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Stress among nurses working in emergency, anesthesiology and intensive care units depends on qualification: a Job Demand-Control survey

Marion Trousselard[1] · Frédéric Dutheil[2,3,4,5] · Geraldine Naughton[3] · Sylvie Cosserant[6] · Sylvie Amadon[6] · Christian Dualé[7,8] · Pierre Schoeffler[5,6]

Abstract

Background The nurse stress literature reports an overwhelming culture of acceptance and expectation of work stressors, ironically linked to the control of the workplace to effectively and proactively manage stress. The stressors involved in delivering "stress management" have been well studied in nursing-related workplaces, especially in acute care settings in accordance with the Karasek Job Demand-Control-Support (JDCS) model. However, little is known about the effects of specificity of an acute care unit and the level of qualifications on stress experienced by nurses.
Methods A survey using the JDCS model was conducted among 385 nurses working in three different acute care units (anesthesiology, emergency and intensive care unit) from a university hospital. Specific questions explored variables such as gender, acute care units, level of qualification and working experience.
Results Two hundred questionnaires were returned. A high level of job strain was highlighted without a gender effect and in the absence of isostrain. Nurses from acute care units were located in the high stress quadrant of the JDCS model. Conversely, other nurses were commonly located in the "active" quadrant. Independent of acute care settings, the highest level of education was associated with the highest job strain and the lowest level of control.
Conclusions In an acute care setting, a high level of education was a key factor for high job stress and was associated with a perception of a low control in the workplace, both of which may be predictors of adverse mental health. In particular, the lack of control has been associated with moral distress, a frequently reported characteristic of acute care settings. To enhance the personal and professional

✉ Frédéric Dutheil
frederic.dutheil@acu.edu.au; fred_dutheil@yahoo.fr

Marion Trousselard
marion.trousselard@gmail.com

Geraldine Naughton
geraldine.naughton@acu.edu.au

Sylvie Cosserant
scosserant@chu-clermontferrand.fr

Sylvie Amadon
samadon@chu-clermontferrand.fr

Christian Dualé
cduale@chu-clermontferrand.fr

Pierre Schoeffler
pschoeffler@chu-clermontferrand.fr

[1] Neurophysiology of Stress, Armies' Biomedical Research Institute, Armies' Health Service, Bretigny sur Orge, France

[2] Occupational Medicine, University Hospital of Clermont-Ferrand (CHU), Clermont-Ferrand, France

[3] School of Exercise Science, Faculty of Health, Australian Catholic University, Melbourne, VIC 3065, Australia

[4] Laboratory of Metabolic Adaptations to Exercise in Physiological and Pathological Conditions EA3533, Blaise Pascal University, Clermont-Ferrand, France

[5] University Clermont Auvergne, 63000 Clermont-Ferrand, France

[6] Anesthésie-Réanimation, Pôle BLOC-ARCHI, CHU Clermont-Ferrand, 63003 Clermont-Ferrand, France

[7] Centre de Pharmacologie Clinique, CHU Clermont-Ferrand, 63003 Clermont-Ferrand, France

[8] Inserm, CIC1405, 63003 Clermont-Ferrand, France

outcomes of the advanced registered nurses, strategies for supporting nurses manage daily stressors in acute care are urgently required.

Keywords Stress · Karasek · Hospital · Occupation · Strain · Social support · Psychology

Abbreviations

AnU   Anesthesia units
APRN   Advanced practice registered nurses
ECU   Emergency care units
ICU   Intensive care units
JCQ   Job Content Questionnaire
JDC   Job Demand-Control model from Karasek
JDCS   Job Demand-Control-Support model
SRNL   Simple registered nurses license
MICU   Mobile intensive care unit

