

Original article

ASSOCIATIONS BETWEEN BURNOUT AND SUBJECTIVE MUSCULOSKELETAL COMPLAINTS IN SURGICAL HEALTH PROFESSIONALS

АСОЦИЈАЦИИ МЕЃУ СИНДРОМОТ НА СОГОРУВАЊЕ И СУБЈЕКТИВНИТЕ ТЕГОБИ ОД МУСКУЛО-СКЕЛЕТНИОТ СИСТЕМ КАЈ ЗДРАВСТВЕНИТЕ РАБОТНИЦИ ОД ХИРУРШКАТА ДЕЈНОСТ

Dragan Mijakoski<sup>1</sup>, Jovanka Karadzinska-Bislimovska<sup>1</sup>, Dragana Bislimovska<sup>1</sup>, Jordan Minov<sup>1</sup>, Sasho Stoleski<sup>1</sup> and Jasmina Goshevska<sup>2</sup>

<sup>1</sup>Institute of Occupational Health of RNM, WHO CC, Skopje, RN Macedonia, <sup>2</sup>Health Centre, Bitola, RN Macedonia

Abstract

**Aim.** The objective of the actual study was to determine the predictive value of burnout for the occurrence of subjective musculoskeletal complaints in surgical health professionals (HPs).

**Methods.** A cross-sectional study analyzing different profiles of surgical HPs (30 surgeons, 30 surgical nurses, 30 physicians (non-surgeons), 30 non-surgical nurses, and 30 administrative and technical workers). Burnout was assessed by the Maslach Burnout Inventory. Hospital Experience Scale was applied for the assessment of job demands. Determination of predictive value of different factors for the occurrence of subjective musculoskeletal complaints included testing of various models of logistic regression.

**Results.** Participants with high/medium emotional exhaustion more frequently complained about back pain (46.2% vs. 22%;  $\chi^2=8.97$ ;  $p=0.003$ ) and lower limb pain (30.8% vs. 15.3%;  $\chi^2=4.64$ ;  $p=0.031$ ) compared to participants with low emotional exhaustion. Participants with burnout compared to those who did not have this syndrome, more frequently complained about back pain (54.5% vs. 29.2%;  $\chi^2=8.57$ ;  $p=0.003$ ) and upper limb pain (20.5% vs. 3.8%;  $\chi^2=10.93$ ;  $p=0.001$ ). The occurrence of back pain was predicted by physical demands (exp  $b=2.27$ , 95%CI 1.06-4.87,  $p<0.05$ ) and emotional exhaustion (exp  $b=1.06$ , 95%CI 1.02-1.09,  $p<0.01$ ) and the occurrence of upper limb pain by physical demands (exp  $b=4.31$ , 95%CI 1.3-14.26,  $p<0.05$ ) and depersonalization (exp  $b=1.18$ , 95%CI 1.08-1.29,  $p<0.001$ ).

**Conclusion.** Both job demands and burnout predict the occurrence of subjective musculoskeletal complaints. Adequate management of job demands can lead to prevention of burnout and musculoskeletal complaints in surgical HPs.

**Keywords:** burnout, job demands, musculoskeletal, surgery, health professionals

Апстракт

**Цел.** Целта на оваа студија е да се утврди предиктивната вредност на синдромот на согорување за појава на субјективни мускуло-скелетни тегоби кај здравствените работници (ЗР) од хируршката дејност.

**Методи.** Студија на пресек, која ги анализира различните профили на ЗР од хируршката дејност (30 хирурзи, 30 инструментарки, 30 доктори, кои не се хирурзи, 30 медицински сестри, кои не се инструментарки и 30 административни работници). Синдромот на согорување е анализиран со Maslach Burnout Inventory. Прашалникот Hospital Experience Scale е употребен за проценка на барањата на работното место. Одредувањето на предиктивната вредност на различните фактори за настанување субјективни мускуло-скелетни тегоби вклучи тестирање на различни модели на логистичка регресија.

