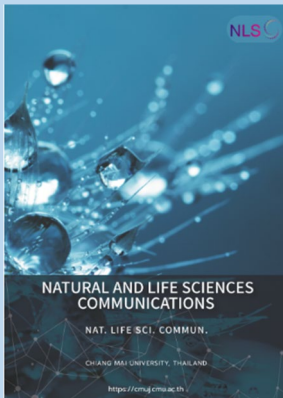


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Assessment of Job-Related Pressure Among Healthcare Professionals in Anesthesiology and Intensive Care Unit: Multi-Site Hospital-Based Study in Vietnam

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ABSTRACT

Job-related pressure in high-precision specialties such as Anesthesiology and Intensive Care is a topic of growing concern; however, there remains a deficit of comprehensive research investigating this issue on a nationwide scale in Vietnam. Therefore, this cross-sectional study aimed to evaluate the level of workplace stress and identify the factors associated with job-related pressure among healthcare professionals in these fields. A total of 428 healthcare workers (217 males and 211 females) were recruited from 41 hospitals across Vietnam between June and October 2025. The study utilized the Workplace Stress Scale (WSS) and the International Commission on Biological Effects of Noise (ICBEN) scale to measure psychological and environmental stressors, with data analyzed via multivariate linear regression models.

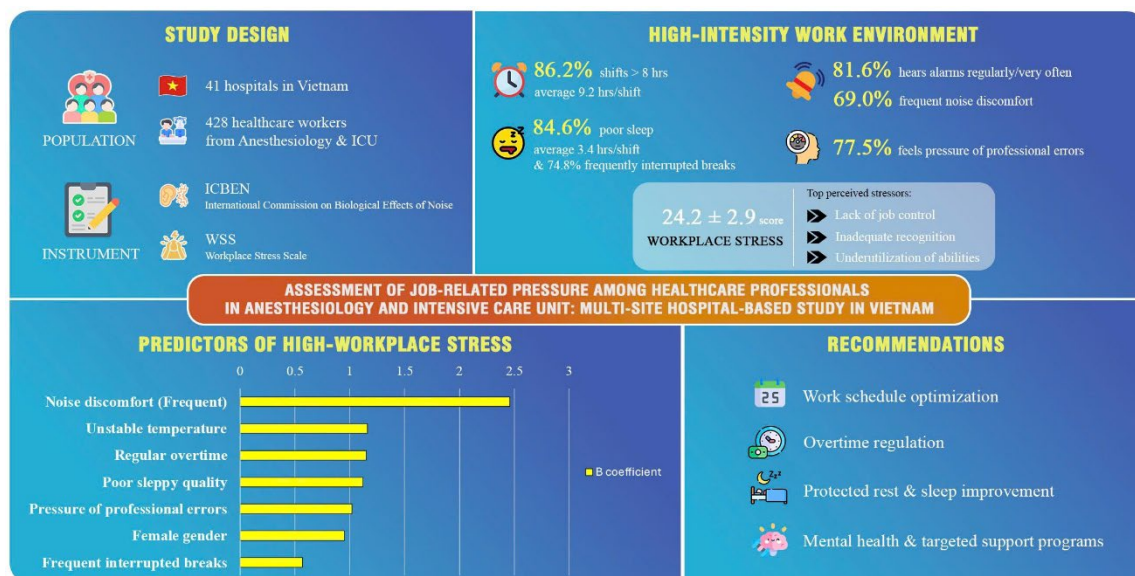
The results found an overall mean stress score of 24.2 ± 2.92 , reflecting a high-intensity work environment where 86.2% of staff worked shifts exceeding 8 hours and 84.6% suffered from poor sleep quality. Significant predictors of elevated stress included female gender, regular overtime, and frequent work-related interruptions during rest periods. Additionally, environmental factors like unstable temperatures and noise discomfort, along with the psychological pressure regarding professional errors, demonstrated a substantial impact on stress levels.

