

## ORIGINAL PAPER

NURSES' WORK ENVIRONMENT, JOB SATISFACTION, AND INTENTION TO LEAVE –  
A CROSS-SECTIONAL STUDY IN CZECH HOSPITALSElena Gurková<sup>1</sup>, Zdeňka Mikšová<sup>1</sup>, Monika Labudíková<sup>2</sup>, Daniela Chocholková<sup>3</sup><sup>1</sup>Department of Nursing, Faculty of Health Sciences, Palacký University in Olomouc, Czech Republic<sup>2</sup>Department of Hemato-Oncology, University Hospital Olomouc, Olomouc, Czech Republic<sup>3</sup>Department of Anesthesiology and Intensive Care Medicine, University Hospital Olomouc, Olomouc, Czech Republic

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## Abstract

**Aim:** The study aimed to determine how Czech nurses perceive individual aspects of their work environment, and examined the differences in perceptions of their work environment related to type of hospital, hospital departments, and individual demographic characteristics. The study included analysis of the relationships between nurses' work environment and: intention to leave, satisfaction with current work position, the role of nurse, and work intensity. **Design:** A cross-sectional descriptive study. **Methods:** The sample involved 371 nurses working in the internal medicine and surgical departments of four hospitals in the Olomouc region. The Czech version of the Practice Environment Scale of the Nursing Work Index (PES-NWI) was used to collect data. Data were analyzed using exploratory and confirmatory factor analysis, the Pearson chi-squared test, the Mann-Whitney test, and Spearman's correlations. **Results:** Nurses from university hospitals evaluated their work environment significantly more highly than nurses in regional non-university hospitals. No significant difference between internal medicine and surgical hospital wards was confirmed. Weak to moderate positive correlations were revealed between nurses' work environment and: satisfaction with the role of nurse, satisfaction with current work position, and satisfaction with team collaboration. Nurses who considered leaving their current job or work position evaluated their work environment significantly more negatively than nurses who did not intend to leave their job. **Conclusion:** The attributes of nurses' work environment are related to nurses' satisfaction at work and their intention of staying in their workplace. Variables of hospitals greatly improved overall assessment of the work environment.

**Keywords:** intention to leave, job satisfaction, nurses, work environment.

## Introduction

Nurses' work environment (NWE) includes modifiable organizational characteristics of the work environment regulating (facilitating or restricting) professional nursing practice and autonomy (Lake & Friese, 2006; Lake et al., 2019). Over the last four decades, NWE quality has been examined as a significant work-related factor affecting nurse and patient outcomes (Aiken et al., 2011, 2012; Kutney-Lee et al., 2013; Lake et al., 2019; Nascimento & Jesus, 2020). NWE greatly affects nurses' job outcomes – i.e., nurse retention, turnover intention, burnout (Aiken et al., 2012; Choi et al., 2013; Kutney-Lee et al., 2013; Lake et al., 2019; Liu et al., 2018); and nurse perceptions of quality and safety of nursing care provided (Aiken et al., 2011, 2012; Lake et al., 2016, 2019). It also affects the satisfaction of patients with nursing care, and thus

patient perception of quality of nursing care (Aiken et al., 2012; You et al., 2013). Syntheses of research studies (Lake et al., 2019; Lee & Scott, 2018; Nascimento & Jesus, 2020), and important international studies (e.g., Aiken et al., 2018; Ausserhofer et al., 2013) recently published, have clearly confirmed that NWE is closely related to patient safety and indicators of nursing care quality (patient mortality rate, failure to rescue, falls, bed sores, medication malpractice, repeated admission to hospital, length of hospitalization, and infections related to nursing care). The relationship between unfavorable NWE and poor nurse outcomes, quality of nursing care, and patient safety has become a global phenomenon (Kutney-Lee et al., 2013).

