clinicians, patients, and organizations. With respect to nurses, stress and burnout can interfere with physical health, mental health, and increase the likelihood they will leave a position, an organization, or the profession as a whole (L. H. Aiken et al., 2008; Dall’Ora et al., 2020; Murphy & Walseng, 2022; Rogers et al., 2013).

Data on stress is usually based on an individual’s perception, but objective measures may be more telling. For example, telomeres, the protective cap at the ends of chromosomes, become shorter with cell division. Shortening of telomeres occurs naturally with age, but can also be a result of chronic stress (Stress, Aging, and Telomeres, n.d.). In a study of telomere length in nurses before and during the COVID-19 pandemic, Wei, et al. (2022) found that the pandemic experience resulted in shortened telomere length that can lead to health conditions such as coronary heart disease and osteoporosis.

When nurses are burned out, the patients they care for are at higher risk for patient mortality, failure to rescue, adverse events, and longer hospital stays. In a study that included 523 hospitals from four different states, researchers found statistically significant relationships between nurse burnout and patient in-hospital mortality (OR = 1.06, $p = 0.003$), failure to rescue (OR = 1.05, $p = 0.037$), and length of stay (IRR = 1.02, $p = 0.013$) such that higher nurse burnout scores were associated with an increased risk for those outcomes (Schlak et al., 2021). Similarly, the results of a recent literature review demonstrated that burnout in nurses had a negative effect on “quality of care, patient safety, adverse events, error reporting, medication error, infections, patient falls, patient dissatisfaction, and family complaints” (Dall’Ora et al., 2020, p. 13).

From an organizational standpoint, burnout hinders job performance by contributing to absenteeism, lower productivity, reduced effectiveness, higher liability costs, and turnover (Maslach et al., 2001; Murphy & Walseng, 2022; Shah et al., 2021). Further, one of the main elements of burnout is cynicism that leads to job detachment and disengagement (Dall’Ora et al., 2020; Maslach et al., 2001). Those described as cynical tend to be distrustful of others and believe that people are motivated primarily by self-interest (Stavrova et al., 2020). Such a cynical outlook does not bode well for the teamwork and collaboration

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Acute care workers are especially prone to work overload and time pressure due to inadequate staffing and high patient acuity.

required to support a healthy organizational culture and good patient outcomes.

The Basics of Burnout

Clinical work is impacted by the environment and circumstances in which the work (both physical and cognitive) takes place. Two specific characteristics of work that have been shown to contribute to burnout are work overload and time pressure (Dall’Ora et al., 2020).

Work Overload

Work overload comes in many forms including short staffing, high patient acuity, long shifts, interruptions, and noise. Higher than average demands are inherent in circumstances of short staffing, inadequate skill mix, high patient ratios, and high acuity (L. Aiken et al., 2002; Dall’Ora et al., 2020; Happell et al., 2013). Another contributor to work overload is long hours such that nurses working shifts of 10-13 hours were more likely to demonstrate characteristics of burnout (Dall’Ora et al., 2016; Stimpfel et al., 2012). Interruptions and noise also contribute to the cognitive demands nurses face. Interruptions increase cognitive overload by diverting focus from a task in progress that increases the risk of error (Weigl et al., 2017). Subsequent to the initial interruption, there is another opportunity for error when the nurse attempts to return to the original task and has to rely on memory. Noise (especially non-critical alarms) is an additional cognitive burden associated with nurse stress, burnout, and errors that could compromise patient care (Smith, 2017; Terzi et al., 2019).

Time Pressure

Time pressure contributes to nursing stress when nurses are trying to meet the needs of too many patients, have patients who are acutely ill, are required to do non-nursing tasks, or any combination of these (Dall’Ora et al., 2020). Unit design can affect time pressure when equipment is not readily available, when nurses have to “work around” poor design, or when they have to “hunt and gather” supplies from multiple locations (Hendrich & Chow, 2008).

Most recently, COVID-19 contributed to both work overload and time pressure increasing the chances for nurse burnout (Murat et al., 2021). Specifically, when nurses were managing both the demands of a stretched healthcare system and



their personal lives, they often had to do so without their typical social support networks, which further contributed to burnout risk (Dall'Ora et al., 2020; Maslach et al., 2001; Wei et al., 2022).

Building Against Burnout

There are numerous strategies to consider when building against burnout (Figure 1), but built environment solutions are integrally tied to the organization (e.g., culture, policies) and the people at risk.



Figure 1: Multifaceted approach to mitigate fatigue in clinicians

The plight of the caregiver has not gone unnoticed (Bodenheimer & Sinsky, 2014; Stanford, 2016) and recent work has been done to understand how to better support healthcare workers (Table 2).



Table 2: Respite, Resilience and Compassion Satisfaction in Nurses

	Respite	Resilience	Compassion Satisfaction
Definition	an interval of rest or relief; especially from something difficult or unpleasant	“complex and dynamic process which when present and sustained enables nurses to positively adapt to workplace stressors, avoid psychological harm and continue to provide safe, high-quality patient care.” (Cooper et al., 2020, p. 567).	“the pleasure, purpose, and gratification received by professional caregivers through their contributions to the well-being of patients and their families.” (Sacco & Copel, 2018, p. 78)
Characteristics	<ul style="list-style-type: none"> • Time-limited – even 5-10 minute breaks make a difference. • Physically away from the difficult or unpleasant circumstance • Mentally separated from the difficult or unpleasant circumstance • Includes some element of rest; physical and/or mental • Includes an element of calm 	<ul style="list-style-type: none"> • Sense of purpose • Collegial professional relationships • Autonomy over practice • A sense of hope and/or optimism • Humor • Work-life balance • Realistic expectations 	<ul style="list-style-type: none"> • Well-being • Fulfillment • Reward • Accomplishment • Joy • Hope
Supportive Interventions	<ul style="list-style-type: none"> • Designated area near but separate from work • A place that allows for physical and mental rest or diversion • Circumstances (staffing, culture) that support brief, but total disengagement from work tasks 	<ul style="list-style-type: none"> • Mindfulness practices • Peer support • Well-being apps • Education • Exposure to outdoors 	<ul style="list-style-type: none"> • Viewing caregiving as a calling • Empathy with patients/families • Collegial support • Work-life balance
Source	(Copeland, 2021; Kim et al., 2017; H. Wang et al., 2021)	(Cooper et al., 2020)	(Sacco & Copel, 2018)

