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ORIGINAL PAPER

Perception of the work environment of nurses working in intensive care units: a cross-sectional study

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Abstract

Aim: This study aimed to evaluate the perception of the work environment among intensive care unit (ICU) nurses in Slovakia and identify factors that influence their evaluation. *Design:* A cross-sectional descriptive study. *Methods:* The study was conducted between July and October 2023 using the Practice Environment Scale-Nursing Work Index (PES-NWI). Data were collected from 153 ICU nurses across four hospitals. Descriptive statistics, correlation analysis, and nonparametric tests were used for data analysis. *Results:* The work environment received a generally positive evaluation, with collegial nurse-physician relations receiving the highest ratings, whereas staffing and resource adequacy scored the lowest. Significant correlations were found between job satisfaction, satisfaction with material resources, and perception of patient safety and positive evaluations of the work environment ($p \leq 0.05$). Multiple regression analysis identified job satisfaction, satisfaction with material resources, and patient safety evaluation as key predictors of a positive work environment ($p \leq 0.05$). *Conclusion:* These findings underscore the importance of addressing staffing adequacy, resource availability, and leadership support to improve the work environment for ICU nurses, with implications for both nurse retention and patient outcomes.

Keywords: hospital, intensive care units, nurses, work environment.

Introduction

Nurses are essential to health care, with their work environment heavily impacting both patient outcomes and nurse retention. A supportive work environment is linked to better patient safety, greater job satisfaction, and lower burnout rates (Aiken et al., 2018). In contrast, a poor work environment can lead to high turnover, compromised care quality, and increased nurse burnout (Stimpfel et al., 2012). The ICU setting is particularly challenging, given the high acuity of care and the emotional demands of managing critically ill patients. Thus, identifying factors that shape the ICU work environment is crucial for healthcare leaders aiming to enhance nurse well-being and the quality of patient care.

The nursing work environment is multifaceted, encompassing physical, psychological, social, and organizational elements. Physical aspects include resource adequacy, such as staffing, equipment, and facilities. Psychological factors involve the mental and emotional demands on nurses, often intensified by high patient acuity and the need for rapid decision-making (Shah et al., 2021). Social dimensions encompass relationships among healthcare professionals, including nurses, physicians, management, and support staff, which can foster either a collaborative environment or contribute to conflict and stress (McHugh et al., 2021).

Organizational factors are perhaps the most critical, as they encompass the policies, procedures, and cultural norms that govern how nursing work is structured and managed. Issues such as workload, shift patterns, and the level of autonomy nurses have in their roles are all shaped by the organization (Lake et al., 2019). These factors are interrelated, with changes in one aspect of the work environment often leading to ripple effects across others. For instance, inadequate staffing can increase workloads, leading

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to greater psychological stress and strained social relations among staff.

Several key challenges characterize the modern nursing work environment. Chief among these is staffing shortages, a problem that has been exacerbated by the COVID-19 pandemic. According to the World Health Organization (2020), there is a global shortage of 5.9 million nurses, with the deficit being most acute in low- and middle-income countries. In the Slovak Republic, the situation is also bleak, with many hospitals struggling to maintain adequate staffing levels (Tupá, 2020). This shortage has led to increased workloads for existing staff, longer hours, and a higher risk of burnout, which in turn exacerbates the problem by driving more nurses out of the profession (National Academies of Sciences, Engineering, and Medicine, 2021). Another significant challenge is the emotional toll of nursing. Nurses are often exposed to traumatic situations, including patient deaths, severe injuries, and intense suffering. These challenging experiences can result in compassion fatigue, whereby nurses experience a reduced ability to empathize with patients, and burnout, characterized by emotional exhaustion, depersonalization, and a diminished sense of personal achievement (Cañadas-De la Fuente et al., 2015). The psychological toll of these demands was especially pronounced during the COVID-19 pandemic, as the stress of working in high-risk settings led to a surge in mental health concerns among nurses (Lai et al., 2020).