**Резултати.** Испитаниците со висока/средна емоционална исцрпеност почесто се жалат на болка во грбот (46,2% *спрема* 22%;  $\chi^2=8,97$ ;  $p=0,003$ ) и долните екстремитети (30,8% *спрема* 15,3%;  $\chi^2=4,64$ ;  $p=0,031$ ), во споредба со испитаниците со ниска емоционална исцрпеност. Испитаниците со синдром на согорување, во споредба со испитаниците, кои го немаат овој синдром, почесто се жалат на болка во грбот (54,5% *спрема* 29,2%;  $\chi^2=8,57$ ;  $p=0,003$ ) и рацете (20,5% *спрема* 3,8%;  $\chi^2=10,93$ ;  $p=0,001$ ). Појавата на болка во грбот е условена од физичките барања на работното место (exp  $b=2,27$ ; 95%CI 1,06-4,87;  $p<0,05$ ) и емоционалната исцрпеност (exp  $b=1,06$ ; 95%CI 1,02-1,09;  $p<0,01$ ), а појавата на болка во рацете од физичките барања (exp  $b=4,31$ ; 95%CI 1,3-14,26;  $p<0,05$ ) и негативниот став кон работата (exp  $b=1,18$ ; 95%CI 1,08-1,29;  $p<0,001$ ).

**Заклучок.** Барањата на работното место и синдромот на согорување имаат предиктивна вредност во нас-

Correspondence to: Dragan Mijakoski, Institute of Occupational Health of RNM-Skopje, 1000 Skopje, R. N. Macedonia; E-mail: dmijakoski@yahoo.com

танувањето субјективни мускуло-скелетни тегоби. Соодветното справување со барањата на работното место може да ја превенира појавата на синдромот на согорување и мускуло-скелетните тегоби кај ЗР во хируршката дејност.

**Клучни зборови:** синдром на согорување, барања на работното место, мускуло-скелетни тегоби, хирургија, здравствени работници

## Introduction

Work-related or job stress can be defined as hazardous physical or emotional response to job pressures and demands that are present at the workplace and which do not correspond to the knowledge, abilities, capacities and the needs of the worker [1,2]. On the other hand, burnout syndrome is a psychological syndrome that results from a prolonged response to chronic emotional and interpersonal workplace stressors [3,4], such as high job demands (physical, social, emotional, cognitive, and organizational aspects of the work that require prolonged mental or physical efforts) and lack of resources, resulting in withdrawal behavior (depersonalization) and disengagement [5,6]. The three components of burnout syndrome are emotional exhaustion, depersonalization, and reduced personal accomplishment [1,2,7-9].

Scientific literature has shown that the core dimensions of burnout are emotional exhaustion and depersonalization, taking into consideration the evidence that the last component (reduced personal accomplishment) usually demonstrates much weaker correlations with the other two dimensions.

The high job demands, working under pressure, prolonged and/or unpredictable working hours, lack of control over the working activities, lack of skills, reduced possibilities for promotion at the workplace, organizational factors, and low social support at work, make healthcare professionals (HPs) especially vulnerable to job stress and characterize hospital settings as an ideal environment for the development of distress, burnout and psychosomatic problems, usually deteriorating the quality of life and service provision [10-13]. Both job stress and burnout, as a potentially pathogenic mechanisms, can lead to negative health effects, including psychological changes, such as emotional manifestations (anxiety, depression, feelings of hopelessness), cognitive problems (difficulties in learning new things or decision making) and behavioral changes (negative attitudes towards people, life, and work), but also somatic manifestations, increasing the risk for cardiovascular mortality and morbidity, development of malignant diseases and development of musculoskeletal disorders (MSDs) [1,14,15]. MSDs are conditions that affect the muscles, nerves, tendons, joints, cartilage, and spinal discs, and they are

associated with certain symptoms, such as pain, swelling, stiffness, and tingling. The most common MSDs include: carpal tunnel syndrome, muscle strains, sprains and tears, lower back pain, and injuries. Work-related MSDs can develop as a result of the factors from the working environment, working conditions and/or by the work performance, and if those factors persist at the workplace, the MSDs can worsen over time [16,17].

The healthcare sector is one of the most affected with an incidence of MSDs varying from 50% to 98%, globally [18-21]. Among HPs, the majority of work-related MSDs occur due to biomechanical exertion caused by:

- Manual handling, lifting, and movement of patients from beds or wheelchairs (the most commonly reported trigger),
- Prolonged periods of sitting or standing with awkward and static postures together with prolonged and repetitive hand/finger movements (e.g., surgery) and
- Moving of equipment/heavy loads (e.g., pushing heavy carts or beds) [16,22,23].