Too often, there is a mismatch between unit layouts that promote operational efficiency and what is needed to mitigate stressors. A recent study of 1,200 nurses indicated that 37% did not have access to a staff room or rest area and 33% responded they had no dedicated place to eat (Dean, 2022). While completely renovating nursing units may not be practical, there are organizational and environmental changes that may support caregivers and mitigate the burnout that leads to expensive turnover.

A Model of Professional Fulfillment

Hospital environments and work processes can be leveraged to enhance staff well-being resulting in staff retention, improved care quality, and more efficient operations (Hendrich & Chow, 2008). As shown in Figure 2, the Stanford Model of Professional Fulfillment™ (SMPF) separates professional fulfillment into



three domains: an organizational culture of wellness, efficient practice, and personal resilience (Stanford, 2016). While the SMPF was originally developed to mitigate burnout and support professional well-being in physicians, the tenets are pertinent to all clinicians, especially those in acute care settings.



Figure 2: Stanford Model of Professional Fulfillment (adapted from the Stanford WellMD model, with permission)

Organizational Culture of Wellness

Organizational efforts to mitigate clinician burnout and support retention require administrative endorsement to set and enforce policy, allocate resources, and ensure initiatives are implemented as intended. Specific initiatives include providing adequate staffing to support breaks, investing in restorative lounges or breakrooms, and ensuring clinician access to dedicated staff gardens and outdoor views (Olson et al., 2019).

Breaks

Because 12-hour shifts have become ubiquitous in acute care settings, there has been a recent focus on leveraging breaks and breakrooms to mitigate the



BREAKS NEEDED

Effective breaks are essential to mitigate the demands of 12-hour shifts. A recent study of 1,200 nurses indicated that 37% did not have access to a staff room or rest area and 33% responded they had no dedicated place to eat (Dean, 2022).

demands of long shifts (Keys, 2020; Nejati, Rodiek, et al., 2016a; Nejati, Shepley, et al., 2016). To truly mitigate the stress experienced by nurses, organizations must be committed to a holistic approach that includes examining and modifying policies and unit cultures to foster restorative breaks (Hurtado et al., 2015; Nejati et al., 2016; Nejati, Rodiek, et al., 2016b). In a recent study of medical-surgical nurses, participants worked an average of 10.7 hours per day, and the duration of non-meal rest breaks was only seven minutes, with more than half of the 993 participants indicating they did not take non-meal breaks (Nejati, Rodiek, et al., 2016b).

Leadership support, adequate staffing, and intentionally-designed break areas are essential to encourage nurses to take breaks, mitigate burnout, retain a viable nursing workforce, encourage health-promoting behaviors, and foster resilience (Cha et al., 2022; Chong & Shorey, 2022; Wakefield et al., 2021). In a recent systematic review of the literature, researchers noted that out of 14 studies reviewed, 11 articles noted nurse shiftwork resulted in irregular meal breaks, two mentioned a lack of uninterrupted breaks, and six articles reported that nursing tasks often prevented meal breaks (Chong & Shorey, 2022). These findings support the importance of fostering resilience with an organizational effort to support work breaks and overcoming resistance to breaks that may be part of the professional nursing culture (Steege & Rainbow, 2017). Breaks as short as 10 minutes can be restorative and should be encouraged on an as-needed basis (Kim et al., 2017; H. Wang et al., 2021). Convenient access to a space, however, is an important aspect of use and compliance.

A notable literature review concluded that quiet, windows, sunlight, access to nature, and regular access to the outdoors can have beneficial effects on staff (Nejati et al., 2016). Further, breakroom features identified in the research (Keys, 2020; Nejati, Rodiek, et al., 2016a; Nejati, Shepley, et al., 2016) that are deemed important by both medical-surgical nurses and nurse leaders include those that are:

- located close to the patient care unit,
- dedicated to nursing respite,
- quiet, and
- include views of the outdoors.



Gardens

Specifically, breaks in accessible outdoor gardens dedicated to staff respite can reduce the emotional exhaustion and depersonalization components of burnout (Murphy & Walseng, 2022). In a small study of nurses, Cordoza, et al. (2018) determined that when nurses took breaks in an outdoor garden versus indoors, the burnout elements of emotional exhaustion and depersonalization were significantly reduced (4.5 vs -0.2; $P < .001$ and 1.8 vs 0.0; $P = .02$). Accessibility is essential as a small qualitative study demonstrated; if the garden is too far removed from the nursing unit, it will not be used (Raj et al., 2022).

Taking an economic perspective on access to nature, another researcher developed a calculation tool to estimate the cost savings that could result from an organization's investment in green space (Murphy & Walseng, 2022). Early estimates demonstrate that modest investments in green spaces could result in significant reductions in burnout, turnover, and liability costs. Because outdoor breaks are not always feasible, understanding unit-level modifications that might be implemented within existing facilities can be helpful.

Views

There is a growing body of work on the importance of outdoor views in supporting staff well-being. In a 2021 study of nurses working in a variety of acute care settings, researchers found that both emotional exhaustion and feelings of depersonalization increased (both $p < .05$) as organizational stress increased and exposure to nature decreased (Mihandoust et al., 2021). Exterior views can have a beneficial effect on acute stress, improve alertness, and may enhance job satisfaction and retention (Pati et al., 2008).