Historically, the increase in scientific interest in examining NWE has been greatly influenced by research associated with the so-called "Magnet movement", or the concept of the attractive "Magnet" hospital. The origin of research focusing on Magnet hospitals is closely related to attempts to resolve the problem of critical nurse shortages in hospitals (McClure & Hinshaw, 2002; Trinkoff et al.,

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2010) in the USA in the 1980s (Aiken et al., 2008; Trinkoff et al., 2010). The lack of nurses in the USA at that time was so severe that it endangered the running of hospitals and their ability to ensure quality of care. The lack of nurses, problems with retaining them, and the high level of turnover in hospitals encouraged interest in examining the effects of NWE in this area.

The initial research carried out in the USA in the 1980s by the American Academy of Nursing (McClure & Hinshaw, 2002) focused on identifying and analyzing the human resources procedures and organizational attributes of those hospitals successful in recruiting and retaining nurses. It was aimed at examining the systemic characteristics endangering or supporting the development of professional nursing practice (Aiken et al., 2008; McClure & Hinshaw, 2002). The label “Magnet” was awarded to those healthcare organizations identified as attractive to nurses (i.e., those successful in gaining, keeping, and motivating nursing staff) and those emphasizing good work conditions, with a supportive NWE, and with a team capable of providing quality nursing care (Aiken et al., 2008; Trinkoff et al., 2010). Studies into the Magnet movement identified 14 “Forces of magnetism” that were later reclassified as the five basic components of the Magnet model. The ideas of the Magnet movement were maintained and developed in research over the following decades. An independent division of the American Nurses Credentialing Center (ANCC) and the accreditation program recognizing Magnet hospitals, known as the *Magnet Recognition Program®*, was developed. Being designated a Magnet hospital is currently the most prestigious award that any healthcare provider can aspire to in the area of providing excellence and innovations in professional nursing practice. Other studies on Magnet hospitals (Kramer & Schmalenberg, 1991; McClure & Hinshaw, 2002; Trinkoff et al., 2010) have focused on monitoring the relationship between human resources procedures and associated NWE organizational characteristics, nurse outcomes, quality of care, and care safety. In summary, research related to the Magnet movement has significantly increased interest in examining NWE characteristics, from macro approaches aimed at clarifying wider attitudes of nurses to their work environment, down to micro approaches associated with particular environmental variables and their impact on provision of care and retention of nurses (Choi et al., 2013).

The growing interest in the issue of NWE is indicated by a number of influential European international projects monitoring the predictive importance

of work environment in the area of quality and care safety – in particular, the European Nurses’ Early Exit study (NEXT), the Nurse Forecasting: Human Resources Planning in Nursing study (RN4CAST), and (currently the most important) the *Magnet4Europe* study, which focuses on the implementation of the evidence-based principles of the international accreditation program, the *Magnet Recognition Program®*, to reorganize the work environment of nurses in six European countries.

The research associated with the Magnet movement has contributed also to the development of NWE self-assessment tools. A significant number of questionnaire methods assessing NWE were developed for studies concerning Magnet hospitals. Today, several valid and reliable instruments for assessing NWE are available. Three follow-up review studies (Bae, 2011; Lake 2007; Norman & Strømseng Sjetne, 2017) were undertaken to compare their contents, revealing considerable divergence in the definition of domains and attributes of NWE. Bae (2011) organized nurses’ work conditions into ten concepts (autonomy, philosophy emphasizing the quality of clinical care, nurses’ participation, supportive managers, collaborative relationships with physicians or peers, staffing and resource adequacy, decentralized involvement in unit decision-making, patient-centered climate, and busyness). Subsequently, Norman & Strømseng Sjetne (2017) performed an analysis of 35 questionnaires related to assessment of NWE attributes. The questionnaires generated various domains, with supportive managers, collaborative relationships with peers, busyness, and professional practice and autonomy, being the common domains. The most significant and widespread tools, including revised and adapted versions (the Nurse Working Index – NWI; Essentials of Magnetism – EOM; the Practice Environment Scale of the Nursing Work Index – PES NWI), were created in the USA as part of the research on Magnet hospitals (Aiken & Patrician, 2000; Kramer & Hafner, 1989; Kramer & Schmalenberg, 2004, 2005; Lake, 2002). Currently, the PES-NWI is the most commonly used tool (Lake, 2002). This tool was mentioned and recommended in the most recent review of NWE tools for further research due to its widespread use, and suitable length and content (Lake, 2007; Lake et al., 2019). It is based on factor analysis of the revised version of the NWI tool (Aiken & Patrician, 2000; Kramer & Hafner, 1989). Key organizations that support the quality of medical care in the USA have recommended the PES-NWI as a tool suitable for assessing the quality of NWE. Its theoretical relevance and domain background, single answer