Apart from these, many studies emphasize the contribution of psychosocial factors and job stress in the development of MSDs. Work stressors have been proved to adversely affect workers' health, quality of life, and work performance, identifying them as important risk factors for MSDs [24-27]. Due to the high incidence, the MSDs are highly associated with absenteeism, loss of productivity, as well as increased health care and employers' compensation costs, estimated to be over \$20 billion annually around the world [17,18]. Various interventions exist in practice for the prevention of work-related MSDs in HPs and they include: workers' education programs, physical conditioning or exercise programs, disability management, organizational policies, and use of mechanical lifts or other patient transfer equipment [28-32].

The actual study analyzes HPs working in a general hospital in Skopje, Macedonia, providing health care to the general population at a secondary and tertiary level. Changes in the health care system in the RN Macedonia in the recent years, together with social reforms aimed at EU accession, have led to increased job demands in hospital HPs. The main purpose of the present study was to examine the associations between burnout and its dimensions with the subjective musculoskeletal complaints in surgical HPs. More specifically, the objective was to determine the predictive value of burnout dimensions for the development of subjective musculoskeletal complaints in surgical HPs. The other objectives of the study were to detect differences between study groups according to: demographic and job characteristics, burnout dimensions, job demands, actual health complaints (including subjective musculoskeletal complaints).

## Methodology

### *Study population*

The **first group** consisted of HPs directly involved in surgical activities. Inclusion criteria for the first group were: physicians-surgeons; nurses directly involved in surgical activities (in the following text: surgical nurses). Exclusion criteria for the first group were: physicians who were not surgeons; nurses who were not directly involved in surgical activities; administrative workers; respondents with pre-diagnosed mental illness.

The **second group** included HPs who were not directly involved in surgical activities. Inclusion criteria for the second group were: physicians who were not surgeons and nurses who were not directly involved in surgical activities. Exclusion criteria for the second group were: physicians-surgeons; surgical nurses; administrative workers; respondents with pre-diagnosed mental illness.

The **third group** involved employees who were not HPs (administrative and technical staff). Inclusion criteria for the third group were administrative workers. Exclusion criteria for the third group were HPs and respondents with pre-diagnosed mental illness.

The first group consisted of 60 HPs directly involved in surgical activities (30 physicians-surgeons and 30 surgical nurses). The second group included 60 HPs not directly involved in surgical activities (30 physicians-non-surgeons and 30 nurses who were not surgical nurses). The third group consisted of 30 employees who were not HPs (administrative and technical staff).

### *Assessment of demographic and job characteristics data*

We used a specially designed “Demographic and Job Characteristics Questionnaire” for the assessment of demographic variables (age, gender, marital status, and level of education) and job characteristics (work profile, hospital tenure, unit tenure, type of employment contract, working hours during the week, and night shifts work) of the examined subjects. By the application of this Questionnaire we identified the workplace stress factors related to job characteristics (work profile, hospital tenure, unit tenure, working hours during the week, and night shifts work), which, according to the WHO classification of work-related stress factors [2], are related to the following categories: physical workload and pace of work; working hours; and the role in the working organization. Additionally, to this Questionnaire, we added questions for the assessment of the health status of the participants, specially addressing subjective complaints by MSDs as well as other health problems.

### *Assessment of burnout and job demands*

Burnout was assessed using the Maslach Burnout Inventory (MBI) [9]. In this study, emotional exhaustion

(nine items) and depersonalisation (five items) subscales were used, and measured with a 7-point Likert scale (0=never to 6=every day). Emotional exhaustion refers to the feelings of overwhelming exhaustion and depletion of emotional resources. Depersonalization refers to the feelings of frustration, anger, and cynicism. It represents interpersonal dimension of burnout and it is described as an excessively detached response to other people. Emotional exhaustion was assessed by questions, such as “I feel emotionally drained from my work” and “I feel burned out by my work”, and depersonalization with questions, such as “I feel I treat some patients as if they were impersonal objects”. Responses were added to form a score for each subscale, thus giving each participant scores for the two components of burnout. The higher the score in one dimension means the higher level of burnout. The participants with the score of emotional exhaustion equal to 27 or higher and the score of depersonalization equal to 13 or higher were labelled as burntout.

Hospital Experience Scale (HES), which was constructed and developed for the FP7 ORCAB Project (<http://orcab.web.auth.gr/>) within the actual study, was applied for the assessment of job demands. The items were categorised into four subscales: physical workload (seven items, e.g., “I am responsible for too many patients in hospital rounds”), organisational (six items, e.g., “The roles in my department are not clear/ambiguous”), emotional (six items, e.g., “I have to deal with verbally abusive patients”) and cognitive (five items, e.g., “I have to make decisions when I don’t have all the information I need”) job demands. Participants indicated their level of agreement with the items on a 5-point Likert scale (1=never to 5=always), and points for statements relating to each of the job demands types were averaged to derive the four types of job demands. The higher mean score means the higher perceived level of particular job demands type.