Researchers found that nurses perceived break areas to be more restorative when there were higher levels of exposure to nature by creating two sets of five images with progressively increasing natural elements (Nejati, Rodiek, et al., 2016a). The average ratings across each set of five images demonstrated a significant difference in nurse perceptions (Set 1: $[F(4, 3877) = 1158.39, p < 0.000]$, Set 2: $[F(4, 3688) = 892.54, p < 0.001]$). The smallest difference was between an image of a breakroom with a plant and an image of a breakroom with artwork (Set 1 = 1.26, $p < 0.001$; Set 2 = 0.96, $p < 0.001$), whereas the greatest difference was between an image of a breakroom with no natural

Even modest investment in accessible green spaces for staff could result in lower burnout, turnover, and liability costs.



Intentional design of corridors and other spaces that support the “invisible work” of collaboration, support, coaching, and mentoring can help mitigate burnout.

elements and an image of a breakroom with a glass door to an outdoor balcony (Set 1 = 6.36, $p < 0.001$; Set 2 = 5.48, $p < 0.001$) (Nejati, Rodiek, et al., 2016a).

Efficiency of Practice

The efficiency of practice domain of the SMPF includes workflow issues and specifically calls out the need for clinicians to be involved in design decisions that impact workflow and teamwork (Olson et al., 2019). The authors of a recent literature review indicate that team dysfunction can increase feelings of burnout, but that social support can protect against burnout (Dall’Ora et al., 2020). Additional environmental factors that can threaten efficiency include interruptions and noise.

Social Support

Spaces that cultivate a sense of community among caregivers can strengthen teamwork, reignite a sense of purpose, and foster resilience that carries over into improvements in patient care (Pappas, 2021). The findings from a qualitative study examining the different social support needs of nurses indicate that support from peers was especially important for nurses during the COVID-19 pandemic such that hugging and reassuring one another became integrated into daily tasks (Sahay & Wei, 2022).

Designing spaces to allow for the invisible work of supporting, collaborating, coaching, and mentoring (Allen, 2014; Becker, 2007; Raj et al., 2022) can help to mitigate burnout. While repositioning nurses out of the unit center and toward patient rooms is well-intended, there are social elements of nursing work that should be preserved (Pati et al., 2015). In 2018, researchers assessed differences in nurse perceptions of a centralized nursing unit both before and after a move to a decentralized nursing unit (Real et al., 2018). They found statistically significant decreases in mentoring (4.2 vs 2.7; $p = .00$) and communication (4.3 vs 2.6; $p = .00$) in the decentralized layout.

The contribution of nursing unit corridors extends beyond thoroughfares for people and equipment, and the shift to decentralized nursing stations has inspired a unique appreciation for this fundamental unit element. Corridors have, in recent years, been recognized as “neutral spaces” that foster interdisciplinary collaboration (Becker, 2007; Carthey, 2008; Hamilton, 2017; Hamilton et al., 2018). Most recently, researchers considered corridors in the



NICU setting using pre/post occupancy evaluation and identified them as strategic areas for multidisciplinary collaboration (Fay et al., 2022). Furthermore, a 2013 study demonstrated that a corridor dedicated to service equipment and activities contributed to a significantly quieter environment ($p < 0.02$) and a significant reduction in nurse stress ($p < 0.01$) (Z. Wang et al., 2013).

Interruptions

While designing to facilitate breaks, views, and social support, it is also important that designs reduce interruptions to help lighten cognitive load and mitigate the negative consequences that can result when a primary task is interrupted to address a secondary task. Negative consequences of interruptions include increased stress for the clinician and an increased risk of adverse events that can impact both patient and provider (Abdelhadi et al., 2022; Freitas et al., 2022). In a study of emergency department professionals, researchers note interruptions about other patients significantly increased provider stress levels even after controlling for workload ($\beta = 0.24$, $P = 0.03$) (Weigl et al., 2017).

In a study specific to nurses, researchers identify three general types of work interruptions (technical, coworkers, and patients/relatives) and explore the perceived impact on care (Abdelhadi et al., 2022). Technical interruptions included alarms, problems with equipment availability or function, computer issues, and consequences of miscommunication. Coworker interruptions included colleagues, supervisors, novice nurses, and interprofessional team members. Researchers note that interruptions by colleagues were perceived as having more of an impact on patient care, (Abdelhadi et al., 2022) such that it may be important to designate specific collaboration areas and to emphasize high-risk areas (such as medication spaces) to deter interruption and/or encourage safety practices (McLeod et al., 2015).

Noise

Patient care units are noisy places. Rolling carts and equipment, paging systems, conversations, HVAC systems, and hard surfaces converge to create around-the-clock noise that can disturb both patients and staff (Busch-Vishniac, 2019). A 2015 [issue brief](#) on noise reduction in hospitals recommends built

INTERRUPTIONS

Designate specific collaboration areas and identify high-risk areas (such as medication preparation areas) to support communication, deter interruption and encourage patient safety (McLeod et al., 2015).



environment strategies to improve both patient and staff outcomes, but there are additional, specific considerations for bedside providers.

One of the primary responsibilities of a nurse is patient assessment. Technology advances in the last several decades support advanced surveillance using sophisticated equipment to monitor cardiac function, blood pressure, respiration, oxygenation, and patient falls to name a few. Visual assessment of the patient and their respective monitoring instruments is not sufficient because nurses divide their attention among multiple patients and collaborate with other caregivers. To help nurses monitor critical patient metrics, most equipment includes an alarm to notify users when physiological thresholds are detected or when equipment malfunctions.