Therefore, healthcare institutions should prioritize optimizing work schedules and establishing protected rest periods to mitigate these stressors. Improving sleep hygiene and developing targeted support programs are also essential steps to protect the well-being of this critical workforce.

Keywords: PSQI, Job stress, Work environment

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Graphical Abstract:



INTRODUCTION

Job-related pressure within the healthcare sector is a topic of growing concern, particularly in specialties that demand high precision, intense workloads, and frequent exposure to emergency situations, notably Anesthesiology and Intensive care units (Saparniene et al., 2023). Healthcare professionals in this field are not only responsible for ensuring patient safety throughout surgical and recovery processes but must also maintain a high degree of alertness and concentration under demanding conditions, including extended work hours, frequent on-call shifts, and a high-stress environment (Scott-Marshall, 2024, Otukoya et al., 2025).

Several studies have indicated that the prevalence of stress and burnout among healthcare professionals in Anesthesiology and Intensive care units is notably high, with rates ranging from 10% to 41% (Hasan et al., 2024). This prevalence is even more pronounced in intensive care units, where approximately 50% of physicians and one-third of nurses exhibit symptoms of occupational burnout (Villagrancia et al., 2025). Previous studies have identified female gender, early-career status, parenthood, frequent on-call duties, and long working hours as key risk factors for stress and burnout (Pham Thi Ngoc Thu et al., 2023; Almutairi et al., 2024; Chen et al., 2025). Occupational pressure leads to numerous adverse health consequences for medical staff and significantly impacts the quality and safety of patient care, increasing the incidence of medical errors, diminishing empathy, and reducing patient satisfaction (National Academies of Sciences and Medicine, 2020; Dima, 2025).

However, there remains a deficit of research that systematically and comprehensively investigates job-related pressure among healthcare professionals specializing in Anesthesiology and Intensive care units on a nationwide scale in Vietnam, as existing studies have largely been restricted to specific local hospitals (Pham Thi Ngoc Thu et al., 2023; Anh et al., 2025). The responsibilities of these professionals extend far beyond the operating room, including intensive care management, post-anesthesia care, and emergency interventions throughout the hospital. These duties require sustained concentration, rapid decision-making, and consistently high performance over prolonged periods (Fortenbaugh et al., 2017). The diversity and high-pressure nature of this work environment necessitate a comprehensive and scientific evaluation to accurately determine the levels of pressure, identify associated risk factors, and understand its impact on the well-being of healthcare professionals.

In the context of a healthcare system facing significant workforce overload, which was exacerbated by the aftermath of the COVID-19 pandemic, research on occupational pressure is of great scientific value (Tamborini et al., 2023; Silveira et al., 2024). It also provides practical data to inform healthcare administrators in developing effective intervention policies aimed at improving occupational health, sustaining professional quality, and enhancing patient care outcomes. Therefore, we conducted this study, entitled: "Assessment of Job-Related Pressure Among Healthcare Professionals in Anesthesiology and Intensive care unit at Public Hospitals in Vietnam" with the following two objectives:

1. To assess the job characteristics and the level of job-related pressure among healthcare professionals in the field of Anesthesiology and Intensive care unit at public hospitals in Vietnam.
2. To identify the factors associated with job-related pressure among this population.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted among healthcare workers at 50 hospitals across the Northern, Central, and Southern regions of Vietnam from June to October 2025. Ethical considerations for this study were granted by the Institutional Review Board of Hue University of Medicine and Pharmacy, Hue University (H2025/585). No identified information was collected.

Study population

This cross-sectional study was conducted across 41 provincial and city-level hospitals in Vietnam, encompassing the Northern (n=7), Central (n=23), and Southern (n=11) regions. Eligible participants were healthcare workers in Anesthesiology and Intensive Care departments with at least six months of experience.

The minimum sample size was calculated using the formula for a single population means:

$$n = \frac{Z_{(1-\alpha/2)}^2 \sigma^2}{d^2}$$

Give a significance level of $\alpha = 0.05$ ($Z_{1-\alpha/2}$ value of 1.96), a standard deviation (σ) of 5.93 for workplace stress scores (Aychew et al., 2025), and a margin of error (d) of 0.6, the calculated sample size was 376. To account for potential non-responses or incomplete data, the target sample size was increased by approximately 10%, resulting in a required sample of 417 participants.