format, and strong empirical base of evidence are the strengths of the PES-NWI (Lake et al., 2019). The PES-NWI has been translated into a number of languages, and has been used in a good number of international projects (e.g. *RN4CAST*) and various clinical settings (in-patient and out-patient departments of acute and intensive care, surgical, internal medicine, and psychiatric wards, and in dialysis-providing centers (Lake & Friese, 2006). For these reasons, and in order to support the development of consistent and comparable evidence regarding new, we decided to use this scale in the context of the selected Czech hospitals.

## Aim

The study aimed to determine how Czech nurses perceive individual aspects of their work environment, and to examine differences in nurses' perceptions of work environment relating to type of hospital, hospital ward, and individual demographic characteristics. The study also included an examination of the relationship between nurses' work environment and: their intention to leave their job, their satisfaction with their work position, the role of nurse, and work intensity.

## Methods

### Design

A cross-sectional descriptive study. The STROBE checklist for observational cross-sectional studies was followed for the reporting of the research study.

### Sample

All university hospitals ( $n = 1$ ) and regional hospitals ( $n = 7$ ) in the Olomouc region were invited to participate in the study. Only four hospitals agreed to participate. The research sample was made up of one university and three regional (non-teaching) hospitals that had given their written consent to the study. The intentionally selected nurses from these hospitals were contacted and were included in the research sample if they: a) worked in standard surgical or internal medicine wards; b) provided care to adult patients; c) worked shifts. Nurses were not included if they: a) worked in pediatric or obstetric-gynecological wards; b) worked in a management position. For statistical reasons, hospitals were divided into two groups – university hospitals (one hospital with more than 1,000 beds) and non-university hospitals (two hospitals with fewer than 300 beds, and one hospital with more than 300 beds). The units were divided into two groups: surgical and internal; within the first group, the surgical, trauma, orthopedic and otorhinolaryngological departments

were contacted; the second group included internal medicine, neurological, geriatric, and oncological wards and the department of palliative care.

### Data collection

The set of questionnaires consisted of the following parts: demographic data / work characteristics / organizational variables (15 items); the PES-NWI questionnaire (Lake, 2002), and questions related to nurses' job satisfaction and their intention of leaving. NWE was evaluated through the Czech version of the PES-NWI (Lake, 2002), comprising 31 items divided into five domains (Table 1). Each item was rated on a four-point Likert scale ranging from 1 – “strongly disagree” to 4 – “strongly agree”. Higher scores indicated more positive nurse perceptions of the domains of NWE. PES-NWI items relate to working conditions in a whole hospital or in nursing units. The Czech version of the questionnaire, developed by the University of Ostrava (Jarošová & Zeleníková, 2017), was used with the consent of the authors of the original and the Czech versions. As recommended by the author of the PES-NWI, we calculated the overall PES-NWI composite score (the mean of the five subscale scores), nurse-specific subscale scores (the mean of the items in the subscale) and hospital-level scores (the item-level mean was calculated from all responses, followed by standard computation of subscale score).

The study also aimed to verify the construct validity and reliability of the Czech version of the PES-NWI. The results of psychometric analysis performed through exploratory and confirmatory factor analysis did not clearly confirm the original five-factor model (Table 1). To check the construct validity, first, the assumptions behind the factor analysis were verified. A matrix of Spearman's correlation coefficients for all 31 items of the Czech version of the PES-NWI was constructed, a scree plot was made to graphically verify the number of factors observed, and the Kaiser-Meyer-Olkin measure and Bartlett's test of homogeneity were calculated. Exploratory analysis (with Varimax rotation) and confirmatory analysis were used to confirm the construct validity. During the confirmatory factor analysis, goodness-of-fit indices were calculated. In the correlation matrix, 53.1% of correlation coefficients were lower than the required value of 0.3. Due to the high occurrence of low correlation coefficients, it was impossible to identify items that should be excluded from the analysis in order to confirm the assumptions. The value of the total Kaiser-Meyer-Olkin measure (KMO), at 0.905, exceeded the recommended value of 0.6, and the Bartlett's test value was significant ( $p < 0.0001$ ).