The alarms associated with patient monitoring notify nurses of changes in patient condition, but also contribute to a noisy work environment, especially if alarm thresholds are not set properly or if an alarm does not require clinical intervention. Stress resulting from work-related noise has been associated with burnout in nurses since the 1980s (Topf & Dillon, 1988) and the expansion of technology and non-critical alarms have exacerbated the issue. Alarm fatigue can result from frequent, non-emergent alarm notifications such that alarm fatigue has been a Joint Commission National Patient Safety Goal since 2014 (Joint Commission, 2013, 2022).

The theory of Enhancement of Person-Environment Compatibility (EP-EC) is based on the assumption that one or more of the following strategies is needed to achieve sustained noise reduction: 1) interdisciplinary sound abatement strategies; 2) ongoing efforts; and 3) ongoing instruction of those in a position to control noise levels (Topf, 2000). However, behavior change is a less reliable strategy, while the built environment can be one of the most effective controls when considered as part of a systems-based approach (Cafazzo & St-Cyr, 2012).

Recommended design options to mitigate stress-causing noise in nursing units include changes to physical structures and equipment such as insulated walls for patient rooms, acoustical barriers for nursing stations, rooms dedicated to staff conversations, and rooms for noisier equipment (e.g., ice machines) (Bayramzadeh et al., 2021). Ongoing efforts to limit noise might include adjusting alarm settings, turning off unused suctioning and oxygen equipment,

ENHANCEMENT OF PERSON-ENVIRONMENT COMPATIBILITY

- 1 Collaborative sound abatement strategies
- 2 Ongoing vigilance
- 3 Ongoing instruction to control noise levels

(Topf, 2000)



repairing squeaky equipment/casters/wheels, and using caution when closing doors and drawers.

Another suggested strategy is to establish designated quiet times during which lighting levels, unit operations, and interactions are intentionally minimized to provide respite for both patients and staff (Busch-Vishniac, 2019). Finally, ongoing instruction may include orienting both patients and new staff regarding routine sounds, how to adjust alarm settings, and supporting both staff and patients with opportunities to block out noise periodically via breaks with noise-cancelling headphones or music.

Personal Resilience

There is an opportunity to leverage the growing body of evidence-based strategies to mitigate stress leading to individual burnout levels through personal resilience. The need for healthy working conditions to foster compassion satisfaction and the sense of purpose that inspired clinicians to enter healthcare has been cited as a specific area that may mitigate further turnover (Boston-Fleischhauer, 2022; Sacco & Copel, 2018). Organizational-level initiatives that foster individual well-being include policies that protect against long work hours and heavy workloads, and allowing employees to engage in healthy behaviors such as breaks and naps (Olson et al., 2019).

Space for Naps?

Naps in healthcare are not without controversy, and the disagreement is often dependent on the intended population (e.g., physicians, nurses). Intern and resident-physician napping has been an evidence-based practice in healthcare (Arora et al., 2006; McDonald et al., 2013). As a result, on-call sleep rooms for night shift physicians have been a fairly established design feature, with some physicians even calling for locations that are more accessible to the work location (Earnshaw, 2019). The same level of acceptance for nurse napping is not common, and despite the similar evidence-based benefits, is still met with organizational and cultural barriers.

Most nurse-related napping studies have focused on benefits afforded night shift nurses due to the interruption in normal circadian rhythms that can increase fatigue. Findings suggest that a napping program can benefit nurse performance. Results have demonstrated lower sleepiness and higher

TO NAP OR NOT...?

While naps can help mitigate the effects of 12-hour shifts, night shift workers stand to benefit the most due to the associated interruption in normal circadian rhythms that can increase fatigue in this population.



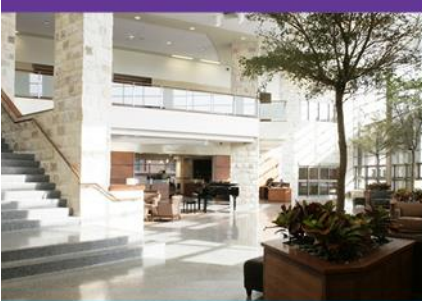
Although naps are an evidence-based strategy, barriers include lack of administrative support, professional enculturation, and the risk of sleep inertia.

performance on different cognitive task assessments in nap vs. no-nap groups (Zion & Shochat, 2019); feeling less stressed, higher alertness when driving home, communicating more efficiently during shift change, greater ability to quickly respond to events and complete tasks safely, and greater ability to wind down after work (Geiger-Brown et al., 2021); and improved fatigue levels, better care quality, perceptions that work is less physically and psychologically demanding, perceptions that work is less fast-paced, and objective measures indicating significant decreases in drowsiness between pre- and post-test evaluations (Han et al., 2021).

Further, in an evidence synthesis of 10 studies, the consensus across the research reviewed indicated that strategic naps result in feelings of rejuvenation and improved cognitive and psychomotor functions associated with fewer errors (Halm, 2018). In a systematic review of night shift napping, there was inconsistent evidence that napping reduced sleepiness and fatigue, but there were other recognized benefits among the articles reviewed, including reduction in self-reported hypertension; reduced sleepiness at the end of shift; a potential decrease in the risk of both breast cancer and cardiovascular disease; and improved cognitive performance (Li et al., 2019).

Although naps are an evidence-based strategy to mitigate the fatigue and stress associated with burnout, there is resistance to the practice for multiple reasons, including lack of administrative support (Halm, 2018; Li et al., 2019; Zion & Shochat, 2019); professional enculturation, such as an unwritten commitment to self-sacrifice for the sake of their patients, and a motivating sense of responsibility that may result in feelings of guilt (Steege & Rainbow, 2017); and the risk of sleep inertia, a transitional state between sleep and wakefulness marked by a reduction in performance and alertness (Trotti, 2017).