A total population sampling strategy was employed, targeting the entire sampling frame of 2,272 eligible staff identified at these institutions. Survey invitations were disseminated via hospital coordinators. Data collection, conducted between June and October 2025, yielded 428 valid responses. This figure satisfied the minimum sample size requirement.

Data collection

After completing the study consent form, a self-administered questionnaire was distributed to the healthcare workers. This questionnaire contained four main sections, including social demographic characteristics, work-related characteristics, and work environment and workplace stress.

We collected data on the participants' social demographic with age, gender, residential area, educational level, and marital status. Work-related Characteristics included years of experience, daily working hours, number of shifts,

sleep duration per shift, frequency of exposure to critically ill patients, and frequency of witnessing patient deaths. The work environment section gathered information on the specific workplace, assessment of workplace temperature, frequency of hearing monitor alarms, and the level of noise-induced annoyance, which was measured using the International Commission on Biological Effects of Noise (ICBEN) scale. Workplace stress was measured by Workplace stress scale (WSS).

Instrument:

ICBEN: an instrument that is part of the ISO/TS 15666 international standard, designed to ensure consistency and comparability of data across different research settings. Participants were asked to rate their degree of annoyance from workplace noise on five levels: 1= Not at all, 2= Slightly, 3= Moderately, 4= Very, and 5= Extremely. In accordance with standard practice, respondents selecting "Very" or "Extremely" were classified as being highly annoyed. This scale has been utilized in previous studies in Vietnam targeting populations exposed to aircraft and road traffic noise (Shimoyama et al., 2014; Trieu et al., 2021).

WSS: Job-related pressure was assessed using the Workplace Stress Scale (WSS), this 8-item instrument utilizes a 5-point Likert scale ranging from 1 ('Never') to 5 ('Very Often'), with items 6, 7, and 8 reverse-scored. The total score is calculated by summing all items, where higher scores indicate elevated stress levels. Regarding its psychometric properties, the Vietnamese version of the WSS has been previously validated among healthcare professionals with a Cronbach's alpha of 0.84 (Tran Minh Quang and Huynh Ho Ngoc Quynh, 2022), and it maintained high reliability in the current study with a Cronbach's alpha of 0.92.

Data analysis

Data was entered and cleaned using Epidata 3.0 and analyzed with SPSS version 20.0. Descriptive statistics were employed to calculate frequencies, percentages (%), means, and standard deviations. The statistical significance level was established at $P < 0.05$. Student's t-test and analysis of variance (ANOVA) were used to examine the associations between independent and dependent variables. A multivariable linear regression model using the Enter method was utilized to evaluate the independent associations between the outcome variables (Workplace stress scores) and predictor variables including all participants' socio-demographic, working characteristics and working environment. The level $\alpha = 0.05$ was used to determine statistical significance results.

RESULTS

The demographic profile of the 428 participants in Anesthesiology and Intensive Care (Table 1) revealed a balanced gender split (50.7% male; 49.3% female) and a mean age of 34.3 ± 6.7 years. Most research subjects are highly educated (37.6% with a university degree and 39.0% with a postgraduate degree) and work in urban hospitals (69.4%).

Table 1. Social demographic of the study participants (n=428).

Character	Frequency (n)	Percent (%)
Demographic		
Age (years) mean $\pm$ SD (range)		34.3 $\pm$ 6.7 (23-59)
Gender		
Male	217	50.7
Female	211	49.3
Living area		
Urban	297	69.4
Rural	131	30.6
Current work		
Physician	225	52.6
Nursing	178	41.6
Other	25	5.8
Education level		
College	100	23.4
University	161	37.6
Postgraduate	167	39.0
Marriage status		
Single	104	24.3
Married	312	72.9
Other (Divorce/Separation/Widow)	12	2.8

Regarding job characteristics, results indicated a high-intensity work environment. A large majority of staff (86.2%) work shifts longer than 8 hours, with an average of 9.2 work hours per day. The primary work settings were high-concentration areas such as the Intensive Care Unit (ICU) (50.7%) and operating rooms (43.2%). Up to 81.6% of the medical staff report hearing alarms from monitoring devices "Regularly" (51.2%) or "Very often" (30.4%).

