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# Shift Work, Quality of Life and Work Ability among Croatian Hospital Nurses

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## ABSTRACT

*This paper is a report of a study of the associations of shift work with work ability and quality of life (QoL) among clinical nurses. A cross-sectional study was conducted in 2007–2008 on 1124 nurses using the Work Ability Index Questionnaire and the Quality of Life Questionnaire (WHOQOL-BREF). Lower education was a predictor for low level of work ability and low physical health domain of QoL. Older age and having no partner were statistically significantly related to lower social interaction. Predictors significantly related to low environment domain of QoL were low education and shift work. Shift workers had higher level of level of work ability, but clinically insignificant. The study provides no evidence of a significant association between shift work and work ability or quality of life. Education has a positive association with nurses' work ability and quality of life.*

**Key words:** nurses, shift work, work ability, quality of life, education

## Introduction

There is a lack of consistent scientific evidence concerning nurses' quality of life (QoL) and its determinants related to working environment. Moreover, the current severe shortage of nursing professionals is projected to continue in the same pattern until 2020<sup>1</sup>. Therefore, information about nurses' work ability, quality of life and ways to improve them could be valuable not only to nurses and their employers but to the whole healthcare community. Nurses form the largest group of health professionals in all countries. One of the characteristics of their work is exposure to work-related stressors which in turn can have harmful consequences on their health. Demanding work environment combined with minimal control and the lack of social support from colleagues results in increased stress, which can also have consequences on quality of their work and patient safety<sup>2</sup>. Occupational stress has been connected to emotional fatigue and exhaustion<sup>3</sup>. The combination of high demands and low decision latitude and the combination of high efforts and low rewards are prospective risk factors for common mental disorders which suggests that the psychosocial work environment is important for mental health<sup>4</sup>. Par-

ticularly nurses in transitional countries experience high effort-reward imbalance which is associated with burn-out and intention to leave nursing profession<sup>5</sup>.

Shift work is a major characteristic of all health professionals, especially nurses. The evidence suggests that shift and night work have a significant influence on sleep, digestive and cardiovascular disorders, as well as health and safety at work<sup>6</sup>. Many intervention studies have suggested measures to alleviate the physiological, psychological and social consequences of shift work, most importantly interventions in regulation of overtime and excessive work hours, individual work time control and increased recovery due to sleep promoting principles in shift rotations<sup>7</sup>. More recent studies are in favor of measures such as reducing the number of consecutive night shifts, avoiding long shifts or early-morning shifts, introducing rapidly forward-rotating shifts, permitting sufficient time for sleep and rest between work shifts<sup>8</sup>.

Work ability is worker's capacity to perform a job considering his work demands, health and mental resources. The Finnish Institute of Occupational Health (FIOH)

has developed the concept of promotion of work ability during aging, considering one's health, functional capacities, physical and psychosocial work environment and professional competence, which through good level of work ability and health enables high productivity, quality of work, quality of life (QoL) and well-being and a successful and meaningful retirement<sup>9,10</sup>.

A cross-sectional study conducted in 10 European countries demonstrated that work ability decreased significantly with age and found a significant association between low level of work ability index (WAI) and intention to leave nursing, especially among younger nurses<sup>11</sup>. It has been suggested that job strain can significantly influence some dimensions of QoL: physical functioning, role functioning related to physical health, vitality, social functioning, and mental health<sup>12</sup>. A study in Japan using WHOQOL-BREF showed a positive association between job control and physical health, psychological and social relationship domains, while job demand was negatively related to physical health domain indicating that higher job control could result in better subjective feeling of well-being<sup>13</sup>.

Although nurses spend most of their time directly dealing with the patients, it is not clear to what extent they consider their own health and QoL important. Recent studies in Croatia addressing occupational stress and work ability of nurses defined six important groups of occupational stressors: 'organization of work and financial issues', 'public criticism', 'hazards at workplace', 'interpersonal conflicts at workplace', 'shift work' and 'professional and intellectual demands'; and identified predictors related to low level of work ability: organization of work and financial issues, lower educational level and older age<sup>14</sup>. Another study on midwives has found that their work-related stress occurs due to: insufficient work resources, insufficient number of co-workers, poor organization at work, communication with superiors and emotional work but their work ability in relation to the demands of their job is good<sup>15</sup>.