This cross-sectional study analyzed different profiles of surgical HPs. The research was conducted in a general hospital with different medical specialties. Respondents were categorized into three groups according to their job activities: whether they were HPs or they worked as an administrative (or technical) staff and whether HPs were directly involved in the surgical activities or not.

With the defined study sample and the determined methodology of the research, we obtained data about the factors (job demands and burnout) that might influence the occurrence of subjective musculoskeletal complaints in HPs directly involved in surgical activities. The participation in the research was voluntarily and anonymous and the participants were informed about the study. The instrument of the survey was distributed among the participants and it contained all the questionnaires necessary for assessment of the objectives of the study.

In the actual study, the questionnaires were filled immediately after the distribution, and not at home. The instrument was distributed in envelopes in a hard copy. The research was anonymous and the HPs were informed about the aim of the study and how their data would be kept and used.

With the analysis for reliability used in the study for the assessment of the internal consistency of the questionnaires, the following consistency coefficients (Cronbach alpha) were determined:

Questionnaire for the assessment of job demands:

- physical demands, Cronbach alpha = 0.736
- organizational demands, Cronbach alpha = 0.761
- emotional demands, Cronbach alpha = 0.738
- cognitive demands, Cronbach alpha = 0.736

Maslach Burnout Inventory:

- emotional exhaustion, Cronbach alpha = 0.913
- depersonalization, Cronbach alpha = 0.820

The Statistical Package for the Social Sciences (SPSS)

statistics (Chicago USA 2011, version 19) was used for the statistical analyses. Continuous variables were presented as mean values with standard deviation, and the nominal variables as absolute numbers and percentages. *P* values below 0.05 were considered as statistically significant.

**Results**

The obtained data showed that within the analyzed hospital the five groups of participants were not significantly different according to age (about 40 years), hospital and unit tenure, as well as the average number of working hours during the week (slightly above 40 hours per week).

In Table 1 demographic characteristics of participants (gender, marital status, and education) and job characteristics (type of employment contract and night shifts work) are shown.

**Table 1.** Demographic characteristics of participants (gender, marital status, and education) and job characteristics (type of employment contract and night shifts work)

Characteristic	Group	n	%	$\chi^2$ (p)
<b>Gender</b> (women)	surgeons (N = 30)	16	53.3	<b>26.92</b> ( <b>&lt;0.001</b> )
	other physicians (N = 30)	18	60	
	surgical nurses (N = 30)	26	86.7	
	other nurses (N = 30)	28	93.3	
	administrative workers (N = 30)	26	86.7	
<b>Marital status</b> (married)	surgeons (N = 30)	18	60	4.96 (0.291)
	other physicians (N = 30)	19	63.3	
	surgical nurses (N = 30)	20	66.7	
	other nurses (N = 30)	23	76.7	
	administrative workers (N = 30)	20	66.7	
<b>Education</b> (university education or higher)	surgeons (N = 30)	30	100	<b>52.65</b> ( <b>&lt;0.001</b> )
	other physicians (N = 30)	30	100	
	surgical nurses (N = 30)	13	43.3	
	other nurses (N = 30)	14	46.7	
	administrative workers (N = 30)	17	56.7	
<b>Type of employment contract</b> (full-time contract)	surgeons (N = 30)	23	76.7	3.64 (0.457)
	other physicians (N = 30)	23	76.7	
	surgical nurses (N = 30)	25	83.3	
	other nurses (N = 30)	26	86.7	
	administrative workers (N = 30)	24	80	
<b>Work in night shifts</b>	surgeons (N = 30)	30	100	<b>25.15</b> ( <b>0.003</b> )
	other physicians (N = 30)	23	76.7	
	surgical nurses (N = 30)	23	76.7	
	other nurses (N = 30)	22	73.3	
	administrative workers (N = 30)	9	30	

As presented in Table 1, it was registered that:

- in the groups of surgical nurses (86.7%) and other nurses (93.3%), women were significantly more frequent than in the groups of surgeons (53.3%) and other physicians (60%), while in administrative workers (86.7%) females were significantly more often than in the surgeons group ( $\chi^2=26.92$ ;  $p<0.001$ ),
- surgeons (100%) and other physicians (100%) had significantly more often completed a university or higher education than surgical nurses (43.3%),

- other nurses (46.7%) and administrative workers (56.7%) ( $\chi^2=52.65$ ;  $p<0.001$ ),
- significantly less frequently administrative workers (30%) worked night shifts in comparison to HPs (over 70%) ( $\chi^2 = 25.15$ ;  $p=0.003$ ).