Introduction

Workplace stress is a major concern (Backe et al. 2012). Nurses working in emergency departments are particularly at risk (Hooper et al. 2010; Healy and Tyrrell 2011; Garcia-Izquierdo and Rios-Risquez 2012). They must focus on a breadth of acute care, on demand. Emergency nurses also experience stress due to shift work (Shao et al. 2010), increased workloads (Lowthian et al. 2012), government reporting targets (Flowerdew et al. 2012), aggressive and violent behavior from patients and their relatives (Magnavita and Heponiemi 2012; Kowalenko et al. 2013) and presentations relating to trauma, alcohol (Patton et al. 2007) and recreational drug abuse (Patton et al. 2007). Emergency nurses are exposed to a complex interplay between stress [life-and-death emergencies (Adriaenssens et al. 2012), which is the defining characteristic of their job], sleep deprivation and fatigue due to repeated changes in shifts (Shao et al. 2010). Work-related exhaustion can lead to various physical and psychological symptoms (Shao et al. 2010) and delayed decision-making, including making treatment or medication errors (Hillin and Hicks 2010; Mazer et al. 2011). Moreover, prolonged stress exposes emergency nurses to a higher risk of multiple diseases (Cohen et al. 2007; Shao et al. 2010), predominantly systemic inflammation (Black 2002; Elenkov et al. 2005), metabolic disorders (Pervanidou and Chrousos 2012) and coronary heart disease (Cohen et al. 2007; Proietti et al. 2011). All these contribute to increased sick leave (Rugless and Taylor 2011) and the premature departure of emergency nurses to other professions and increased turnover of staff (Jones 2008). Among nurses, those who work in emergency care units (ECU; Gillespie and Melby 2003), anesthesia units (AnU) or intensive care units (ICU;

Bakker et al. 2005; Guntupalli et al. 2014) are thought to have higher levels of stress and burnout. However, differences in occupational stress between nurses from these different types of units involved in acute care have never been extensively investigated.

The Job Demand-Control model (JDC) from Karasek et al. (1981) and the Job Demand-Control-Support (JDCS) model (Karasek et al. 1998) are among the most widely used theoretical frameworks relating the characteristics of a workplace to health and well-being (Pisanti et al. 2011). The JDC model recognizes the importance of daily environmental stressors on the long-term experiences of stress (Theorell and Karasek 1996). It is based on two main hypotheses: the strain hypothesis predicts that job demands, such as high workload and time pressures, increase employee stress, and the buffer hypothesis predicts that increasing control can alleviate the negative effects of high demands. Use of the term "control" highlights the two opposing ends of a continuum describing decision latitude: skill discretion and decision authority (Karasek et al. 1998). The "active job" quadrant is defined by high demands and high control, and the "strain" high stress quadrant is defined by high demands with low control (Theorell and Karasek 1996). The active job quadrant has been associated with facilitation for learning and developing skills (Karasek et al. 1981; Pisanti et al. 2011). Karasek also developed the JDCS, which is also known as the "Job Content Questionnaire" (Karasek et al. 1998). The JDCS model added a social support buffer that can moderate the negative impact of high strain on health and well-being (Johnson and Hall 1988). This model defines an isostrain hypothesis which predicts the most negative outcomes among workers engaged in an isostrain job (high demands–low control–low social support/isolation). Because of the naturally occurring variations in demands and control within the healthcare sector, nursing has been well evaluated by the JDC and its upgraded JDCS model (Ganster et al. 2001; Laschinger et al. 2001). Repeatedly and internationally, the nursing profession has been found to fall into the "active job" quadrant of the model (Theorell and Karasek 1996; Seago and Faucett 1997). Three quarters of French nurses were placed into the "active job" quadrant. In contrast, one quarter fell into the high stress quadrant, with social support playing a moderator role in their well-being (Niedhammer et al. 2006).

Such results suggest that certain subpopulations appear to be more vulnerable to high (iso)strain, whereas others benefit more from high control. This is in line with the literature giving considerable support for the strain and isostrain hypotheses, but less consistent support for the moderating influence of job control and social support (Pisanti et al. 2011). The balance between demands and control may be one of the key factors in the conflicting

data (Pisanti et al. 2011). Indeed, only some aspects of job control appear to correspond to specific demands of a given job and are given the status for moderating the impact of high demands on health, well-being or job satisfaction. The impact of the demands and control imbalance on the stress experienced by nursing students is currently generating interest (Gerrish 2000; Duchscher 2001; O'Shea and Kelly 2007). However, less is known about experienced and graduated nurses. Particularly, there is a scarcity of investigations into the role of the level of nursing qualification in stress. It is possible that nurses with higher qualifications and positions may be vulnerable to relatively high strain associated with perceptions of inadequate control, namely the ability to make decisions (Toh et al. 2012). Therefore, the main objective of this study was to compare the differences in perceived demands, control and social support between nurses from ECU, AnU and ICU. The secondary aim was to evaluate the role of the level of nursing qualification in the demands–control balance.