The implications of the nursing work environment extend beyond the well-being of individual nurses to affect the entire healthcare system. A supportive work environment is linked to higher-quality patient care, since nurses who are satisfied with their jobs are more likely to be attentive, thorough, and motivated (Kutney-Lee et al., 2013). Moreover, hospitals with better work environments tend to have lower rates of patient mortality, fewer medical errors, and higher patient satisfaction scores (Aiken et al., 2018). On the other hand, a poor work environment can have severe consequences for healthcare delivery. High turnover rates among nurses can lead to staffing shortages, which in turn increases workloads for remaining staff and reduces the quality of care. This cycle can result in negative outcomes for patients, including longer hospital stays, higher rates of infection, and increased readmission rates (Needleman et al., 2011).

The intensive care unit (ICU) is a critical component of modern health care, where patients with life-threatening conditions receive complex and continuous care. The high-stakes nature of the ICU requires nurses to operate in a fast-paced, high-pressure environment, making their well-being and performance essential for ensuring optimal patient outcomes (Aungsuroch et al., 2024). Therefore, it is crucial to identify and address key factors that shape ICU nurses' perceptions of their work environment. These factors include age, professional experience, job satisfaction, satisfaction with material resources, and perceptions of quality and patient safety.

Each of these factors plays a significant role in determining how nurses cope with the unique demands of the ICU (Dan et al., 2023). For example, age and professional experience influence resilience, adaptability, and the ability to manage high-pressure situations. Experienced nurses often have well-developed critical thinking and decision-making skills, but they may also face cumulative stress, increasing their risk of burnout (Dall'Ora et al., 2020). Job satisfaction and satisfaction with material resources directly affect nurses' morale and performance, with dissatisfaction often leading to errors, increased workload stress, and higher turnover rates (Lake et al., 2019; Stimpfel et al., 2012).

Furthermore, perceptions of quality and patient safety provide critical insights into the systemic challenges nurses face in the ICU. These perceptions not only reflect the adequacy of the work environment but also highlight areas that require targeted improvements to ensure better care delivery (Needleman et al., 2011). Addressing these factors is essential since the ICU's complexity and intensity amplify the consequences of suboptimal work conditions, affecting both nurse retention and patient outcomes.

By understanding how these factors shape the ICU work environment, healthcare leaders can design interventions aimed at enhancing nurse well-being, promoting retention, and maintaining the high standards required for effective critical care. Ultimately, improving these aspects is integral to sustaining a motivated and resilient nursing workforce and ensuring the delivery of high-quality, safe patient care in the ICU (Aiken et al., 2018; Kutney-Lee et al., 2013).

Aim

This study aimed to investigate the perception of the work environment among ICU nurses in Slovakia, with a particular focus on identifying factors that influenced their evaluation.

Methods

Design

This was a descriptive cross-sectional study conducted from July to October 2023, following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies (von Elm et al., 2007).

Sample

A convenience sample of 153 ICU nurses was recruited from four hospitals in Slovakia, including university, teaching, and tertiary hospitals. Respondents were required to have at least one year of experience in the ICU to ensure familiarity with the work environment. Of 215 distributed questionnaires, 166 were returned (77.21% response rate), and 153 were included in the final analysis after excluding incomplete responses.

Data collection

Data were gathered using the Practice Environment Scale-Nursing Work Index (PES-NWI) (Lake, 2002), a tool specifically developed to assess the nursing work environment. The linguistic validation of the PES-NWI followed the guidelines outlined by Wild et al. (2005). The PES-NWI was translated into Slovak, followed by back-translation by independent translators. After the research team achieved consensus, the Slovak version was finalized. Face validity was examined by five qualified nurses, who reviewed the tool for comprehensiveness, relevance, and clarity. Several items were revised for better understanding. Content validity was assessed by seven experts (a head nurse, four nurse managers, two advanced practice nurses) using a 4-point Likert scale. The overall content validity index (S-CVI) was 0.925, with individual item agreement ranging from 0.825 to 0.975. After adjustment, the PES-NWI is considered a comprehensive instrument measuring the perceptions of work environment from the perspective of nurses.