The following table presents the average values of the key variables of the survey within the total sample.

The above data and the methods for comparing mean values (ANOVA and the Post Hoc procedures of Gabriel and Games-Howell) showed that within the total sample:



**Table 2.** Average values of key variables within the total group of participants

	Variable	Mean	SD	Welch F (p)
<b>Burnout</b>	Emotional Exhaustion	21.35	13.12	/
	Depersonalization	4.99	5.87	
	Physical	3.29	0.65	
<b>Job demands</b>	Organizational	2.58	0.83	<b>45.23</b> <b>(&lt;0.001)</b>
	Emotional	2.47	0.71	
	Cognitive	2.84	0.76	

- the mean value of physical job demands was significantly higher than the average values of all other job demands-organizational (mean diff.=0.72;  $p<0.001$ ), emotional (mean diff.=0.82;  $p<0.001$ ) and cognitive (mean diff.=0.45;  $p<0.001$ ),
- the average value of cognitive job demands was significantly higher than the mean values of organizational (mean diff.=0.26;  $p=0.017$ ) and emotional (mean diff.=0.37;  $p<0.001$ ) job demands.

Medium or high level of emotional exhaustion was registered in 24(80%) surgeons, 24(80%) other physicians, 27(90%) surgical nurses, 14(46.7%) other nurses, and 2(6.7%) participants from the administrative workers. Data showed that significantly more surgeons (80%), physicians who werenot surgeons (80%) and surgical nurses (90%) had medium or high level of emotional exhaustion (a sum of responses higher than 16) than other nurses (46.7%). In all examined groups of HPs a significantly higher frequency of participants with medium or high level of emotional exhaustion was registered in comparison to administrative workers (6.7%) ( $\chi^2 = 59.34$ ;  $p<0.001$ ).

Medium or high level of depersonalization was detected in 14(46.7%) surgeons, 13(43.3%) other physicians, 11(36.7%) surgical nurses, 5(16.7%) other nurses, and in 2 (6.7%) administrative workers. It was noticed that

a significantly higher frequency of surgeons (46.7%), other physicians (43.3%), and surgical nurses (36.7%) had a medium or high level of depersonalization (a sum of responses higher than 6) than other nurses (16.7%) and administrative workers (6.7%) ( $\chi^2=17.46$ ;  $p=0.002$ ).

Burnout syndrome (for each of its two dimensions detected high or medium level) was registered in 14 (46.7%) surgeons, 13(43.3%) other physicians, 11(36.7%) surgical nurses, 5(16.7%) other nurses as well as in 1 (3.3%) administrative worker. These data have clearly shown that significantly more surgeons (46.7%), other physicians (43.3%), and surgical nurses (36.7%) had burnout syndrome compared to other nurses (16.7%) and administrative workers (3.3%) ( $\chi^2=20.07$ ;  $p<0.001$ ).

According to the Questionnaire data, actual health complaints were registered in 17(56.7%) surgeons, 16 (53.3%) other physicians, 23(76.7%) surgical nurses, 7 (23.3%) other nurses and in 16(53.3%) administrative workers. Accordingly, significantly smaller number of other nurses (23.3%) had actual health complaints when compared to the other groups of participants included in the study ( $\chi^2=17.49$ ;  $p=0.002$ ).

In the following table, the distribution of musculoskeletal complaints that show significant differences between different groups of participants is presented.

**Table 3.** Distribution of musculoskeletal complaints that show significant differences between different groups of participants

MS complaints	Group	n	%	$\chi^2$ (p)
<b>Back pain</b>	surgeons	15	50	<b>12.34 (0.015)</b>
	other physicians	9	30	
	surgical nurses	15	50	
	other nurses	12	40	
	administrative workers	4	13.3	
<b>Shoulder and neck pain</b>	surgeons	5	16.7	<b>10.29 (0.036)</b>
	other physicians	11	36.7	
	surgical nurses	15	50	
	other nurses	11	36.7	
	administrative workers	6	20	
<b>Upper limb pain</b>	surgeons	1	3.3	<b>9.77 (0.044)</b>
	other physicians	2	6.7	
	surgical nurses	4	13.3	
	other nurses	6	20	
	administrative workers	0	0	
<b>Lower limb pain</b>	surgeons	6	20	<b>10.62 (0.031)</b>
	other physicians	7	23.3	
	surgical nurses	12	40	
	other nurses	10	33.3	
	administrative workers	2	6.7	