In this paper, we will show that nurses with higher educational levels have better work abilities than their colleagues with lower educational levels and that lower level of work ability among nurses is associated with poor organization of work, insufficient financial resources, lower educational level and older age. Organization of work and financial issues were perceived as being the most severely stressful among both educational groups of nurses. This would implicate that providing educational and career prospects can contribute to decreasing nurses' occupational stress levels and thus maintain their work ability. On addition, hospital managers should develop strategies to address and improve the quality of working conditions for nurses in Croatian hospitals.

## Subjects and Methods

The aim of this study was to assess the associations of shift work with work ability and QoL among clinical nurses.

A cross-sectional study was conducted in 2007 and 2008 in seven hospitals in Croatia. The hospitals were randomly chosen from the list of all 70 hospitals in Croatia. They represented all organizational types of hospitals: two university hospitals, four general/county hospitals and one specialized hospital.

The questionnaires were given to all nurses employed in those hospitals at the time (N=1718) according to the Croatian Health Service Yearbook 2008, and 1124 nurses agreed to participate in our study which gives the response rate of 65%. As non-respondents refused to participate in the study at its beginning, it was not possible to collect any demographic information on them needed to make comparisons with respondents.

The work ability was measured by Work Ability Index (WAI) Questionnaire developed by Finnish Institute of Occupational Health (FIOH). Quality of life was measured by the World Health Organization Quality of Life Questionnaire, brief version (WHOQOL-BREF).

The Finnish Institute of Occupational Health has developed and validated the Work Ability Index (WAI) Questionnaire which gives us a subjective assessment of one's work ability<sup>16,17</sup>. It was test retested for reliability and validity<sup>18,19</sup>, also a satisfactory relation was established between the WAI and objective cardio-respiratory, musculoskeletal and psychological measures<sup>20</sup>.

The Work Ability Index (WAI) Questionnaire contains 7 items: subjective feelings regarding current work ability and how it compares with the lifetime best (0–10 points); work ability and how it compares with work demands (2–10 points); number of diseases diagnosed by the physician (1–7 points); estimated work impairment because of sickness (1–6 points); sick leave during the past year (1–5 points); own assessment of work ability two years from now (1, 4 and 7 points); and, mental resources (0–4 points). The WAI score is calculated by adding the points of each item, and the score range is from 7–49 points. The WAI score between 7–27 is considered as poor level of work ability; between 28–36 is considered as moderate level of work ability; between 37–43 is considered as good level of work ability; and between 44–49 is considered as excellent level of work ability. Participants with the WAI score of less than 37 were categorized as having low level of work ability. A Croatian translated version was used in the study, already validated in prior research<sup>14</sup>.

The WHOQOL-BREF is comprised of 26 items evaluating 4 dimensions of QoL: physical health, psychological health, social relationships, and the environmental domain. The scores for every domain range from 0 to 100, where good quality of life presents score over 60<sup>21</sup>. The WHOQOL-BREF in Croatian language is acceptably reliable and valid instrument for the quality of life assessment<sup>21</sup>. Shift work was determined with the question: Do you work in shifts Yes/No and treated as a binary variable in the analysis.

The study was approved by the authorized ethics committee of the Medical School University of Zagreb

and by the ethics committees of all the hospitals in which the study was carried out.

In the descriptive analysis the Mann-Whitney U test was used to analyze differences in continuous variables. Chi-square test was used to analyze differences in frequencies of categorical variables and differences in work ability and domains of QoL considering shift work. Five different binary logistic regression models were performed to detect predictors of nurses work ability and each domain of QoL. WAI was treated in one model as a binary dependent variable with the cut off value 37, where  $WAI < 37$  was considered poor and  $WAI \geq 37$  was considered good. Other four logistic regression models used four domains of QoL with the cut off value at 60% of scale maximum (SM). PASW Statistics 18 (2010 SPSS Inc., USA) was used for all statistical analyses.  $P < 0.05$  was considered statistically significant.

## Results

Participants (N=1124) were 987 female (87.8%) and 137 male (12.2%). Median (interquartile range) age of nurses was 42 (31–47) years. Median (IQR) work experience was 18 (11–27) years ranging from 0 to 44 years of

work experience (data available for N=1115). Overall median (IQR) WAI for 1119 participants was 39 (34–43).