Methods

Participants

We conducted a cross-sectional survey on the 385 nurses working in ECU (174 nurses, 45.2 %, four departments), AnU (93 nurses, 24.2 %, two departments) and ICU (118 nurses, 30.6 %, three departments) of the University Hospital of Clermont-Ferrand, France. Being a nurse working in those units was the only inclusion criteria; no exclusion criteria applied. Questionnaires were distributed by the team managers to the nurses' mailbox. To be included, volunteers had to complete the questionnaires anonymously within a month. The study was approved by the University Hospital Ethics Committee of Clermont-Ferrand, France.

Outcomes

Questionnaires assessed characteristics of the nurses and JDCS model. Demographic and employment variables: age, gender, experience as a nurse, experience in the hospital, experience in the current position and qualifications in emergency/anesthesia/intensive care, were distinguished in simple registered nurses license (SRNL) or advanced practice registered nurses (APRN). The JDCS assessed job demands, job control and social support using the 26 items of the French version of Job Content Questionnaire (JCQ; Karasek et al. 1998; Niedhammer et al. 2006). The questionnaire measures nine items of job demands, nine items of job control and eight items of social support. Items of

JCQ were scored on a four-point Likert-type scale, ranging from 1 = strongly disagree to 4 = strongly agree. Among the 26 items, five negative statements required reverse scoring. From French data, the job strain threshold is set for a demands score higher than 20 and a control score lower than 71; the isostrain threshold is determined from a combining score of job strain and social support lower than 24 (Niedhammer et al. 2006).

Statistical analyses

Questionnaires were excluded when more than two items of the questionnaire were incomplete. All statistics were performed using the XLSTAT software (version 2014.1, Addinsoft, France). Whenever possible, parameters were expressed as mean ± standard deviation (SD). Inter-sample differences were studied using ANalysis Of VAriance with Tukey post hoc analysis applied when significant interaction (quantitative variables) or Chi-square tests (qualitative variables). A multiple-component analysis was finally performed to detect relationships between qualitative variables (units, qualification, strain and isostrain). A single-factor solution was obtained, explaining 85.5 % of the variance. Factor loads were then used to categorize the participants by k-means clustering method. Two subgroups were separated according to the nurses' level of qualification (SRNL or APRN). Significance was set for a $p < 0.05$ level. Correlations between variables were considered strong when $r > 0.5$, moderate when $0.3 < r < 0.5$ and negligible when $r < 0.3$ (Bussing et al. 2011).

Results

Representativeness of care units

We analyzed 200 questionnaires of the 385 distributed (51.9 %). The number of questionnaires included significantly differed between units (Table 1): 31 from ECU (39.7 %), 70 from AnU (53.8 %) and 99 from ICU (68.7 %). The main scores of the sample were 25.9 ± 3.8 for the demand score, 70.3 ± 6.1 for the control score and 22.9 ± 3.3 for the isostrain score (Table 2). No returned questionnaires were excluded because of missing data. The only missing data were gender in 28.5 % of questionnaires returned; all other questions were completed.

Gender of voluntary nurses

Among the 200 respondents, 110 nurses were females (55 %), 33 were males (16.5 %), and the remaining 57 omitted information about gender (28.5 %).