With these barriers in mind, it has been suggested that successful napping programs should reframe stress and fatigue management as an essential component of patient safety (Geiger-Brown et al., 2021; Halm, 2018; Li et al., 2019). Recommendations to support a successful napping program include a dedicated napping area that is quiet and has comfortable furniture, blankets, pillows, and low-lighting (Li et al., 2019). As Earnshaw suggested for physicians (2019), and consistent with the approach to break rooms, the location of a room to support napping should also be accessible to the work location.



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Conclusion

Clinicians are the most essential component of the healthcare delivery system and should be handled with care. Supporting caregivers with organizational policies and unit-based norms that encourage brief, but critical breaks from patient care are important first steps. Secondly, acknowledging the invisible work of support, mentoring, and collaboration and their impact on patient outcomes can inspire organizations to invest in the creation of spaces dedicated to these activities (Wakefield et al., 2021). Finally, by reducing the impact of distractions including interruptions and noise, healthcare workers can concentrate on critical tasks and respond timely to changes in patient conditions. Intentionally creating spaces to support caregivers can send the message that healthcare workers are indeed a valued resource.

For Additional Detail

For more detailed information on clinician burnout, refer to *Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being* from the National Academy of Medicine (2019). The paper is available at <https://nam.edu/systems-approaches-to-improve-patient-care-by-supporting-clinician-well-being/>.



References

- Abdelhadi, N., Drach-Zahavy, A., & Srulovici, E. (2022). Work interruptions and missed nursing care: A necessary evil or an opportunity? The role of nurses' sense of controllability. *Nursing Open*, *9*(1), 309–319. <https://doi.org/10.1002/nop2.1064>
- Aiken, L., Clarke, S., Sloane, D., Sochalski, J., & Silber, J. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association*, *288*(16), 1987–1993. <https://doi.org/10.1001/jama.288.16.1987>
- Aiken, L. H., Clarke, S. P., Sloane, D. M., Lake, E. T., & Cheney, T. (2008). Effects of hospital care environment on patient mortality and nurse outcomes. *J Nurs Adm*, *38*(5), 223–229. <https://doi.org/10.1097/01.NNA.0000312773.42352.d7>
- Allen, D. (2014). *The Invisible Work of Nurses* (0 ed.). Routledge. <https://doi.org/10.4324/9781315857794>
- Arora, V., Dunphy, C., Chang, V. Y., Ahmad, F., Humphrey, H. J., & Meltzer, D. (2006). The Effects of On-Duty Napping on Intern Sleep Time and Fatigue. *Annals of Internal Medicine*, *144*(11), 792–798. <https://doi.org/10.7326/0003-4819-144-11-200606060-00005>
- Bayramzadeh, S., Ahmadpour, S., & Aghaei, P. (2021). The relationship between sensory stimuli and the physical environment in complex healthcare settings: A systematic literature review. *Intensive and Critical Care Nursing*, *67*, 103111. <https://doi.org/10.1016/j.iccn.2021.103111>
- Bean, M., Carbajal, E., & Gleeson, C. (2022, May 6). *Nurses make exit plans after RaDonna Vaught's conviction*. Becker's Hospital Review. <https://www.beckershospitalreview.com/nursing/nurses-make-exit-plans-after-radonda-vaught-s-conviction.html>
- Becker, F. (2007). Nursing Unit Design and Communication Patterns: What Is “Real” Work? *HERD: Health Environments Research & Design Journal*, *1*(1), 58–62. <https://doi.org/10.1177/193758670700100115>
- Berwick, D. M., Nolan, T. W., & Whittington, J. (2008). The triple aim: Care, health, and cost. *Health Affairs (Project Hope)*, *27*(3), 759–769. <https://doi.org/10.1377/hlthaff.27.3.759>
- Bodenheimer, T., & Sinsky, C. (2014). From Triple to Quadruple Aim: Care of the Patient Requires Care of the Provider. *The Annals of Family Medicine*, *12*(6), 573–576. <https://doi.org/10.1370/afm.1713>
- Boston-Fleischhauer, C. (2022). Reversing the Great Resignation in Nursing: More Things to Consider. *JONA: The Journal of Nursing Administration*, *52*(6), 324–326. <https://doi.org/10.1097/NNA.0000000000001155>



- Buerhaus, P. I., Staiger, D. O., Auerbach, D. I., Yates, M. C., & Donelan, K. (2022). Nurse Employment During The First Fifteen Months Of The COVID-19 Pandemic: Study examines nurse employment trends during first fifteen months of the COVID-19 pandemic. *Health Affairs*, 41(1), 79–85. <https://doi.org/10.1377/hlthaff.2021.01289>
- Busch-Vishniac, I. (2019). Hospital Soundscapes: Characterization, Impacts, and Interventions. *Acoustics Today*, 15(3), 11. <https://doi.org/10.1121/AT.2019.15.3.11>
- Cafazzo, J. A., & St-Cyr, O. (2012). From discovery to design: The evolution of human factors in healthcare. *Healthcare Quarterly (Toronto, Ont.)*, 15 Spec No, 24–29. <https://doi.org/10.12927/hcq.2012.22845>
- Carthey, J. (2008). Reinterpreting the hospital corridor: “Wasted space” or essential for quality multidisciplinary clinical care? *HERD: Health Environments Research & Design Journal*, 2(1), 17–29. <https://doi.org/10.1177/193758670800200103>
- Cha, Y. J., Lee, K.-S., Cho, J. H., Choi, I. S., & Lee, D. (2022). Effect of Job Stress on Burnout among Nurses Responding to COVID-19: The Mediating Effect of Resilience. *International Journal of Environmental Research and Public Health*, 19(9), 5409. <https://doi.org/10.3390/ijerph19095409>
- Chong, K. E., & Shorey, S. (2022). Barriers in adopting health-promoting behaviours among nurses: A qualitative systematic review and meta-synthesis. *International Journal of Nursing Practice*, 28(1). <https://doi.org/10.1111/ijn.13030>
- Colosi, B. (2022). *2022 NSI National Health Care Retention & RN Staffing Report* (pp. 1–18). Nursing Solutions Incorporated.
- Cooper, A. L., Brown, J. A., Rees, C. S., & Leslie, G. D. (2020). Nurse resilience: A concept analysis. *International Journal of Mental Health Nursing*, 29(4), 553–575. <https://doi.org/10.1111/inm.12721>
- Copeland, D. (2021). Brief Workplace Interventions Addressing Burnout, Compassion Fatigue, and Teamwork: A Pilot Study. *Western Journal of Nursing Research*, 43(2), 130–137. <https://doi.org/10.1177/0193945920938048>
- Cordoza, M., Ulrich, R. S., Manulik, B. J., Gardiner, S. K., Fitzpatrick, P. S., Hazen, T. M., Mirka, A., & Perkins, R. S. (2018). Impact of Nurses Taking Daily Work Breaks in a Hospital Garden on Burnout. *American Journal of Critical Care*, 27(6), 508–512. <https://doi.org/10.4037/ajcc2018131>
- Dall’Ora, C., Ball, J., Recio-Saucedo, A., & Griffiths, P. (2016). Characteristics of shift work and their impact on employee performance and wellbeing: A literature review. *International Journal of Nursing Studies*, 57, 12–27. <https://doi.org/10.1016/j.ijnurstu.2016.01.007>
- Dall’Ora, C., Ball, J., Reinius, M., & Griffiths, P. (2020). Burnout in nursing: A theoretical review. *Human Resources for Health*, 18(1), 41. <https://doi.org/10.1186/s12960-020-00469-9>