The PES-NWI consists of 31 items assessing various aspects of nurses' work environments, organized into five subscales: nurse involvement in hospital activities (nine items), foundational nursing elements for quality care (ten items), leadership and support from nurse managers (five items), adequacy of staffing and resources (four items), and collaborative nurse-physician relationships (three items). Nurses rate each item on a 4-point Likert scale, from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating a more positive work environment. A mean score is calculated for each subscale, enabling categorization of the work environment: a favorable environment (mean score of at least 2.5 on four subscales), a mixed environment (mean score above 2.5 on two or three subscales), and an unfavourable environment (mean score above 2.5 on one or none of the subscales). To investigate factors that affect the work environment, several sociodemographic characteristics were added to the questionnaire, such as unit type, age, education, working hours per week, overtime hours in the last three months, overall professional experience and current position, perceived adequacy of staff (1 – not adequate at all; 5 – fully adequate), job satisfaction (1 – strongly dissatisfied; 5 – highly satisfied), subjective evaluation of patient safety (1 – poor safety; 5 – excellent safety) and quality care (1 – poor quality; 5 – excellent quality).

Data analysis

Data analysis was performed with IBM SPSS, version 25.0. Descriptive statistics, including means, standard deviations, and frequencies, were used to analyze the PES-NWI instrument and sample characteristics. The instrument demonstrated high acceptability, with minimal missing data ranging from 0.1% to 0.2%. To test the significant associations between the mean score of the PES-NWI, the individual subscales of the PES-NWI, and selected sociodemographic variables (age, professional experience overall, professional experience in the current position, job satisfaction, satisfaction with the material resources, subjective evaluation of patient safety, and quality care), the Spearman correlation coefficient was used. To analyze differences in the evaluation of the work environment based on selected sociodemographic data (specialization training, education, and ICU type), the chi-square test with other nonparametric tests (Mann-Whitney U test, Kruskal-Wallis test) were used. All results were evaluated with a significance level of $p < 0.05$. The reliability of the PES-NWI was assessed using the Cronbach's alpha coefficient, yielding an overall α of 0.920, which indicates excellent reliability.

Results

The sample included 153 ICU nurses, with a mean age of 40.88 years (SD = 11.39). The majority were employed in anesthesiology and intensive care medicine (51.6%) and held a bachelor's degree in nursing (43.1%). Nurses had an average of 18.94 years of professional experience (SD = 12.66), with 11.46 years in their current role on average (Table 1).

Evaluation of the work environment of ICU nurses

The overall mean score for the PES-NWI was 2.82 (SD = 0.41), reflecting a generally positive view of the work environment. The work environment was divided into three categories based on the number of subscales with scores exceeding 2.5, following the approach of Lake and Friese (2006). According to this classification, 56.8% of nurses rated their work environment as favorable (mean scores above 2.5 in four or five subscales), 29.4% as mixed (mean scores above 2.5 in two or three subscales), and 13.7% as unfavorable (none or only one subscale with a score higher than 2.5). Each PES-NWI subscale achieved a mean score above 2.5, indicating a favorable work setting (see Table 2). 'Collegial nurse-physician relations' received the highest rating (M = 3.04, SD = 0.36), while 'Staffing and resource adequacy' had the lowest (M = 2.70, SD = 0.59). This indicates that while ICU nurses value collaboration with physicians, they perceive staffing levels and material resources to be insufficient.

Table 1 Sample characteristics

Variables				N = 153	%
Unit type	internal ICU			27	17.60
	surgical ICU			21	13.70
	pediatric ICU			26	17.00
	clinic of anesthesiology and intensive medicine			79	51.60
Education	secondary vocational education			12	7.80
	higher education			38	24.80
	bachelor's degree			66	43.10
	master's degree or higher			37	24.20
Specialization training	no			61	39.90
	yes			92	60.10
		Min	**Max**	**M**	**SD**
Age		22	62	40.88	11.39
Professional experience in total		0.5	43	18.94	12.66
Professional experience in the current position		0.5	43	11.46	9.82
Job satisfaction		1	5	3.82	0.83
Satisfaction with the material resources		1	5	3.90	0.90
Subjective evaluation of quality		1	5	4.21	0.65
Evaluation of patient safety		1	5	4.03	0.77