KMO values of individual items ranged from 0.828 to 0.948. Based on the given prerequisites for the factor analysis, only the first prerequisite, regarding the correlation of individual items, was not met. The other prerequisites were met.

Exploratory factor analysis indicated a six-factor solution, which explained 60.9% of the total variance. The first factor explained 33.1% of the variability in items, the other factors explained from 3.6% up to 8.1% of variability. Three items (items 11, 17, and 31) were excluded since they saturated more than one factor to the same extent, and, therefore, could not be unambiguously assigned to a single factor (cross-loadings). After three items were excluded, results of the confirmatory factor analysis led to a five-factor solution (Table 1), in which only two criteria were met. The

comparative-fit index (CFI) was 0.921. The root mean square error of approximation (RMSEA) was 0.055. The normed fit index (NFI) was 0.865. The Tucker–Lewis index (TLI) was 0.880. The five-factor solution explained 50.6% of the total variance.

Internal consistency was determined through Cronbach alpha coefficient. The internal consistency for 31 PES-NWI items was  $\alpha = 0.930$ , and for individual subscales ranged from 0.789 to 0.867 (Table 3). The results indicated good internal consistency in the Czech PES-NWI version. For this reason, and in order to compare the outcomes with foreign studies, we did not reduce the number of items but kept the original number of items and the subscale structure.

**Table 1** Differences in the factor structure of the PES-NWI between US and Czech versions

Dimensions of the PES-NWI	Items in the US version	Results of the EFA / CFA of the Czech version
<b>Facility – level subscales</b>		
nurse participation in hospital affairs	9 items (5; 6; 11; 15; 17; 21; 23; 27; 28)	8 items* (4; 5; 6; 15; 21; 23; 26; 27)
nursing foundations for quality of care	10 items (4; 14; 18; 19; 22; 25; 26; 29; 30; 31)	7 items (14; 18; 19; 22; 25; 29; 31)
<b>Unit – level subscales</b>		
nurse manager ability, leadership, and support of nurses	5 items (3; 7; 10; 13; 20)	6 items** (3; 7; 10; 13; 20; 28)
staffing and resource adequacy	4 items (1; 8; 9; 12)	3 items (8; 9; 12)
collegial nurse-physician relations	3 items (2; 16; 24)	4 items*** (1; 2; 16; 24)

\*Three items (11; 17; 31) were removed due to cross-loadings. Two items (4; 26) from the American factor “Nursing foundations for quality of care” were put together with items from the dimension “Nurse participation in hospital affairs” in the Czech version. \*\*One item (28) from the American factor “Nurse participation in hospital affairs” was put together with items from the dimension “Nurse manager ability, leadership, and support of nurses” in the Czech version. \*\*\*One item (1) from the American factor “Staffing and resource adequacy” was put together with items from the dimension “Collegial nurse-physician relations” in the Czech version.

The last part of the questionnaire set consisted of six items adopted from the MISSCARE Survey questionnaire (Kalisch & Williams, 2009). These questions evaluated satisfaction with teamwork, the role of nurse, current work position, and intention to leave the job (four items). Satisfaction with work position, team work, and the role of nurse were assessed on a five-point Likert scale, ranging from 1 – “very dissatisfied” to 5 – “very satisfied”, whereby a higher score indicated a higher level of satisfaction in nurses.