Table 1 Numbers of nurses in emergency, anesthesiology and intensive care units

Units	Nurses	Questionnaires returned	
	n	n (%)	Distribution (%)
Emergency care units	174	31 (39.7 %)	
SRNL/emergency room		25	12.5
APRN/MICU		6	3.0
Anesthesiology units	93	70 (53.8 %)	
SRNL		11	5.5
APRN		59	29.5
Intensive care units	118	99 (68.7 %)	
SRNL		89	44.5
APRN		10	5.0
Total	385	200 (52 %)	

APRN advance practice registered nurses, *SRNL* simple registered nurses license, *MICU* mobile intensive care unit

Experience

Employment seniority as a nurse was 101.5 ± 88.2 months. Experience in the hospital was 111.8 ± 88.8 months, and experience in the unit was 64.9 ± 67.6 months. ECU and ICU SRNL had lower experience in the hospital emergency and the intensive care units. Experience in the hospital differed ($F = 4.09$, $p = 0.001$): AnU APRN had more experience than ECU ($p = 0.009$) and ICU ($p = 0.008$) SRNL

(Fig. 1). Females had longer experience than males, collectively in employment seniority ($t = 2.27$; $p = 0.02$; female: 71.5 ± 72.4; male: 41.2 ± 42.3), experience in the hospital ($t = 2.48$; $p = 0.01$; female: 124.9 ± 104.0; male: 77.8 ± 60.1) and experience in the unit ($t = 2.47$; $p = 0.01$; female: 112.6 ± 89.6; male: 70.6 ± 69.5).

Qualifications

The rate of having an APRN qualification differed between AnU, ECU and ICU ($X_2 = 119.2$; $p < 0.001$), as the nurses in AnU were mostly APRNs (i.e., anesthetist nurses; 59/70, 84.3 %), while those from ECU and ICU were mostly SRNL nurses (respectively, 25/31 and 89/99, i.e., 80.6 and 89.9 %). Among the four departments of ECU, we had to distinguish the nurses assigned to the mobile intensive care unit (MICU) and those working in emergency rooms (ER), because the mobile unit has highly specialized qualification demands. No gender effect was found for the qualification level (X_2; $p > 0.05$).

Job strain and isostrain

In the current study, Cronbach's alpha coefficients were 0.61 for psychological demands, 0.60 for job control and 0.81 for social support. Job demand and social support levels did not differ between units. SRNL ICU nurses had a higher control level than APRN AnU nurses (Table 2). Job

Table 2 Descriptive variables (mean ± SD) for job demand, control and social support according to the units and the level of qualification

Variables	Mean ±SD	F, p-value	Units (n)	qualification (n)	Mean ±SD
Job demand	25.9±3.8	1.9, p=0.1	AnU n=70	APRN (59)	24.8±2.8
				SNRL (11)	26.6±3.4
			ICU n=99	APRN (10)	24.8±4.2
				SNRL (89)	26.5±4.5
			ECU n=31	MICU (6)	24.7±2.3
				SNRL (25)	26.5±3.9
Control	70.3±6.1	2.98, p=0.01	AnU n=70	APRN (59) *	**68.2±6.7**
				SNRL (11)	72.6±4.6
			ICU n=99	APRN (10)	67.8±5.4
				SNRL (89) *	**71.2±5.9**
			ECU n=31	MICU (6)	69.7±4.9
				SNRL (25)	72.0±4.2
Social support	22.9±3.3	1.42, p=0.22	AnU n=70	APRN (59)	22.9±2.7
				SNRL (11)	25.2±3.3
			ICU n=99	APRN (10)	22.9±3.4
				SNRL (89)	22.7±3.1
			ECU n=31	MICU (6)	22.8±4.1
				SNRL (25)	22.2±4.6

AnU anesthesiology unit, *ECU* emergency care unit, *ICU* intensive care unit, *MICU* mobile intensive care unit, *APRN* advance practice registered nurses, *SRNL* simple registered nurses license

* Significant difference between subgroups (in bold)