Min – minimal values; Max – maximal values; M – mean; SD – standard deviation

Table 2 Description of individual subscales of the PES-NWI

Subscales of the PES-NWI	Min	Max	M	SD
Nurse participation in hospital affairs	1	4	2.69	0.49
Nursing foundations for quality of care	1	4	2.92	0.41
Nurse manager ability, leadership, and support of nurses	1	4	2.80	0.54
Staffing and resource adequacy	1	4	2.70	0.59
Collegial nurse-physician relations	1	4	3.04	0.46
A mean score of the PES-NWI	1	4	2.82	0.41

Min – minimal values; Max – maximal values; M – mean; SD – standard deviation

Correlation analysis of factors affecting the work environment of ICU nurses

Correlation analysis revealed several noteworthy findings across the PES-NWI subgroups (favorable, mixed, and unfavorable). In the favorable subgroup, there were statistically significant positive correlations between job satisfaction ($r = 0.436$, $p < 0.001$), satisfaction with material resources ($r = 0.435$, $p < 0.001$), and perceptions of patient safety ($r = 0.465$, $p < 0.001$) and PES-NWI mean scores. As these variables increased, the evaluation of the work environment also increased (Table 3). In the unfavorable subgroup, job satisfaction showed a significant negative correlation ($r = -0.460$, $p = 0.036$) highlighting dissatisfaction as a major challenge in unfavorable environments. None of the variables in the mixed subgroup achieved significance.

Differences in the evaluation of the work environment of ICU nurses based on selected variables

Variations in ICU nurses' work environment evaluations were observed based on unit type and education level (see Table 4). The work environment was evaluated significantly more highly by nurses working in anesthesiology and intensive care and those who had a master's degree or higher, as indicated the further result of Kruskal-Wallis's test ($p < 0.001$).

Predictors of the work environment in ICUs

The relationship between PES-NWI scores and various individual factors (age, total professional experience, experience in the current unit, job satisfaction, satisfaction with material resources, and subjective evaluations of quality and safety) was analyzed. Model 1 ($R^2 = 0.402$; Adj. $R^2 = 0.373$; SE of estimate = 0.328; df = 152; F = 13.921; $p < 0.001$) identified three significant predictors, explaining 37.3% of the variability in PES-NWI scores (see Table 5). Nurses who reported greater job satisfaction ($\beta = 0.279$; $p < 0.001$), satisfaction with material resources ($\beta = 0.239$; $p = 0.003$), and a stronger perception of overall patient safety on their unit ($\beta = 0.302$; $p < 0.001$) also reported a more favorable work environment.

Table 3 Correlation analysis of the selected variables and the work environment

Variables	Favorable work environment	Mixed work environment	Unfavorable work environment
Age	0.122	0.047	0.128
Professional experience in total	0.026	0.096	0.179
Professional experience in the current position	0.132	0.047	0.072
Job satisfaction	0.436**	0.120	-0.460**
Satisfaction with material resources	0.435**	0.088	-0.227**
Subjective evaluation of quality	0.099	0.026	-0.412
Evaluation of patient safety	0.465**	0.096	-0.239*

**p < 0.05; **p < 0.001*

Table 4 Differences in the evaluation of the work environment

Variables		Favorable work environment (n)	Mixed work environment (n)	Unfavorable work environment (n)	p-value*
Unit type	internal ICU	17	4	6	
	surgical ICU	15	3	3	
	pediatric ICU	20	3	3	< 0.001**
	clinic of anesthesiology and intensive medicine	63	8	8	
Education	secondary vocational education	9	1	2	
	higher education	29	2	7	< 0.001**
	bachelor's degree	49	9	8	
	master's degree or higher	28	6	3	
Specialization training	no	45	9	7	0.608
	yes	70	9	13	

**Chi-square test; **p < 0.001*

Table 5 Predictors of the work environment in ICUs (N = 153)