A total of 554 questionnaires in print format were distributed to nurses at their workplaces in four selected Czech hospitals in the Olomouc region. The researcher was present in person in each of the selected hospitals and provided explanation of the purpose of the research to head nurses on the wards included in the study. Questionnaires were handed

out to all general nurses and practical nurses working on these wards. Nurses’ participation in the project was voluntary. Completed questionnaires were regarded as consent to participation in the study. The data were collected between April and September 2020, i.e., between the first and the second waves of the COVID-19 pandemic in the Czech Republic. Of the 554 distributed questionnaires, 371 were returned (a return rate of 66.97%).

### Data analysis

Data were analyzed using the Statistical Package for the Social Sciences 20.0. After data-cleaning, descriptive statistics were used. Since the data were not normally distributed (the Shapiro-Wilk test was used), the analysis was performed using nonparametric tests. For group comparisons, the

Mann-Whitney test was used to test differences in rating NWE by hospital and unit type. Proportion comparisons were carried out with Pearson's chi-square test. For determining the associations and correlations between variables, nonparametric Spearman correlations were used. A p-value < 0.05 was taken to indicate statistical significance for all comparisons.

## Results

The characteristics of the four participating hospitals are reported in Table 2. Almost half of the nurses (57.7%) worked in the university hospital and in medical units (56.0%). Over two-thirds of nurses (66.7%) worked rotating shifts. Most (77.2%) had graduated from secondary schools for nurses or had a higher degree (diploma). Only 18.4% had completed a specialized training program. The majority of nurses reported that during their last shift they had had up to six admissions and / or discharges. The mean number of patients during their last shift was 12.35 (SD = 6.35).

**Table 2** Sample characteristics

Characteristics		n	%
<b>Gender</b>	female	343	92.5
	male	18	4.9
<b>Work position</b>	general nurse	241	66.2
	practical nurse	56	15.4
	general nurse with specialization	67	18.4
	secondary vocational school or higher degree (diploma)	277	77.2
<b>Highest education level</b>	university (bachelor's or master's degree)	82	22.8
<b>Most frequent shifts</b>	days	112	30.4
	nights	8	2.2
	rotated shifts	246	66.7
	others	3	0.8
<b>Department</b>	surgical	160	44.0
	non-surgical	204	56.0
<b>Hospital type</b>	teaching (faculty or university) hospital	214	57.7
	general hospital	157	42.3
<b>Leaving intentions</b>	leave	43	12.0
	stay	315	88.0
<b>Work intensity</b>			
patient admissions	1 to 3 patients	232	67.1
	4 to 6 patients	87	25.1
	7 to 10 patients	23	6.6
	more than 10 patients	4	1.2
patient discharges	1 to 3 patients	241	70.5
	4 to 6 patients	82	23.9
	7 to 10 patients	14	4.2
	more than 10 patients	5	1.4
<b>Characteristics</b>		<b>mean</b>	<b>SD</b>
	age	37.51	10.74
	work experience in years	15.70	11.21
	work experience on current hospital ward	8.60	8.17
	hours of overtime in the last three months	24.21	21.65
	number of patients taken care of during the last shift	12.35	6.35

SD – standard deviation

## Nurse work environment

Based on the descriptive analysis of PES-NWI items (Table 3), we can state that all mean values of subscales were higher than 2.5 (the neutral midpoint for a four-point response set). The highest score was achieved in the subscale “*Foundations for quality*”, and nurses scored lowest in the subscale “*Staffing and resource adequacy*”.

We used two distinct strategies, both of which involved dividing nurse work environment into three categories.

In the first strategy, based on the work of Park et al. (2018), the value of the 25<sup>th</sup> and the 75<sup>th</sup> percentile of the total PES-NWI score were calculated. Subsequently, NWE was divided into three groups according to the following scheme:

- good NWE (> 75<sup>th</sup> percentile of the mean distribution for the overall PES-NWI scale);
- moderate environments (25<sup>th</sup> to 75<sup>th</sup> percentile);
- poor environments (< 25<sup>th</sup> percentile).