- Dean, E. (2022). Grubby, tiny or non-existent: The spaces provided for nurses' breaks. *Nursing Standard*, 37(4), 19–22. <https://doi.org/10.7748/ns.37.4.19.s12>
- Earnshaw, L. J. (2019). Doctors' rest facilities must be accessible. *BMJ*, 366, l4621. <https://doi.org/10.1136/bmj.l4621>
- Fay, L., Real, K., & Haynes, S. (2022). The healthcare workspace: Understanding the role of decentralized nursing stations, corridors, and huddle spaces as locations for teamwork in a neonatal intensive care unit. *HERD: Health Environments Research & Design Journal*, in press. <https://doi.org/10.1177/19375867221106503>
- Freitas, W. C. J. de, Menezes, A. C., Mata, L. R. F. da, Lira, A. L. B. de C., Januário, L. H., & Ribeiro, H. C. T. C. (2022). Interruption in the work of nursing professionals: Conceptual analysis. *Revista Brasileira de Enfermagem*, 75(2), e20201392. <https://doi.org/10.1590/0034-7167-2020-1392>
- Gamble, M. (2021, September 2). *Healthcare workers, once cheered as heroes, now threatened and harassed*. Becker's Hospital Review.
- Geiger-Brown, J., Harlow, A., Bagshaw, B., Sagherian, K., & Hinds, P. S. (2021). Going Beyond Position Statements: One Hospital's Successful Initiative to Implement Napping for Night Shift Nurses. *Workplace Health & Safety*, 69(10), 474–483. <https://doi.org/10.1177/21650799211038003>
- Halm, M. (2018). Night Shift Naps Improve Patient and Workforce Safety. *American Journal of Critical Care*, 27(2), 157–160. <https://doi.org/10.4037/ajcc2018861>
- Hamilton, D. K. (2017). Is ICU Safety Threatened by the Straight Corridor? *HERD: Health Environments Research & Design Journal*, 10(2), 101–103. <https://doi.org/10.1177/1937586716682165>
- Hamilton, D. K., Swoboda, S. M., Lee, J.-T., & Anderson, D. C. (2018). Decentralization: The Corridor Is the Problem, Not the Alcove. *Critical Care Nursing Quarterly*, 41(1), 3–9. <https://doi.org/10.1097/CNQ.0000000000000181>
- Han, K., Hwang, H., Lim, E., Jung, M., Lee, J., Lim, E., Lee, S., Kim, Y.-H., Choi-Kwon, S., & Baek, H. (2021). Scheduled Naps Improve Drowsiness and Quality of Nursing Care among 12-Hour Shift Nurses. *International Journal of Environmental Research and Public Health*, 18(3), 891. <https://doi.org/10.3390/ijerph18030891>
- Happell, B., Dwyer, T., Reid-Searl, K., Burke, K. J., Caperchione, C. M., & Gaskin, C. J. (2013). Nurses and stress: Recognizing causes and seeking solutions. *Journal of Nursing Management*, 21(4), 638–647. <https://doi.org/10.1111/jonm.12037>
- Hendrich, A. L., & Chow, M. (2008). *Healthcare Leadership White Paper Series—Maximizing The Impact of Nursing Care Quality: A Closer Look at the Hospital Work Environment and the Nurse's Impact on Patient-Care Quality* (Healthcare Leadership White Paper No. 4; Healthcare Leadership, p. 22). The Center for Health Design. http://www.healthdesign.org/hcleader/HCLLeader_4_NursingCareWP.pdf