Between the groups of shift and non-shift workers there was no significant difference in gender and marital status. Substantially less college-educated nurses worked in shifts than nurses with only secondary school degree (Table 1). Eight percent of shift workers had college education in comparison with 23% of non-shift workers ( $p < 0.001$ ). Median (IQR) age for shift workers was 40 (30–46) years and for non-shift workers was 44 (33–48) years, which makes shift workers group significantly younger ( $p < 0.001$ ). Also, they had less work experience, median (IQR) of 18 (11–27) years, as opposed to 24 (13–29) years of non-shift workers,  $p < 0.001$ . Incidentally, there is a statistically significant difference in WAI suggesting better work ability of shift workers ( $p < 0.05$ ). There were no significant differences in domains of QoL between the observed groups. Both groups achieved highest QoL in social interaction domain (median 75% SM for both groups) and the lowest in environmental domain (median 59.4% SM for shift workers and 62.5% SM for non-shift workers).

In Table 2 good WAI was defined as  $WAI \geq 37$  and good QoL as  $QoL \geq 60\%$  SM. The differences in the proportions of nurses with good and low WAI with respect to shift

**TABLE 1**  
SOCIO-DEMOGRAPHIC CHARACTERISTICS AND QUALITY OF LIFE OF NURSES (N=1124) ACCORDING TO THE STATUS OF SHIFT WORK, MANN-WHITNEY U TEST AND CHI-SQUARE TEST

Variable	All workers	Shift workers (n=644)	Non-shift workers (n=462)	p <sup>1</sup>
	n (%)	n (%)	n (%)	
Sex				
Women	987 (88)	567 (88)	405 (88)	
Men	137 (12)	77 (12)	57 (12)	0.848
Marital status				
Married	794 (71)	439 (69)	331 (72)	
Single	210 (19)	130 (20)	78 (17)	
Extramarital community	38 (3)	23 (4)	15 (3)	
Divorced	56 (5)	31 (5)	25 (6)	
Widowed	24 (2)	14 (2)	10 (2)	0.671
Education				
Secondary school	955 (85)	585 (92)	355 (77)	
College	165 (15)	53 (8)	105 (23)	<0.001
	Median (IQR)	Median (IQR)	Median (IQR)	
Age (years)	42 (31–47)	40 (30–46)	44 (33–48)	<0.001
Work experience (years)	22 (12–28)	18 (11–27)	24 (13–29)	<0.001
WAI	39 (34–43)	40 (34–44)	39 (34–43)	0.026
QoL (%SM)				
Physical health	71.4 (60.7–82.1)	71.4 (60.7–82.1)	71.4 (57.1–78.6)	0.911
Psychological health	66.7 (58.3–79.1)	66.7 (58.3–79.2)	70.8 (58.3–79.2)	0.644
Social interaction	75.0 (58.3–83.3)	75.0 (66.7–83.3)	75.0 (58.3–83.3)	0.149
Environment	59.4 (50.0–68.8)	59.4 (50.0–68.8)	62.5 (50.0–69.4)	0.160

IQR interquartile range; <sup>1</sup> p for the difference between shift workers and non-shift workers.

**TABLE 2**  
PROPORTIONS OF PARTICIPANTS IN TWO CATEGORIES OF WAI AND QOL DOMAINS WITH RESPECT TO SHIFT WORK STATUS CHI-SQUARE TEST

	Shift workers n (%)	Non-shift workers n (%)	p
WAI (n= 1101)			
Low WAI	215 (33)	180 (39)	0.046
Good WAI	428 (67)	278 (61)	
Physical health (n= 1103)			
Low	157 (24)	116 (25)	0.788
Good	485 (76)	345 (75)	
Psychological health (n= 1101)			
Low	196 (30)	127 (28)	0.381
Good	447 (70)	331 (72)	
Social interaction (n= 1103)			
Low	157 (24)	123 (27)	0.314
Good	486 (76)	337 (73)	
Environment (n= 1106)			
Low	355 (55)	220 (48)	0.014
Good	289 (45)	242 (52)	

Good WAI was defined as WAI≥37, good QoL was defined as QoL ≥60% SM in the domain of interest.

work status was borderline significant, with 61% of non-shift workers having good WAI compared with 67% of shift workers having good WAI ( $\chi^2=3.998$ ,  $df=1$ ,  $p=0.046$ ). Furthermore, considerably more shift workers had poor QoL in the environmental domain than non-shift workers (55% vs. 48%;  $\chi^2=6.071$ ,  $df=1$ ,  $p=0.014$ ). Other domains of QoL did not show statistically signifi-

cantly differences in the proportions of participants with respect to shift-work status.