Model	The work environment (mean score of the PES-NWI) (R^2 = 0.402; Adj R^2 = 0.373; SE of estimate = 0.328; df = 152; F = 13.921; p < 0.001)			
Variables	**Unstandardized β**	**Standardized β**	**t**	**p-value**
(Constant)	1.564	-	5.860	< 0.001**
Age	-0.010	-0.288	-1.390	0.167
Professional experience in total	0.008	0.258	1.137	0.257
Professional experience in the current position	0.005	0.113	1.151	0.252
Job satisfaction	0.139	0.279	3.623	< 0.001**
Satisfaction with material resources	0.109	0.239	2.970	0.003*
Subjective evaluation of quality	0.162	0.302	3.275	< 0.001**
Evaluation of patient safety	-0.032	-0.051	-0.554	0.580

**p ≤ 0.05; **p < 0.001; β – Standardized Beta coefficient; df – degrees of freedom; F – F-value*

Discussion

This study examined the work environment of ICU nurses through the Practice Environment Scale of the Nursing Work Index (PES-NWI). The results provide important insights into the factors shaping ICU nurses' perceptions of their work setting. The positive evaluations across most subscales of the PES-NWI are consistent with findings in other nursing work environment studies, but they also reveal areas in which improvements are needed, such as staffing and resource adequacy (Brešan et al., 2021; Norman & Sjetne, 2017).

The mean PES-NWI score of 2.82 (SD = 0.41) out of 4 reflects a generally positive perception of the ICU work environment. Among the subscales, 'Collegial nurse-physician relations' received the highest mean score, suggesting strong interdisciplinary collaboration. This finding is critical, as nurse-physician collaboration has been repeatedly linked to improved patient outcomes and increased job satisfaction among nurses (Kutney-Lee et al., 2013). Effective collaboration fosters mutual respect, enhances communication, and creates a supportive culture in which nurses feel empowered to contribute to patient care decisions. Interdisciplinary teamwork is particularly vital in ICUs, where the complexity and acuity of care require the integration of diverse perspectives to ensure optimal patient outcomes (Ervin et al., 2018). However, the lower score for 'Staffing and resource adequacy' points to a key challenge faced by ICU nurses. Inadequate staffing and resources are a well-documented issue in healthcare, especially in high-demand settings like ICUs. Research has shown that insufficient staffing levels contribute to nurse burnout, increased job dissatisfaction, and adverse patient outcomes (Griffiths et al., 2018). The association between staffing adequacy and work environment perceptions in this study aligns with broader findings in nursing literature, which emphasize that adequate staffing is essential for maintaining a positive work environment and high-quality care (Aiken et al., 2014).

Various factors influenced ICU nurses' perceptions of their work environment, including education level. Nurses with higher education levels, particularly those with master's degrees or higher, reported more favorable evaluations of the work environment. This observation highlights the interplay between advanced education, professional practice, and organizational culture. Nurses with advanced degrees are typically equipped with deeper clinical knowledge, enhanced critical thinking skills, and leadership training. These competencies empower them to navigate complex patient care scenarios with confidence and efficiency, often resulting in heightened job satisfaction and a perception of supportive work conditions (Mabona et al., 2022). Hospitals that employ advanced-degree nurses often prioritize professional development, fostering an environment that values continuous learning and expertise. These settings are more likely to encourage autonomy, interdisciplinary collaboration, and evidence-based practice – factors associated with improved perceptions of the work environment (Cho et al., 2015). Moreover, higher education enables nurses to participate actively in decision-making processes, policy development, and quality improvement initiatives, further reinforcing their sense of professional fulfillment and engagement (Woo et al., 2017). Additionally, advanced-degree nurses are also better positioned to mentor and support their colleagues, contributing to a cohesive team dynamic and a culture of mutual respect. Their ability to advocate for patient care and workplace

improvements can enhance both patient outcomes and the overall work atmosphere. Consequently, hospitals benefit from the advanced skillset of these nurses, fostering environments in which their contributions are recognized and valued, creating a mutually reinforcing cycle of positivity and growth (Mabona et al., 2022; Woo et al., 2017).