The results presented in Table 3 show that:

- surgeons (50%), surgical nurses (50%) and other nurses (40%) significantly more often complained about **back pain** than administrative workers (13.3%) ( $\chi^2=12.34$ ;  $p=0.015$ ),
- surgical nurses (50%) had **shoulder and neck pain** significantly more frequently than surgeons (16.7%) and administrative workers (20%) ( $\chi^2=10.29$ ;  $p=0.036$ ),
- **upper limb pain** was significantly more frequent in other nurses (20%) than in surgeons (3.3%) and administrative workers (0) ( $\chi^2=9.77$ ;  $p=0.044$ ), and
- significantly more frequently surgical (40%) and other nurses (33,3%) complained on **lower limb pain** in comparison to administrative workers (6.7%) ( $\chi^2=10.62$ ;  $p=0.031$ ).

Additionally, the data analysis indicated that participants who demonstrated a high or medium level of emotional exhaustion compared to participants with a low level of emotional exhaustion, significantly more frequently complained about actual health problems (59.3% vs. 42.4%;  $\chi^2=4.13$ ;  $p=0.042$ ), back pain (46.2% vs. 22%;

$\chi^2=8.97$ ;  $p=0.003$ ), and lower limb pain (30.8% vs. 15.3%;  $\chi^2=4.64$ ;  $p=0.031$ ). The participants with a high or medium level of depersonalization compared to participants with a low level of depersonalization significantly more frequently complained on back pain (51.1% vs. 30.5%;  $\chi^2=5.78$ ;  $p=0.016$ ), and upper limb pain (24.4% vs. 1.9%;  $\chi^2=20.22$ ;  $p<0,001$ ). The participants from the analyzed hospital that had burnout syndrome compared to those who did not have this syndrome significantly more frequently complained on back pain (54.5% vs. 29.2%;  $\chi^2=8.57$ ;  $p=0.003$ ), and upper limb pain (20.5% vs. 3.8%;  $\chi^2=10.93$ ;  $p=0.001$ ).

In order to determine the predictive value of different factors for the occurrence of health complaints (including subjective musculoskeletal complaints) in participants from the study hospital, we tested up to four models of logistic regression for every health complaint:

Model 1 - including the four types of job demands,

Model 2 - including the factor - working in night shifts,

Model 3 - with different work profiles, and

Model 4 - including burnout dimensions.

**Table 4.** Standardized exp *b* coefficients of significant independent predictors of subjective musculoskeletal complaints among study participants

Health complaints	Significant independent predictor	exp <i>b</i> (95% CI)	Cox & Snell $R^2$ ; Nagelkerke $R^2$	$\chi^2$ of the model ( <i>p</i> )
<b>Health complaints-general</b>	other doctors vs. administrative workers	5.65** (1.59-20.04)	0.1;	15.01
	other nurses vs. administrative workers	2.87* (1.2-6.89)	0.15	(0.011)
<b>Back pain</b>	physical demands	2.27* (1.06-4.87)	0.11;	13.82
	emotional exhaustion	1.06** (1.02-1.09)	0.14	(0.02)
<b>Shoulder and neck pain</b>	gender (women vs. men)	4.4* (1.17-16.58)	0.12;	17.56
	physical demands	2.19* (1.07-4.5)	0.17	(0.025)
<b>Upper limb pain</b>	physical demands	4.31* (1.3-14.26)	0.13;	17.55
	depersonalization	1.18*** (1.08-1.29)	0.18	(0.025)
<b>Lower limb pain</b>	not married vs. married	3.7* (1.29-10.61)	0.13;	17.61
	education (other vs. higher)	3.17* (1.16-8.64)	0.25	(0.024)
	physical demands	2.37* (1.12-5.01)	0.17;	25.81
	not married vs. married	3.77* (1.38-10.3)	0.34	(0.001)
	age	1.07* (1.01-1.15)	0.12;	17.43
	not married vs. married	4.85** (1.64-14.34)	0.17	(0.026)
	surgical nurses vs. administrative workers	9.31** (2.29-37.91)	0.15;	22.45
other nurses vs. administrative workers	3.78* (1.28-11.19)	0.22	(0.008)	

\* $p<0.05$ ; \*\* $p<0.01$ ; \*\*\* $p<0.001$

Every group of factors which predictive value was analyzed (job demands, night shifts work, work profile, and burnout dimensions) was integrated into a separate hierarchical model. These models also involved age, working hours during the week, hospital and unit tenure, gender, marital status, and education as a potentially confounding variables.