Finally, binary logistic regression was used to determine how shift work, age, sex, education, partner situation and work experience predict work ability and QoL (Table 3). WAI and domains of QoL were used as dichotomous variables where WAI<37 and QoL<60% SM were considered low and WAI≥37 and QoL≥60 as satisfactory. The results revealed that lower education was a predictor for low level of work ability (OR 1.87, 95% CI [1.25–2.80]) and low physical health domain of QoL (OR 2.48, 95% CI [1.52–4.09]). Statistically significant predictor for psychological health was not found. Older age and having no partner were statistically significantly related to lower social interaction (OR 0.92, 95% CI [0.87–0.98], OR 1.49, 95% CI [1.07–2.06]). Predictors significantly related to low environment domain of QoL were low education (OR 1.66, 95% CI [1.17–2.36]) and shift work (OR 0.76, 95% CI [0.59–0.97]).

### Discussion

Without taking into account the difference in age and education, we found that shift workers have significantly higher (Table 1 i 2) level of work ability and non-significantly lower QoL in the environmental domain compared to non-shift workers. However, in a multivariate binary logistic regression (Table 3), we did not find a significant association between shift work and WAI. Furthermore, shift work was substantially associated with lower likelihood of good QoL in the environmental domain. Significant predictor for good WAI was higher education level. Good physical health domain was significantly associated with higher education. For good QoL in social interaction domain predictors were younger age

**TABLE 3**  
PREDICTORS OF POOR WORK ABILITY AND QUALITY OF LIFE ACCORDING TO DOMAINS AMONG NURSES (N0 1124), BINARY LOGISTIC REGRESSION MODEL

	WAI		PHYSICAL HEALTH		PSYCHOLOGICAL HEALTH		SOCIAL INTERACTION		ENVIRONMENT	
	OR (95%) CI	SE	OR (95%) CI	SE	OR (95%) CI	SE	OR (95%) CI	SE	OR (95%) CI	SE
SHIFT WORK	1.22 (0.93-1.60)	0.14	1.03 (0.77-1.39)	0.15	0.86 (0.65-1.13)	0.14	1.02 (0.76-1.36)	0.15	0.76 (0.59-0.97)	0.13
AGE	0.98 (0.92-1.03)	0.03	0.99 (0.94-1.06)	0.03	0.98 (0.93-1.03)	0.03	0.92 (0.87-0.98)	0.03	0.99 (0.95-1.05)	0.03
SEX	0.91 (0.60-1.39)	0.22	1.23 (0.76-2.01)	0.25	1.27 (0.82-1.98)	0.22	1.48 (0.92-2.40)	0.25	1.32 (0.90-1.93)	0.19
EDUCATION	1.87 (1.25-2.80)	0.21	2.50 (1.52-4.09)	0.25	1.23 (0.83-1.82)	0.20	0.84 (0.57-1.24)	0.20	1.66 (1.17-2.36)	0.18
PARTNER SITUATION	1.01 (0.73-1.40)	0.17	0.78 (0.54-1.11)	0.18	1.31 (0.96-1.80)	0.16	1.49 (1.07-2.06)	0.17	0.96 (0.72-1.28)	0.15
WORK EXPERIENCE	0.96 (0.91-1.01)	0.02	0.96 (0.91-1.02)	0.03	0.99 (0.94-1.05)	0.03	1.04 (0.99-1.10)	0.03	0.99 (0.94-1.04)	0.03

OR – odds ratio, 95% CI – 95% confidence interval, SE – standard error



and having a partner. Good environmental domain of QoL was substantially associated with higher education and no shift work.

The present study has several methodological limitations. Firstly, given the cross-sectional design an appropriate temporal sequence cannot be established, which precludes causal inference. However, it permits for certain statistical associations to be drawn. Secondly, findings are restricted to clinical nurses who work in the hospital setting and cannot be generalized to other settings such as primary healthcare. Thirdly, no conclusion can be made on nurses who did not participate in the study. No assumptions can be made as to whether non-respondents have better or worse level of work ability or QoL compared with respondents. Fourthly, we relied exclusively on participants' self-report for the assessment of exposures and outcomes as done in the vast majority of previously published studies. This could have led to misclassification with respect to exposure or outcome, thus distorting final estimates of the association between shift work, QoL and work ability. Further research in this area could consider more objective methods for the ascertainment of physical health, e.g. medical records.