Fig. 1 Scattergrams for length of service in the unit (*top*) and in the hospital (*middle*), and employment seniority (*bottom*) in months. *AnU* anesthesiology unit, *ECU* emergency unit, *ICU* intensive care unit, *MICU* mobile intensive care unit, *APRN* advance practice registered nurses, *SRNL* simple registered nurses license
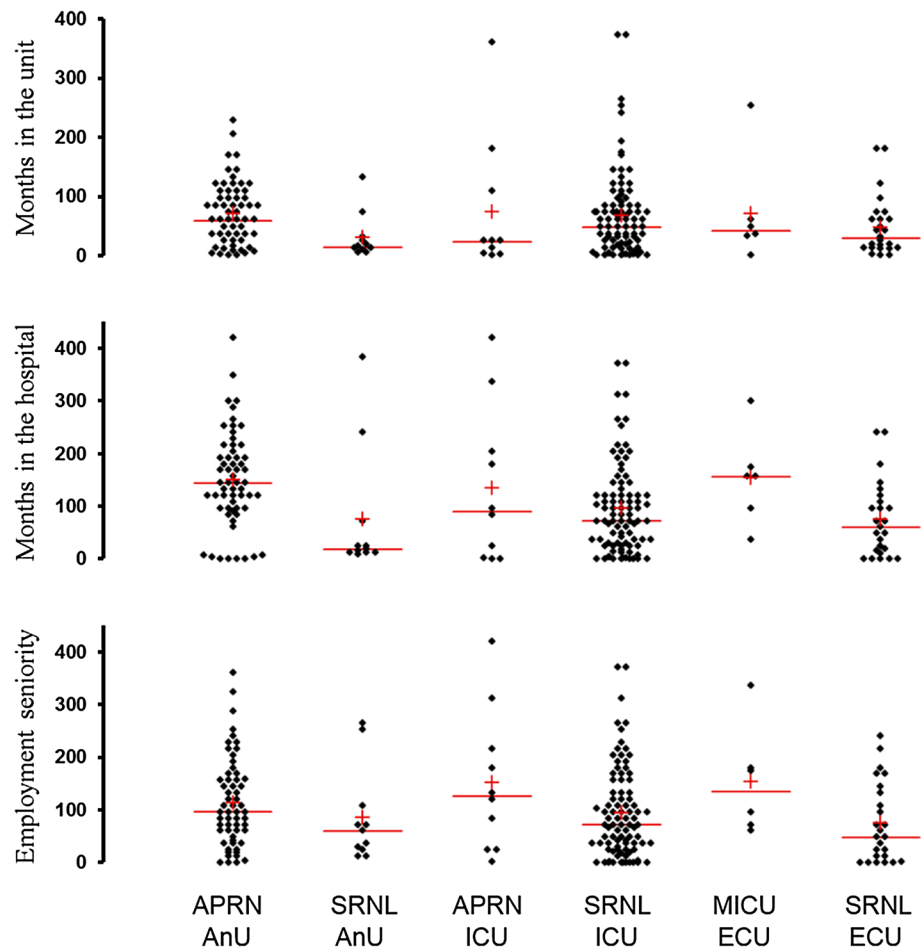
demand was positively correlated with job control scores ($r = 0.25$, $p < 0.001$) and negatively correlated with social support ($r = -0.15$, $p = 0.05$). Job control was also positively correlated with social support ($r = 0.21$, $p = 0.004$). No gender effect was observed for job demand and job control. Males tended to perceive a higher social support than females (males: 23.7 ± 2.7; females: 22.6 ± 3.4; $F = 3.01$, $p = 0.08$). The percentage of nurses with job strain was 48.8 %. The percentage of nurses with job strain was higher in APRN nurses of MICU (66.7 %), AnU (62.7 %) and ICU (70.0 %) than in SRNL nurses of ER (28 %), AnU (36.4 %) and ICU (43.8 %) ($p = 0.023$). Isostrain percentages between these subgroups did not differ ($p = 0.22$). The percentages of nurses with job strain did not differ with gender, males (48.5 %) and females (51.8 %; $p = 0.73$), nor with isostrain between males (21.2) and females (38.2 %; $p = 0.07$).