Exposure to critically ill patients was a constant feature of their work, with a minority of staff (37.6%) managing five or more cases weekly. The majority (82.0%) experience this fewer than five times per month, nearly one-fifth of the cohort (18%) were confronted with patient mortality more frequently.

Table 2. Working characteristics and working environment of the study participants (n=428).

Character	Frequency (n)	Percent (%)
Working characteristics		
Experience (years) , mean (range)		10.1 (0-34)
Average hours worked per day (hours) , mean (range)		9.2 (6-24)
Average number of shifts per month (times) , mean (range)		8.9 (0-15)
Hours worked in each shift		
$\leq$ 8 hours	59	13.8
> 8 hours	369	86.2
Average number of shifts per month		
< 10 cases	380	88.8
From 10 – 20 cases	34	7.9
From 21 to 30 cases	10	2.3
Over 30 cases	4	1.0
Overtime		
Irregular	205	47.9
Regular	223	49.1

Character	Frequency (n)	Percent (%)
Average sleep time per shift (hours), mean (range)	3.4 ± 2.2 (0-24)	
Frequency of calls/wakeups during breaks		
Irregular	108	25.2
Regular	320	74.8
Sleep Quality		
Poor	362	84.6
Good	66	15.4
Frequency of contact with critically ill patients (hours), mean (range)	5.9 ± 7.6 (0-70)	
Frequency of exposure critically ill patients (per week)		
< 5 times	267	62.4
From 5 – 10 times	108	25.2
>10 times	53	12.4
Frequency of witnessing patient death (per month)		
< 5 times	351	82.0
From 5 – 10 times	46	10.8
>10 times	31	7.2
Working Environment		
Main Working Area		
Operating room	185	43.2
Postoperative room	26	6.1
ICU	217	50.7
Working Area Temperature		
Cool	253	59.2
Normal	131	30.6
Hot, stuffy	10	2.3
Unstable	34	7.9
Frequency of hearing alarms from monitoring devices in work area		
Few	25	5.8
Average	54	12.6
Regular	219	51.2
Very often	130	30.4
Level of discomfort caused by noise on the ICBEN scale		
Absolutely not	19	4.4
Partly	114	26.6
Frequent	195	69.0
Pressure on professional errors		
No	8	1.9
Insignificant	88	20.6
Pressure	210	49.0
Very much pressure	122	28.5

Table 3 provided data on the perceived stress levels of the study subjects, with an overall mean score of 24.2 ± 2.9 . Specifically, the three factors with the highest mean scores include: "I feel like I don't have enough control or involvement in deciding on tasks at work" (4.0 ± 1.0), "I don't have the opportunity to use my full abilities and talents at work" (4.0 ± 0.9), and "I receive unsatisfactory recognition or rewards for good work achievements" (3.9 ± 1.0). In contrast, factors such as excessive workload (2.5 ± 1.1) or unsafe working conditions (2.4 ± 0.9) received lower scores.

Table 3. Description of the subject's level of workplace stress (n=428).