Large number of participants is the main strength of the study, since similar research has been conducted on fairly smaller samples of a few hundred respondents<sup>22</sup>, while longitudinal studies have gathered far more participants<sup>11</sup>.

Our first observation of WAI using chi-square test suggested better level of work ability of nurses working in shifts compared to non-shift workers. This difference is purely of statistical importance as clinically both medians of WAI are considered good level of work ability and, moreover, other covariate factors are not considered such as age. Both groups have the lowest QoL in environmental domain, particularly shift workers, which could be explained by specific occupational stressors characteristic for our transitional country such as poor organization of work, insufficient financial resources and inadequate working environment<sup>14</sup>.

We found that higher education level predicts good level of work ability, good physical health domain and good environmental domain of QoL, which is consistent with previous studies<sup>14</sup>.

Education for nurses in Croatia has long been restricted to only secondary education and college which is an educational qualification below university degree. Although Croatian educational authorities signed the Bologna Declaration in 2001, efforts to introduce postgraduate studies for nurses have been made during the last two years. Currently, there is only secondary and college education level available for nurses in Croatia. Despite that the level of education has an impact on WAI and QoL. This indicates the importance of further educational progress. Moreover, this result is also in line with the research indicating the positive impact of education

on work ability and self-rated health in other populations<sup>23</sup>.

Younger age and having a partner was related to good social interaction. Partner situation in other studies was related to better QoL in psychological, social and environmental domain<sup>22</sup>, whereas here only to social domain, which is to be expected. Other studies have shown a decrease in work ability with age<sup>9</sup>. However, the association between age and WAI in our study was not statistically significant. On the other hand, it seems that social interaction decreases with age. We tested social interaction with questions concerning social relationships, social support and sexual activity (WHOQOL-BREF). Since studies have shown that sexual activity tends to decrease with age<sup>24</sup>, this could partly explain the lower likelihood of good QoL in social interaction for older age.

Our findings regarding shift work and work ability are not consistent with other studies<sup>6</sup>. The possible explanation could be younger age of our shift work group or lower educational level. Additionally, the information concerning shift work was self-reported rather than supplied from company records and thus prone to bias. However, shift work was related to low environmental domain of QoL, which could be explained by poor organization at work, insufficient number of co-workers and poor communication with superiors which are some of the most important occupational stressors for nurses<sup>15</sup>.

## Conclusion

In hiring and keeping the nursing staff hospital managers have to consider risk exposure, emotional demands, role ambiguity, conflicts, effort-reward imbalance, meaning of work, nursing management, work ability, satisfaction with working time and other organizational determinants<sup>3</sup>. Although in our research there is no significant connection between shift work and poor WAI and low QoL, it is our recommendation to introduce measures in hospitals to encourage healthy communication among nurses and other health workers, stimulation of physical activity, team building, implementation of meaningful work assignments, management of knowledge and skills which includes a system of mentorship and continuing education from a specific medical area, improvement of the working conditions consisting of better work organization, financial security, redistribution of shift work, stress management training and adequate work load.

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## SMJENSKI RAD, KVALITETA ŽIVOTA I RADNA SPOSOBNOST KOD MEDICINSKIH SESTARA U HRVATSKIM BOLNICAMA

### SAŽETAK

U ovom radu prikazani su rezultati analize o povezanosti smjenskog rada sa radnom sposobnošću i kvalitetom života među kliničkim medicinskim sestrama. Presječno istraživanje provedeno je 2007–2008 godine na 1124 medicinske sestre pomoću Upitnika Indeksa radne sposobnosti i Upitnika o kvaliteti života (WHOQOL-BREF). Niže obrazovanje je prediktor za nisku radnu sposobnost i nisku domenu fizičkog zdravlja kvalitete života. Starija dobi i status bez partnera bile su statistički značajno povezani s nižom domenom socijalne interakcije. Prediktori koji su statistički značajno povezani sa niskom domenom okoliša kvalitete života su nizak stupanj obrazovanja i smjenski rad. Smjenski radnici imali su veću radnu sposobnost, ali klinički beznačajno. Studija ne daje dokaz o povezanosti između smjenskog rada i radne sposobnosti ili kvalitete života. Obrazovanje ima pozitivan utjecaj na radnu sposobnost i kvalitetu života medicinskih sestara.