Level qualification impact

A multiple-component analysis was lastly performed to detect a relationship between qualitative variables (units, qualification, strain and isostrain). A single-factor solution

was obtained, explaining 85.5 % of the variance. Factor loads were then used to categorize the participants by k-means clustering method. Two subgroups were separated according to the nurses' level of qualification (SRNL or APRN). SRNL nurses in ECU, AnU and ICU were evenly distributed in the job active quadrant, whereas APRN nurses in MICU, AnU and ICU were located in the high stress job quadrant (Fig. 2; Table 3).

Discussion

The main findings from the JDCS questionnaire were that nurses from ECU, AnU and ICU exhibited both a high level of demand and a low control level of job strain, independent of gender. They were located in the high stress quadrant of the JDCS model, whereas French nurses in general were commonly located in the active quadrant (Niedhammer et al. 2006). Moreover, nurses with the highest level of qualifications had the highest job strain and the lowest level of control, independent of the acute care settings.

Our nurses were located in the high stress quadrant of the JDCS model, with a higher level of job demand, a lower

Fig. 2 Cluster of nurses for job demand and control. Representation, for each identified cluster, of the mean values of job demand and control levels. The *gray circle* represents the APRN (advance practice registered nurses) cluster, the *white circle* represents the SRNL (simple registered nurses license) cluster, and the *black diamond* represents the referential value for French nurses in 2003 (Niedhammer et al. 2006). The whiskers are the limits of the 95 % confidence interval. *AnU* anesthesia unit, *ER* emergency room, *ICU* intensive care unit, *MICU* mobile intensive care unit
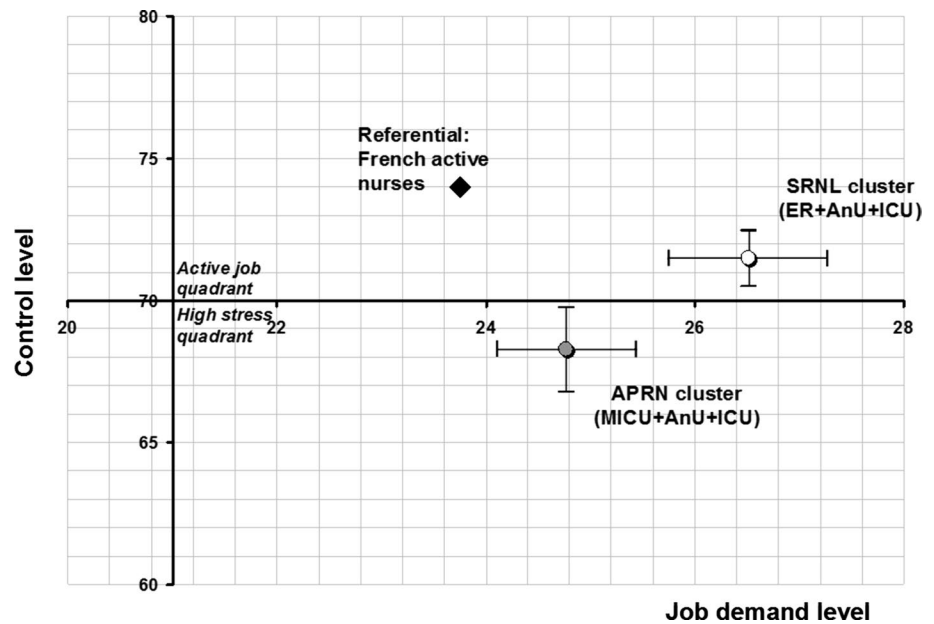

Table 3 Distribution of nurses within quadrants of the job demand, control and social support model (active, high strain, passive and low strain) and isostrain

Units	Qualification n	Quadrant – n (%)				Isostrain n (%)
		Active	High strain	Passive	Low strain	
AnU	APRN, n=59	18 (30.5)	37 (62.7)	3 (5.1)	1 (1.7)	23 (39.0)
	SNRL, n=11	6 (54.5)	4 (36.4)	0 (0.0)	1 (9.1)	2 (18.2)
ICU	APRN, n=10	2 (20.0)	7 (70.0)	1 (10)	0 (0.0)	5 (50.0)
	SNRL, n=89	47 (52.8)	39 (43.8)	3 (3.4)	0 (0.0)	25 (28.1)
ECU	MICU, n=6	2 (33.3)	4 (66.7)	0 (0.0)	0 (0.0)	3 (50.0)
	SNRL, n=25	16 (64.0)	7 (28.0)	0 (0.0)	2 (8.0)	5 (20.0)
p value (chi square)		**0.030**				0.222
APRN cluster, n=75		22 (29.3)	48 (64.0)	4 (5.3)	1 (1.3)	31 (41.3)
SRNL cluster, n=125		69 (55.2)	50 (40.0)	3 (2.4)	3 (2.4)	32 (25.6)
p value (chi square)		**0.003**				**0.031**