Content	$\bar{X} \pm SD$	Level
Uncomfortable or sometimes even unsafe working conditions	2.4 $\pm$ 0.9	1-5
I feel like my job is negatively affecting my physical or mental health	2.6 $\pm$ 1.0	1-5
I have too much work to do and/or too many unreasonable deadlines	2.5 $\pm$ 1.1	1-5
I find it difficult to express my opinion or feelings about the working conditions to my superiors	2.3 $\pm$ 1.0	1-5
I feel the pressure of work affecting my family or personal life	2.4 $\pm$ 1.0	1-5
I feel like I don't have enough control or involvement in deciding on tasks at work	4.0 $\pm$ 1.0	1-5
I receive unsatisfactory recognition or rewards for good work achievements	3.9 $\pm$ 1.0	1-5
I don't have the opportunity to use my full abilities and talents at work	4.0 $\pm$ 0.9	1-5
Overall Score	24.2 $\pm$ 2.9	

Table 4 presented the results of the multivariate logistic regression analysis, identifying the statistically significant predictors of workplace stress. The model explains approximately 20% (Adj. $R^2 = 0.20$) of the variance in stress levels ($P < 0.001$).

Gender and Work Patterns: Being female ($B=0.95$, $P < 0.001$) was a significant predictor of higher stress compared to being male. Work schedule-related factors, such as regular overtime ($B = 1.15$, $P = 0.001$) and frequent calls/wakeups during breaks ($B = 0.57$, $P = 0.038$), also significantly increase stress levels.

Environmental Factors: The work environment has a pronounced impact. An unstable work area temperature ($B = 1.16$, $P = 0.019$) and, most notably, the level of discomfort caused by noise ("Partly": $B = 2.24$, $P = 0.001$; "Frequent": $B = 2.46$, $P < 0.001$) are among the strongest predictors of stress in the model.

Personal and Psychological Factors: Pressure related to professional errors ($B = 1.02$, $P = 0.002$) and poor sleep quality ($B = 1.12$, $P = 0.003$) were also strongly associated with increased stress levels.

Table 4. Multivariate linear regression model of factors related to the level of workplace stress of the study subject.

Related factors	Stress levels in the workplace			
	B	SE1	95% CI	P
Age	0.001	0.02	-0.04; 0.04	0.973
Gender (Male*)				
Female	0.95	0.27	0.43; 1.48	<0.001
Average number of shifts per month (< 10 shifts*)				
From 10 – 20 cases	-0.45	0.48	-1.40; 0.50	0.353
From 21 to 30 cases	1.68	0.86	-0.016; 3.37	0.052
Over 30 cases	0.43	1.35	-2.22; 3.09	0.749
Overtime/Overtime (Irregular*)				
Regular	1.15	0.33	0.49; 1.80	0.001
Frequency of calls/wakeups during breaks (Infrequently*)				
Regular	0.57	0.27	0.03; 1.11	0.038
Pressure on professional errors (No pressure*)				
Pressure	1.02	0.32	0.39; 1.65	0.002
Work area temperature (Cool*)				
Normal	0.16	0.29	-0.41; 0.74	0.578
Hot, stuffy	0.68	0.87	-1.03; 2.39	0.437

Related factors	Stress levels in the workplace			
	B	SE1	95% CI	P
Unstable	1.16	0.49	0.19; 2.12	0.019
Frequency of alarm hearing from monitoring devices in work area (less*)				
Average	0.15	0.67	-1.16; 1.46	0.820
Regular	0.41	0.59	-0.75; 1.57	0.487
Noise discomfort level according to the ICBEN scale (Absolutely not*)				
Partly	2.24	0.66	0.94; 3.55	0.001
Frequent	2.46	0.70	1.08; 3.83	<0.001
Sleep quality (Good*)				
Poor	1.12	0.37	0.39; 1.85	0.003

Note: ¹SE = Standard Error; CI = Confidence Interval
 $R^2 = 0.23$; Adj. $R^2 = 0.20$; $P < 0.001$

DISCUSSION

Research on 428 HCWS in Anesthesiology and Intensive care units across twenty hospitals in Vietnam, our findings demonstrate the substantial impact of heavy workload and work-related stress.