- Henson, J. S. (2020). *Burnout or Compassion Fatigue: A Comparison of Concepts*. 29(2), 6.
- Hurtado, D. A., Nelson, C. C., Hashimoto, D., & Sorensen, G. (2015). Supervisors' Support for Nurses' Meal Breaks and Mental Health. *Workplace Health & Safety*, 63(3), 107–115. <https://doi.org/10.1177/2165079915571354>
- Joint Commission. (2013). *Alarm Fatigue_NPSG 2013*. Joint Commission. https://www.jointcommission.org/-/media/tjc/documents/standards/r3-reports/r3_report_issue_5_12_2_13_final.pdf
- Joint Commission. (2022). *Alarm Fatigue_NPSG 2022*. Joint Commission. https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/2022/simple_2022-hap-npsg-goals-101921.pdf
- Keys, Y. (2020). Mitigating the Adverse Effects of 12-Hour Shifts: Nursing Leaders' Perspectives. *JONA: The Journal of Nursing Administration*, 50(10), 539–545. <https://doi.org/10.1097/NNA.0000000000000931>
- Kim, S., Park, Y., & Niu, Q. (2017). Micro-break activities at work to recover from daily work demands. *Journal of Organizational Behavior*, 38(1), 28–44. <https://doi.org/10.1002/job.2109>
- Li, H., Shao, Y., Xing, Z., Li, Y., Wang, S., Zhang, M., Ying, J., Shi, Y., & Sun, J. (2019). Napping on night-shifts among nursing staff: A mixed-methods systematic review. *Journal of Advanced Nursing*, 75(2), 291–312. <https://doi.org/10.1111/jan.13859>
- Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology*, 52, 397–422.
- McDonald, J., Potyk, D., Fischer, D., Parmenter, B., Lillis, T., Tompkins, L., Bowen, A., Grant, D., Lamp, A., & Belenky, G. (2013). Napping on the Night Shift: A Study of Sleep, Performance, and Learning in Physicians-in-Training. *Journal of Graduate Medical Education*, 5(4), 634–638. <https://doi.org/10.4300/JGME-D-12-00324.1>
- McLeod, M., Barber, N., & Franklin, B. D. (2015). Facilitators and Barriers to Safe Medication Administration to Hospital Inpatients: A Mixed Methods Study of Nurses' Medication Administration Processes and Systems (the MAPS Study). *PLOS ONE*, 10(6), e0128958. <https://doi.org/10.1371/journal.pone.0128958>
- Mihandoust, S., Pati, D., Lee, J., & Roney, J. (2021). Exploring the relationship between perceived visual access to nature and nurse burnout. *HERD: Health Environments Research & Design Journal*, 14(3), 258–273. <https://doi.org/10.1177/1937586721996302>
- Murat, M., Köse, S., & Savaşer, S. (2021). Determination of stress, depression and burnout levels of front-line nurses during the COVID-19 pandemic. *International Journal of Mental Health Nursing*, 30(2), 533–543. <https://doi.org/10.1111/inm.12818>
- Murphy, S., & Walseng, A. (2022). *Take Burnout from Red to Green*. Nature Sacred. <https://naturesacred.org/new-report-shows-financial-impact-of-nature-spaces-in-hospitals/>



- NASEM. (2019). *Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being* (p. 25521). National Academies Press. <https://doi.org/10.17226/25521>
- Nejati, A., Rodiek, S., & Shepley, M. (2016a). Using visual simulation to evaluate restorative qualities of access to nature in hospital staff break areas. *Landscape and Urban Planning, 148*, 132–138. <https://doi.org/10.1016/j.landurbplan.2015.12.012>
- Nejati, A., Rodiek, S., & Shepley, M. (2016b). The implications of high-quality staff break areas for nurses' health, performance, job satisfaction and retention. *Journal of Nursing Management, 24*(4), 512–523. <https://doi.org/10.1111/jonm.12351>
- Nejati, A., Shepley, M., & Rodiek, S. (2016). A Review of Design and Policy Interventions to Promote Nurses' Restorative Breaks in Health Care Workplaces. *Workplace Health & Safety, 64*(2), 8. <https://doi.org/10.1177/2165079915612097>
- Nejati, A., Shepley, M., Rodiek, S., Lee, C., & Varni, J. (2016). Restorative Design Features for Hospital Staff Break Areas: A Multi-Method Study. *HERD: Health Environments Research & Design Journal, 9*(2), 16–35. <https://doi.org/10.1177/1937586715592632>
- Olson, K., Marchalik, D., Farley, H., Dean, S. M., Lawrence, E. C., Hamidi, M. S., Rowe, S., McCool, J. M., O'Donovan, C. A., Micek, M. A., & Stewart, M. T. (2019). Organizational strategies to reduce physician burnout and improve professional fulfillment. *Current Problems in Pediatric and Adolescent Health Care, 49*(12), 100664. <https://doi.org/10.1016/j.cppeds.2019.100664>
- Pappas, S. (2021). The Role of Nurse Leaders in the Well-being of Clinicians. *JONA: The Journal of Nursing Administration, 51*(7/8), 362–363. <https://doi.org/10.1097/NNA.0000000000001029>
- Pati, D., Harvey, T. E., & Barach, P. (2008). Relationships Between Exterior Views and Nurse Stress: An Exploratory Examination. *HERD: Health Environments Research & Design Journal, 1*(2), 27–38. <https://doi.org/10.1177/193758670800100204>
- Pati, D., Harvey, T. E., Redden, P., Summers, B., & Pati, S. (2015). An Empirical Examination of the Impacts of Decentralized Nursing Unit Design. *HERD: Health Environments Research & Design Journal, 8*(2), 56–70. <https://doi.org/10.1177/1937586715568986>
- Peng, J., & Rewers, L. (2021). *Why so many nurses are quitting (and what to do about it)*. Advisory Board: Daily Briefing. <https://www.advisory.com/Daily-Briefing/2021/10/06/nurse-turnover>
- Peters, E. (2018). Compassion fatigue in nursing: A concept analysis. *Nursing Forum, 53*(4), 466–480. <https://doi.org/10.1111/nuf.12274>