The factors: age, working hours during the week, and hospital and unit tenure were included in the first step of regression; the factors: gender, marital status, and education in the second step; and concrete specific variables which predictive value was the objective of analysis were included in the third step. Within every single step, the variables were included in one block.

The following table demonstrates the standardized *exp b* coefficients of significant independent predictors of subjective musculoskeletal complaints.

The results from Table 4 show that the demographic characteristics of the participants, the stress factors from the workplace (job demands and work profile) and dimensions of burnout syndrome, in different combinations and relationships, presented significant predictors for the onset of subjective musculoskeletal complaints among the participants of this study.

## Discussion

This study involved 150 HPs that demonstrated certain differences in demographic (i.e., women significantly more frequent in the groups of nurses than in physicians groups; physicians significantly more often completed a university or higher education than nurses) and job (i.e., significantly less frequently administrative workers worked night shifts in comparison to HPs) characteristics.

Contrary to previous studies conducted in hospital HPs, the actual study showed lower average emotional exhaustion (21.4) and depersonalisation (4.99) scores [13]. Increased job demands that are reported by the HPs from this hospital [33], according to the JD-R Model, could result in increased compensatory efforts in HPs (in order to maintain performance level and higher levels of job engagement) as well as in reduced physiological and psychological costs (lower levels of depersonalization) [33]. Additionally, hospital "protective factors" (e.g., support from superiors, independence in decision making), previously emphasized by the hospital HPs [34], could also have an important role.

Participants from the analysed hospital emphasized physical workplace stressors (i.e., time pressure, excessive workload, and lack of staff and supplies) as particularly demanding aspects of their work life. Cognitive work demands (i.e., lack of receiving feedback on performance as well as training new staff) were also characterised as important and demanding workplace factors. Within the energetic process of overtaxing, high job demands could both exhaust the worker's energy (leading to emotional exhaustion) and downward adjust-

ment of performance targets (resulting in cynical attitudes towards work, depersonalization, and disengagement). However, the presence of job resources (physical, psychological, social, or organizational aspects of the job) may be functional in achieving work goals, could reduce job demands and associated physiological and/or psychological costs (changes), and could stimulate personal growth, learning, and development of the worker [9,12]. Hence, the motivational process involves job resources that enable dealing effectively with high job demands and prevents mental withdrawal or disengagement [5,35,36].

The actual study demonstrated that the frequencies of participants with medium/high levels of emotional exhaustion or depersonalization and burnout were very high in the groups of physicians and surgical nurses. The frequencies of these psychological phenomena were significantly lower in administrative workers. Similar findings have also been presented in other studies, clearly showing the high frequency of burnout in surgeons [37,38] and surgical nurses [39,40]. Shanafelt *et al.* in 2012 found that surgery department, together with emergency department, intensive care, and family medicine, represents a group of medical specialties with the highest frequency of burnout [41].

The risk of development of health complaints related to burnout is increased in HPs. Despite this fact, there are only rare studies which have analyzed the associations between burnout, subjective health complaints, and workers' health behaviors [42,43]. The pool of studies analyzing these relationships in HPs or surgical HPs is even smaller [44,45].

Actual health complaints were reported by a large number of HPs (above half of participants in all examined groups), especially in surgical nurses (above 75%). Surgical nurses were also characterized with significantly higher frequency of back, shoulder and neck pain, and lower limb pain compared to administrative workers. Health problems in surgeons and surgical nurses were reported in a wide range of studies, globally. Depression symptoms were shown in a third of 7,905 examined USA surgeons [37].

The systematic literature review in surgeons in the UK highlighted several work-related problems: burnout, sharp injuries, and musculoskeletal diseases [46]. Musculoskeletal problems were reported in almost 80% of nurses and job stress was found to be one of the predictors for their manifestation [47]. These complaints were significantly more frequent in surgical nurses than in nurses from other departments [48].