A very high proportion of staff worked more than 8 hours per shift (86.2%), each staff had an average of 8.9 shifts per month and 49.1% regularly worked overtime, indicating that they often faced high work intensity and little rest. Previous studies have shown that healthcare workers with long working hours or regular overtime were at significantly higher risk of burnout, poor sleep and psychological stress than those working standard hours (Lin et al., 2021; Curva et al., 2023). Heavy workloads, especially where night shifts are common, are a major cause of increased mental health problems (Li et al., 2024). Numerous studies have consistently found that night shift work is associated with a higher risk of depression, anxiety, burnout, sleep problems, and lower overall quality of life in health care workers (Teo et al., 2022; Wan et al., 2022). In fact, medical staff in the anesthesiology, resuscitation and intensive care departments (with 50.7% working in the ICU) mainly treat severe and critical patients, with a high workload leading to more pronounced occupational stress for doctors and nurses in other departments. The results show that the majority of staff have to contact severe patients and often witness deaths. On average, each staff spends 5.9 ± 7.6 hours/week in contact with severe patients. This creates an emotional burden, increasing the risk of stress, anxiety and burnout (Bayram Deger, 2024). Especially in anesthesia and resuscitation, they have to make important decisions in a short time, causing great psychological pressure. The pressure of having to make quick decisions in critical situations, witnessing patients suffer or die, combined with the inability to provide adequate care, increases the burden and creates a stressful working environment (Lv et al., 2023).

Up to 84.6% of employees were assessed as having poor sleep, many of whom were on night shifts, with an average sleep of just 3.4 hours per shift and 74.8% frequently being awakened during breaks. This disruption is one of the most common stressors in the workplace, contributing to chronic stress, affecting concentration and performance, and increasing the risk of errors (Medic et al., 2017; Galliker et al., 2024). The majority of staff work in cool environments (59.2% of staff work in cool environments) especially in the operating room, in contrast to outside conditions which can be hot or unstable, creating frequent temperature fluctuations. This factor can increase occupational stress, cause fatigue and reduce work performance in anesthesia and resuscitation cases (De Sario et al., 2023). As many as 81.6% of employees hear alarms often or very often and 69.0% are frequently bothered by noise. Continuous alarms not only disrupt sleep but also increase fatigue. Fatigue from continuous alarms

can be associated with increased stress, emotional exhaustion and a reduced ability to maintain humane care (Michels et al., 2025). This increases psychological stress and reduces employees' ability to respond effectively (Michels et al., 2025). 49% of staff felt pressure and 28.5% felt a lot of pressure related to the risk of errors, which is understandable because just a small error in anesthesia and resuscitation can lead to serious consequences. This constant anxiety increases the level of occupational stress, which has a negative impact on physical, social and psychological health (Bayram Deger, 2024).

The results reveal that the average stress level in women was 0.95 points higher than that of men, suggesting that women are at higher risk of experiencing occupational stress. Some previous studies have also noted a similar trend, where women often report higher stress levels than men, such as the study by Almutairi AF in Saudi Arabia (Almutairi et al., 2024), the study by Asma Alneyadi in Abu Dhabi (Alneyadi et al., 2025). One possible explanation is that women often have to juggle both work and family responsibilities at the same time, and the pressure of dual roles may increase overall stress levels (Notten et al., 2017). In addition, differences in psychological and social characteristics, ways of coping with stress and social expectations also contribute to making women more vulnerable to occupational stress factors (Fida et al., 2023). Prior studies have also highlighted that men and women may experience stressors differently due to differences not only in perception but also in the nature of the stressors they are exposed to, as well as differences in coping strategies (Fida et al., 2023). Furthermore, evidence suggests that even within the same profession, women and men may face different working conditions and differing types of job demands, which can further contribute to disparities in stress levels (Fida et al., 2023).

Employees who regularly work overtime have a 1.15-point higher stress level than those who work overtime irregularly. This finding reinforces the notion that the frequency of overtime is an important determinant of psychological well-being in the workplace. Previous studies have also demonstrated a link between the frequency of work or overtime and occupational stress (Pham Thi Ngoc Thu et al., 2023; Anh et al., 2025). Working overtime exposes employees to greater workload pressure, shorter rest periods, and reduced physical and mental recovery. Additionally, research by Yong-Hsin Chen has shown that overtime in healthcare workers significantly increases the risk of burnout, a condition that progressively worsens over time (Chen et al., 2025).