- Raj, M., Jimenez, F. E., Rich, R. K., Okland, K., Roy, L., Opollo, J., Rogers, J., & Brittin, J. (2022). Influence of evidence-based design strategies on nurse wellness. *HERD: Health Environments Research & Design Journal*, in press. <https://doi.org/10.1177/19375867221110915>
- Real, K., Fay, L., Isaacs, K., Carll-White, A., & Schadler, A. (2018). Using Systems Theory to Examine Patient and Nurse Structures, Processes, and Outcomes in Centralized and Decentralized Units. *HERD: Health Environments Research & Design Journal*, 11(3), 22–37. <https://doi.org/10.1177/1937586718763794>
- Rogers, B., Buckheit, K., & Ostendorf, J. (2013). Ergonomics and Nursing in Hospital Environments. *Workplace Health & Safety*, 61(10), 429–439. <https://doi.org/10.1177/216507991306101003>
- Sacco, T. L., & Copel, L. C. (2018). Compassion satisfaction: A concept analysis in nursing. *Nursing Forum*, 53(1), 76–83. <https://doi.org/10.1111/nuf.12213>
- Sahay, S., & Wei, W. (2022). “Everything Is Changing, but I Am Not Alone”: Nurses’ Perceptions of Social Support during COVID-19. *Sustainability*, 14(6), 3262. <https://doi.org/10.3390/su14063262>
- Schlak, A. E., Aiken, L. H., Chittams, J., Poghosyan, L., & McHugh, M. (2021). Leveraging the Work Environment to Minimize the Negative Impact of Nurse Burnout on Patient Outcomes. *International Journal of Environmental Research and Public Health*, 18(2), 610. <https://doi.org/10.3390/ijerph18020610>
- Shah, M. K., Gandrakota, N., Cimiotti, J. P., Ghose, N., Moore, M., & Ali, M. K. (2021). Prevalence of and Factors Associated With Nurse Burnout in the US. *JAMA Network Open*, 4(2), e2036469. <https://doi.org/10.1001/jamanetworkopen.2020.36469>
- Smith, A. (2017). Effects of noise on errors, injuries and subjective health of nursing staff. *ICBEN 2017 Congress Proceedings*, 1–8.
- Stanford. (2016). *The Stanford Model of Professional Fulfillment* [Academic]. Stanford Medicine: WellIMD & WellPhD. <https://wellmd.stanford.edu/about/model-external.html>
- Stavrova, O., Ehlebracht, D., & Vohs, K. D. (2020). Victims, perpetrators, or both? The vicious cycle of disrespect and cynical beliefs about human nature. *Journal of Experimental Psychology: General*, 149(9), 1736–1754. <https://doi.org/10.1037/xge0000738>
- Steege, L. M., & Rainbow, J. G. (2017). Fatigue in hospital nurses – ‘Supernurse’ culture is a barrier to addressing problems: A qualitative interview study. *International Journal of Nursing Studies*, 67, 20–28. <https://doi.org/10.1016/j.ijnurstu.2016.11.014>
- Stimpfel, A. W., Sloane, D. M., & Aiken, L. H. (2012). The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. *Health Affairs*, 31(11), 2501. <https://doi.org/10.1377/hlthaff.2011.1377>



- Stress*. (2021, January 28). Cleveland Clinic. <https://my.clevelandclinic.org/health/articles/11874-stress>
- Terzi, B., Azizoğlu, F., Polat, Ş., Kaya, N., & İşsever, H. (2019). The effects of noise levels on nurses in intensive care units. *Nursing in Critical Care, 24*(5), 299–305. <https://doi.org/10.1111/nicc.12414>
- Topf, M. (2000). Hospital noise pollution: An environmental stress model to guide research and clinical interventions. *Journal of Advanced Nursing, 31*(3), 520–528.
- Topf, M., & Dillon, E. (1988). Noise-induced stress as a predictor of burnout in critical care nurses. *Heart Lung, 17*(5), 567–574.
- Trotti, L. M. (2017). Waking up is the hardest thing I do all day: Sleep inertia and sleep drunkenness. *Sleep Medicine Reviews, 35*, 76–84. <https://doi.org/10.1016/j.smrv.2016.08.005>
- Wakefield, M. K., Williams, D. R., Menestrel, S. L., & Flaubert, J. L. (Eds.). (2021). Supporting the Health and Professional Well-Being of Nurses. In *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity* (pp. 301–354). National Academies Press. <https://doi.org/10.17226/25982>
- Wang, H., Xu, G., Liang, C., & Li, Z. (2021). Coping with job stress for hospital nurses during the COVID-19 crisis: The joint roles of micro-breaks and psychological detachment. *Journal of Nursing Management, jonm.13431*. <https://doi.org/10.1111/jonm.13431>
- Wang, Z., Downs, B., Farrell, A., Cook, K., Hourihan, P., & McCreery, S. (2013). Role of a Service Corridor in ICU Noise Control, Staff Stress, and Staff Satisfaction: Environmental Research of an Academic Medical Center. *HERD: Health Environments Research & Design Journal, 6*(3), 80–94. <https://doi.org/10.1177/193758671300600307>
- Wei, H., Aucoin, J., Kuntapay, G. R., Justice, A., Jones, A., Zhang, C., Santos, H. P., & Hall, L. A. (2022). The prevalence of nurse burnout and its association with telomere length pre and during the COVID-19 pandemic. *PLOS ONE, 17*(3), e0263603. <https://doi.org/10.1371/journal.pone.0263603>
- Weigl, M., Beck, J., Wehler, M., & Schneider, A. (2017). Workflow interruptions and stress at work: A mixed-methods study among physicians and nurses of a multidisciplinary emergency department. *BMJ Open, 7*(12), e019074. <https://doi.org/10.1136/bmjopen-2017-019074>
- WHO. (2019, May 28). *Burn-out an “occupational phenomenon”*: International Classification of Diseases. World Health Organization. <https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases>
- Zion, N., & Shochat, T. (2019). Let them sleep: The effects of a scheduled nap during the night shift on sleepiness and cognition in hospital nurses. *Journal of Advanced Nursing, 75*(11), 2603–2615. <https://doi.org/10.1111/jan.14031>