**Table 3** Subscale scores of the PES-NWI

	Hospital-level scores of the PES-NWI		Nurse-specific subscale scores of the PES-NWI		Cronbach's alpha coefficient
	mean	SD	mean	SD	
Nurse participation in hospital affairs	2.74	0.26	2.74	0.40	0.832
Nursing foundations for quality of care	3.05	0.22	3.04	0.39	0.802
Nurse manager ability, leadership, and support of nurses	2.93	0.24	2.93	0.63	0.867
Staffing and resource adequacy	2.65	0.24	2.65	0.63	0.789
Collegial nurse-physician relations	2.93	0.06	2.92	0.56	0.813
Composite score of subscales			2.82	0.42	0.930

SD – standard deviation

Using this procedure, 24.6% of nurses evaluated NWE as good, 50.0% as moderate, and 24.9% as poor.

The second strategy was based on the recommendations of Lake & Friese (2006). A mean score of five defined subscales was determined for each nurse, the value of the score of each subscale was compared to the value of 2.5 (the neutral midpoint for a four-point response set). NWE was classified into three groups, based on the number of subscales with score higher than 2.5:

- favorable NWE (mean score in four or five subscales was higher than 2.5)
- mixed NWE (mean score in two or three subscales were higher than 2.5)
- unfavorable NWE (none or only one of the five subscales reached a value higher than 2.5).

Using this procedure, 63.3% of nurses rated NWE as favorable, 30.0% as mixed, and 7.0% as unfavorable.

We found that NWE was rated significantly more highly in university hospitals than in regional hospitals. This outcome was valid for assessment of NWE using either strategy (Table 4). The results of the Mann-Whitney U test ( $p < 0.0001$ ) indicated a significant difference in the total PES-NWI score between university and regional hospitals.

On the other hand, no significant difference in rating NWE between surgical and internal medicine wards was found (Table 4). In addition, the Mann-Whitney U test results ( $p = 0.231$ ) indicated no significant difference in the total PES-NWI score between surgical and internal hospital units.

We found that nurses intending to leave their jobs or work positions rated NWE significantly less positively (mean = 2.64; SD = 0.32; median = 2.68) than nurses who did not consider leaving their jobs (mean = 2.90; SD = 0.43; median = 2.86). The difference was significant ( $p < 0.0001$ ).

**Table 4** Differences between hospitals and units in rating of NWE

Items		n (%)	n (%)	n (%)	p-value*
Classification according to the 25 <sup>th</sup> and 75 <sup>th</sup> percentile (Park et al., 2018)					
		Good NWE	Moderate NWE	Poor NWE	
Hospital type	university	68 (31.9)	103 (48.4)	42 (19.7)	0.0002
	general	23 (14.6)	84 (53.5)	50 (31.8)	
Unit type	surgical	43 (27.0)	85 (53.5)	31 (19.5)	0.075
	medical	46 (22.5)	97 (47.5)	61 (29.9)	
Classification according to scoring innovation introduced by Lake & Friese (2006)					
		Favourable NWE	Mixed NWE	Unfavourable NWE	
Hospital type	university	154 (72.3)	49 (23.0)	10 (4.7)	< 0.0001
	general	79 (50.3)	62 (39.5)	16 (10.2)	
Unit type	surgical	99 (62.3)	51 (32.1)	9 (5.7)	0.577
	medical	127 (62.3)	60 (29.4)	17 (8.3)	

\*Chi-square test; NWE – nurse work environment

Two weak negative correlations were confirmed between overall PES-NWI score and: years of work experience on the current hospital ward, number of hours of overtime worked in the last three months, and number of patients taken care of during the last shift. Weak to moderately strong correlations were

confirmed between overall PES-NWI score and: satisfaction with role of nurse, satisfaction with current work position, and satisfaction with the collaborative team (Table 5).