A significant finding of this study was the moderate correlation between work environment perceptions and key outcomes such as job satisfaction, satisfaction with material resources, and patient safety evaluations. The positive relationship between job satisfaction and the work environment underscores the importance of a supportive work environment in fostering nurse well-being and retention. Studies consistently show that job satisfaction is one of the most important predictors of nurse retention, and poor work environments are a major cause of burnout and turnover (Friese & Himes-Ferris, 2013; Kelly et al., 2011). Similarly, satisfaction with material resources was moderately correlated with better perceptions of the work environment. This finding highlights the critical role that adequate resources play in shaping nurses' experiences in ICUs. When nurses have access to the necessary tools, equipment, and supplies, they are better able to provide high-quality care and feel more confident in their ability to meet patient needs. This reduces stress and contributes to a more positive perception of the work environment (Friese & Himes-Ferris, 2013). The study also revealed a significant correlation between patient safety evaluations and work environment perceptions. This aligns with broader research indicating that nurses who view their work environment as supportive and well-resourced are more likely to report high levels of patient safety (Flynn et al., 2012). The availability of adequate staffing, resources, and leadership support allows nurses to focus on patient care, adhere to safety protocols, and collaborate effectively with other healthcare providers, all of which contribute to better patient outcomes.

Regression analysis identified job satisfaction, satisfaction with material resources, and patient safety evaluations as significant predictors of the overall work environment. This finding emphasizes the interconnectedness of these factors and suggests that improving job satisfaction and resource availability can directly enhance nurses' perceptions of their work environment. The strong link between patient safety evaluations and the work environment highlights the critical role of a supportive environment in enhancing patient safety (Lake et al., 2017). The finding that job satisfaction is a key predictor of positive work environment perceptions is consistent with previous studies (e.g., Kelly et al., 2011; Wang & Brower, 2018). Satisfied nurses tend to feel valued and supported, which boosts their engagement and willingness to participate in hospital affairs (Wan et al., 2022). High job satisfaction also reduces burnout, which is associated with improved patient care and lower turnover rates (Kelly et al., 2011).

Limitation of the study

While the study's findings are valuable, several limitations should be noted. First, the study was conducted in a single region, limiting its generalizability to other settings with different healthcare systems and staffing norms, which may affect nurses' perceptions. Second, the reliance on self-reported data introduces potential bias, such as social desirability, which could lead nurses to report more favorable work environments. Additionally, the cross-sectional design only captures a single point in time, preventing causal inferences between work environment factors and outcomes like job satisfaction or patient safety. One notable limitation of this study is the sample size, which may be insufficient for robust psychometric evaluations of the Slovak translation of the PES-NWI. As highlighted by Lake et al. (2024), a sample size of at least 320 is recommended for comprehensive reliability assessments of a 31-item instrument like the PES-NWI. While the reported Cronbach's alpha of 0.920 indicates excellent internal consistency, future studies with larger sample sizes are essential for validating these findings and enhancing generalizability.

Conclusion

The study highlights the significant impact of job satisfaction, material resources, and patient safety on ICU nurses' perceptions of their work environment. These factors were identified as key predictors of a positive work environment, underscoring the need for healthcare institutions to prioritize adequate staffing, resource allocation, and leadership support to improve both nurse well-being and patient outcomes. The findings also point to the importance of continued professional development, since nurses with higher education levels and specialization training reported better work environments. However, to further strengthen the understanding of the ICU work environment, future research should aim to address the limitations of this study by incorporating more diverse samples,

objective measures, and longitudinal designs. Addressing these challenges allows healthcare institutions to foster more supportive, resource-rich environments for ICU nurses, resulting in better staff retention, increased job satisfaction, and enhanced quality of care.

Ethical aspects and conflict of interest

Nurses were included only if they provided their informed consent. They were informed about the anonymity and credibility of the research as well as the possibility to withdraw from the research at any time. The research was carried out according to the recommendations of the Declaration of Helsinki. The authors declare no conflict of interest.

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Author contributions

Conception and design (DK, ŠG), data analysis and interpretation (AS, DK, ŠG), manuscript draft (DK), critical revision of the manuscript (AS, MČ, ŠG), final approval of the manuscript (AS, DK, MČ, ŠG).

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