The actual study also analyzed the associations of burnout and its dimensions with health complaints in participating HPs. Subjective musculoskeletal complaints were significantly more frequent in HPs with: 1. high/medium emotional exhaustion (back pain, and lower limb pain), 2. high/medium depersonalization (back pain, and upper limb pain), 3. burnout (back pain and upper



limb pain), than in HPs with low emotional exhaustion, low depersonalization, and in HPs without burnout, respectively. Other studies similarly demonstrated that self-reported depression, anxiety, sleep disturbance, memory impairment, and neck and back pain were more frequent in workers with high emotional exhaustion and burnout [49]. It was also shown that burnout was correlated with MSDs and the prevalence of MSDs increased with the severity of burnout dimensions [50].

The actual study has shown that demographic characteristics of the participants, workplace stress factors (job demands, work profile) and dimensions of burnout syndrome, in different combinations and correlations, present significant predictors for the onset of subjective musculoskeletal complaints among the participants. It has been clearly demonstrated that in HPs who were exhausted, HPs who were exposed to a wide range of job demands health problems were more frequent, as well as in HPs who worked in surgery department. The relationships between job stress (and especially burnout) and both physical and mental health problems in workers have been elaborated in different studies and burnout has been considered as a mediator in their development [49-53].

It has been detected that HPs with higher levels of burnout dimensions more frequently report health problems in comparison with HPs who reach low burnout levels. Available data have shown the strong association of altered health status with burnout in HPs [42]. Hence, it can be concluded that workplace characteristics (high job demands and reduced job resources) could predict the development of burnout, which in turn leads to health problems in workers. In that context, burnout acts as a mediator of the effects that high job demands and low job resources express on the physical and mental health [53]. Physical and emotional job demands as well as burnout have been found to be risk factors for the development of musculoskeletal problems [54,55].

As a support of the aforementioned findings, the prospective cohort study has detected associations between job demands/resources and neck pain. A significant relationship was found between neck pain and high job demands and low support from the colleagues [56].

In this study only job demands were analyzed. Further studies should also involve job resources (such as salary, team work, job security, participation in decision making, autonomy, performance feedback, etc.) that could reduce job demands, and protect HPs from disengagement and physical health problems. Special attention should be paid on the associations between different job and psychological characteristics of HPs and quality of patient care.

The data obtained can be used in the creation and implementation of specific organizational interventions in the analyzed hospital settings, guided by the effects of burnout and job demands on the occurrence of

subjective musculoskeletal complaints. Specific strategies should be implemented in the hospital towards improvement of physical working conditions (e.g., reducing workload and time pressure through new employments as well as by purchasing new medical equipment and other supplies). Further building of the team work (e.g., forming teams to solve workplace problems, holding regular meetings to review progress, celebrating team successes publicly as well as building fun and shared occasions into the hospital's agenda) within the hospital settings can be used as a means with regard to improving the well-being of HPs since team work was found to have buffering effect on the development of burnout. These issues should be presented to the policy makers especially in the context of health care reforms. Finally, it is important to notice that providing adequate job demands-resources interaction can lead to the prevention of work-related burnout and physical health complaints in HPs, and contribute positively to higher quality of patient care. These considerations are particularly meaningful since scientific evidence clearly demonstrates that burnout and impaired health in HPs lead to a reduced quality of care.

Various interventions could be implemented for the prevention of work-related MSDs in HPs [28-30]. The main effort focuses on early intervention by identifying and removing risk factors, as well as by implementing processes that could involve, for example, avoidance of repetitive patterns of work through job design and re-design (e.g., mechanization, job rotation, job enlargement and enrichment, or strengthening teamwork). Applying of organizational and individual strategies for the prevention of work-related stress has to be fostered, together with changes in regulations and policies at the workplace as well as lifestyle changes, training and education of employees, modifying the individuals' stress responses, and assistance or counseling programs [31,32]. The inclusion of key stakeholders, such as specialists in occupational medicine, occupational safety and health professionals, workers, employers, managers (especially, line managers), ergonomic consultants, or disability managers is needed for building an evidence platform for informed decision-making and making better choices towards prevention of work-related MSDs and job stress.

## Conclusion

We can conclude that both job demands and burnout predict the occurrence of subjective musculoskeletal complaints. Participants with high/medium emotional exhaustion more frequently complain about back and lower limb pain compared to participants with low emotional exhaustion. Participants with burnout compared to those who did not have burnout more frequently complain about back and upper limb pain. The occurrence of back pain was predicted by physical

demands and emotional exhaustion and the occurrence of upper limb pain by physical demands and depersonalization. Adequate management of job demands can lead to prevention of burnout and musculoskeletal complaints in surgery HPs.

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