**Table 5** Correlations between NWE and other variables

	Years of experience	Overtime	Satisfaction with current position	Satisfaction with being a nurse	Satisfaction with the level of teamwork	Number of patients taken care of during the last shift	Collegial nurse-physician relations	Staffing and resource adequacy	Nurse manager ability, leadership, and support of nurses	Nursing foundations for quality of care	Nurse participation in hospital affairs
<b>Overall PES-NWI score</b>	-0.125*	-0.239***	0.462***	0.375***	0.493***	-0.182***	0.674***	0.786***	0.830***	0.712***	0.714***
<b>Nurse participation in hospital affairs</b>	-0.039	-0.140*	0.339***	0.327***	0.289***	-0.201***	0.342***	0.533***	0.521***	0.546***	
<b>Nursing foundations for quality of care</b>	-0.069	-0.157*	0.357***	0.375***	0.364***	-0.122*	0.383***	0.447***	0.596***		
<b>Nurse manager ability, leadership, and support of nurses</b>	-0.057	-0.198**	0.377***	0.269***	0.511***	-0.113*	0.472***	0.521***			
<b>Staffing and resource adequacy</b>	-0.086	-0.379***	0.360***	0.255**	0.368***	-0.179**	0.387***				
<b>Collegial nurse-physician relations</b>	-0.113*	-0.120*	0.303***	0.320***	0.368***	0.028					
<b>Number of patients taken care during the last shift</b>	-0.009	0.102	-0.205***	-0.180**	-0.041						
<b>Satisfaction with the level of teamwork on this unit</b>	-0.067	-0.243***	0.451**	0.365**							
<b>Satisfaction with being a nurse</b>	-0.006	-0.169**	0.603***								
<b>Satisfaction with current position</b>	-0.047	-0.212**									
<b>Overtime</b>	-0.158*										

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; Overall PES-NWI score: the mean of the five subscale scores of the PES-NWI (Practice Environment Scale of the Nursing Work Index).

## Discussion

A positive NWE is considered to be key to retaining nurses in the workplace and ensuring quality and safe nursing care. The burden of the COVID-19 pandemic on the Czech healthcare system and hospitals significantly affected nurses and their perception of their work environment. Our cross-sectional study was performed between the first and the second waves of the COVID-19 pandemic in the Czech Republic, the outcomes of which can thus provide an interesting insight into individual areas of NWE in acute hospitals from nurses' perspectives. The PES-NWI, one of the most frequently used tools to rate NWE, was used in our study. Its wide

applicability across many countries and clinical settings (Lake et al., 2019; Warshawsky & Havens, 2011) means that it makes it possible to obtain consistent and comparable evidence for the examination of NWE.

The first important output of the study was an evaluation of the construct validity and internal consistency of the Czech version of the PES-NWI, which had not been published previously. The PES-NWI has been used and validated in several European countries in connection with the well-known *RN4CAST* project (Aiken et al., 2018; Almeida et al., 2020; Ausserhofer et al., 2013; Warshawsky & Havens, 2011). The most common



modification in various countries is revision of the wording of items, the elimination of non-relevant items, or more precise specification of the organizational entity (type of workplace), aimed at increasing the relevance of NWE rating in particular cultures. In the Czech version, no items were modified or eliminated. The second most common change in the various PES-NWI versions is a reduction of the number of items, or a reorganization of items into various subscales due to factor analysis outcomes. Our study revealed the instability of the suggested five-factor solutions and recommended minor changes in the grouping of items into subscales (Table 1). On the other hand, internal consistency of the original five subscales was relatively high (Table 3). In future research, we recommend that the factor structure of the Czech version be tested.

In accordance with previous studies, our study dealt with the PES-NWI composite score. Compared to studies in the USA and in Europe (Lake & Friese, 2006; Lake et al., 2020; Warshawsky & Havens, 2011; Wei et al., 2018), in our study, the values of the PES-NWI were above 2.5 and nurses rated their work environment as favorable. We also found, in accordance with the review study by Warshawsky & Havens (2011), that the most highly rated area was the subscale “*Nursing foundations for quality of care*”, while the area of staffing gained the lowest score. Items which gained the highest level of agreement from nurses included those related to having a preceptor program for newly hired nurses, an expectation of high-quality standards of care provided by the hospital, and the support of head nurses. Items awarded the lowest score included opportunity for nurses to participate in making decisions in the hospital, being involved in internal management of the hospital, and sufficient number of nurses.