Stress levels were 0.57 points higher in the group of healthcare workers who were frequently called/waked during breaks compared to the group who were rarely called/waked during breaks. This suggests that rest interruptions is an important contributor to increased occupational stress. Healthcare workers often face emergency situations or urgent work demands while resting, and being repeatedly awakened causes sleep disruption, leading to physical and mental fatigue. Work interruptions are one of the most common stressors in the workplace and are associated poorer health and well-being outcomes (Galliker et al., 2024). Previous research has also shown that frequent interruptions in rest time are associated with a variety of health problems, including adverse mental health effects in employees (Vieten et al., 2023).

Staff with poor sleep had a 1.12-point higher stress level than those with good sleep. Sleep disruption or inadequate sleep has been shown to correlate strongly with work-related difficulties, the doctor-patient relationship, psychological well-being, environmental factors, and career-related pressures such as promotion or competition, thereby intensifying occupational stress (Deng et al., 2020). Deng Xuexue's research also showed that job stress scores were negatively related to sleep quality, or in other words, the higher the job stress score, the poorer the sleep quality (Deng et al., 2020). In addition, Lena J. Lee's research further indicated that sleep problems or sleep disorders completely or partially affect the relationship between occupational quality of life and physical/mental health in healthcare workers (Lee et al., 2022).

CONCLUSION

In conclusion, heavy workload is a primary driver of occupational stress among healthcare professionals working in anesthesiology and intensive care in Vietnam. Significant predictors of elevated stress include female gender, regular overtime, frequent work-related interruptions during rest periods, and poor sleep quality. These findings highlight the urgent need for multi-level interventions to protect the well-being of this critical workforce.

Therefore, we recommend that healthcare institutions prioritize optimizing work schedules, enforcing limits on overtime, and establishing protected rest periods to mitigate exposure to key stressors. Concurrently, promoting mental health awareness, improving sleep hygiene, and developing targeted support programs for high-risk groups are essential steps. Future research should focus on evaluating the efficacy of these interventions to foster a healthier and more sustainable working environment for healthcare professionals.

LIMITATIONS

This study acknowledges certain limitations. First, data collection was conducted via an online survey. Despite the deployment of coordinators to facilitate the process at participating hospitals, the response rate remained relatively low (approximately 20%), which may limit the generalizability of the findings. Second, regarding the environmental assessment, the ICBEN scale has not yet undergone formal psychometric validation in Vietnam, although it has been applied in prior local research. While this instrument constituted a minor component of the study, the lack of formal validation may introduce some degree of measurement uncertainty to the overall data.

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AUTHOR CONTRIBUTIONS

Thang Phan: Conceptualization (Equal), Methodology (Lead), Resource (Equal), Writing – Original Draft (Lead), Writing – Review & Editing (Lead), Investigation (Equal), Supervision (Lead), Project Administration (Equal); **Van Minh Nguyen:** Data Curation (Equal), Formal Analysis (Equal), Writing – Original Draft (Equal), Writing – Review & Editing (Equal), Investigation (Lead); **Nhan Phuc Thanh Nguyen:** Conceptualization (Equal), Data Curation (Equal), Formal Analysis (Equal), Writing – Original Draft (Equal), Writing – Review & Editing (Equal), Investigation (Lead); **Cao Khoa Dang:** Data Curation (Equal), Formal Analysis (Equal), Writing – Review & Editing (Equal), Investigation (Lead); **Hong Quan Le:** Data Curation (Equal), Formal Analysis (Equal), Writing – Original Draft (Equal), Investigation (Equal); **Toan Ket Tran:** Methodology (Supporting), Formal Analysis (Supporting), Validation (Equal), Investigation (Supporting), Supervision (Equal), Project Administration (Supporting); **Phuong Ho Thi Uyen:** Conceptualization (Lead), Methodology (Lead), Formal

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CONFLICT OF INTEREST

The authors declare that they hold no competing interests.

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