A considerable number of studies (Warshawsky & Havens, 2011; Wei et al., 2018; Zeleníková et al., 2020) have concerned the relationship between NWE and organizational structure variables (type of the healthcare facility, location, size of the facility, teaching status, number of patients per nurse). The vast majority of American studies have focused on comparison of NWE in “Magnet” and “Non-Magnet” hospitals (Lake & Friese, 2006; Warshawsky & Havens, 2011). Our study aimed to identify differences in NWE with respect to two organizational structured variables – teaching status of hospitals, and type of hospital (hospital and unit variables). We confirmed that nurses working in university teaching hospitals rated NWE higher than nurses from regional non-teaching hospitals.

On the other hand, differences between type of unit (internal versus surgical) were not significant. Similar goals were found in the Czech study by Zeleníková et al. (2020). They examined differences in NWE according to location of hospital, finding that location of hospital did not have any significant effect on NWE rating. Although NWE was rated more highly by nurses from regional city hospitals compared to nurses working in hospitals in smaller towns, the differences were not significant.

NWE rating in this study positively correlated with job satisfaction of nurses – particularly with satisfaction with team collaboration on the ward, and satisfaction with current work position. Nurses intending to stay in their current workplace for the foreseeable future rated NWE significantly more highly than nurses intending to leave their job. The positive effect of NWE on job satisfaction and nurses’ intention to stay in their workplace were also reported in outcomes of the last published meta-analysis of 17 studies in a research sample of 165,024 nurses from 2,677 hospitals (Lake et al., 2019). This meta-analysis confirmed that NWE had the greatest effect in the area of *Nurse job outcomes*. Nurses working in a more positive work environment had a 28% – 32% lower probability of reporting work dissatisfaction, burnout, or intention to leave. They also had a 23% – 51% lower probability of reporting low levels of quality and safety in nursing care at the workplace (Lake et al., 2019). A positive relationship has been determined between PES-NWI score and other nurse outcomes: organizational commitment, job enjoyment, nurse empowerment (Warshawsky & Havens, 2011), relationships between nurses at the workplace, nurse mental health, work performance, and productivity (Wei et al., 2018). Attributes of NWE, especially staffing, adequate resources, and management are significant predictors of job satisfaction in nurses and of their retention in the workforce (Choi et al., 2013). The lack of general nurses in the Czech Republic is considered to be a pervasive long-term problem. According to the Organisation for economic co-operation and development (OECD) statistics in the *Health at a glance* document (OECD, 2020), there are 8.1 nurses per 1,000 inhabitants in the Czech Republic. In terms of number of nursing graduates, the Czech Republic is one of the countries with a long-term downward trend (only 14 graduates per 100,000 inhabitants). The lack of general nurses is reciprocally associated with NWE aspects. Longitudinal research into NWE attributes and their impact on nurse outcomes could contribute to a deeper analysis of the quality of nursing care in acute in-patient hospital care, as indicated by



foreign studies (Kutney-Lee et al., 2013; Lake et al., 2020). Longitudinal changes in organizational environment characteristics, or their improvement, lead to higher nurse satisfaction at work, lower levels of nurse burnout, and fewer nurses with the intention of leaving their job.

### Limitation of study

The study outcomes cannot be extrapolated to the whole population of Czech nurses since nurses were not randomly selected in the research sample; data gathering took place in hospitals in a particular Czech region.

### Conclusion

Attributes of the work environment of nurses are related to their satisfaction at work and their likelihood of remaining in the job. Hospital variables significantly contributed to their overall rating of the work environment. The outcomes of the study can help initiate measures to improve the NWE, and thus the quality of nursing care in the Czech context.

### Ethical aspects and conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship and / or publication of this article. The research protocol was approved by the Ethical Committee of the Faculty of Health Sciences of Palacký University Olomouc.

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### Author contributions

Concept and design (EG), analysis and data interpretation (EG, ZM, ML, DCH), preparation of the manuscript (EG, ZM, ML, DCH), critical revision of manuscript (EG, ZM), final revision (EG, ZM).

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