Significant difference between subgroups (in bold)

AnU anesthesiology unit, *ECU* emergency care unit, *ICU* intensive care unit, *MICU* mobile intensive care unit, *APRN* advance practice registered nurses, *SRNL* simple registered nurses license

level of control, and a lower level of social support than the French thresholds (Niedhammer et al. 2006). These results were not representative of French nurses who were previously described in the active job quadrant of the Karasek model (Niedhammer et al. 2006). However, they were in accordance with previous reports of a higher stress level for nurses working in acute care units in comparison with those working in other medical services (Gillespie and Melby 2003; Bakker et al. 2005; Guntupalli et al. 2014). In terms of health, a review of 20 years of empirical research using Karasek's model confirmed that being in the high stress quadrant was associated with low psychological well-being,

poor job satisfaction, burnout and other forms of psychological distress (Laschinger et al. 2001; Pisanti et al. 2011).

Potential explanatory variables of higher job stress have typically been demographic factors such as age, marital status and education (Lutzen et al. 2003; Chou et al. 2014). We did not assess these variables to preserve the perception of anonymity. Interestingly, we found similar job strain levels between female and male nurses. Studies have previously reported a higher stress level for females independent of nationality and the health unit (Lutzen et al. 2003; Chou et al. 2014). In our study, the lack of gender difference may reflect that the demands and immediacy of stressful

situations were unlikely to be perceived differently by gender. Perhaps, nurses in less stressful roles might represent gender differences more strongly. Although not observed in the current study, gender effects on stress in health care industry remain of significant importance both at the individual and collective level. For example, in France, healthcare industry employs in excess of 1,500,000 workers with more than 75 % of females that includes a majority of nurses (Niedhammer et al. 2006). Whether our finding must be considered as an exception among nursing workplaces or be linked to the specific assessed acute care setting units, needs further research with a stronger exploration of sociodemographic variables.

The job strain and isostrain levels failed to differ between ECU, AnU and ICU. Emergency, as anesthesia or intensive care, imposes engagement in shift work, cognitive work complexity such as unpredictability, serious consequences for missing information and unreliable access to resources and processes. It also imposes a high cognitive workload for care management strategy because of stacking of activities, strategic delegation, hand-off decisions, anticipation and forward thinking (Ebright et al. 2003). Our results suggested that these occupational stressors induced a common pattern of stress among nurses working in acute care settings independent of the specialization between ECU, AnU or ICU.

A negative impact of the level of qualification was observed on job strain level, again, independent of the acute care settings. Specifically, nurses with an APRN qualification, characterizing the nurses with additional education, exhibited the highest job strain and perceived the lowest control level. It is an interesting result as there is a dearth of the available literature on the effect of the educational level on nurses' occupational stress. The highlighted role of control (decision latitude) in job stress addresses two issues for further studies. The first one questions whether a low control acts as a direct factor or as moderator of job stress (Hurrell and McLaney 1988). The second one points to the need for additional research into the role of the two constructs of the control variable: skill discretion and decision authority (Karasek et al. 1998). Skill discretion, as the level of skill required, the ability to learn, to develop skills or use these skills creatively on the job, as well as the repetitiveness or variety of skills used on the job is usually observed as a key factor of job stress (Karasek et al. 1998), in particular for nurse managers and experienced nurses in intensive care unit (Theorell and Karasek 1996; Lutzen et al. 2003). Decision authority signifies the ability of employees to make decisions regarding work. It has mainly been considered as a factor of stress for nurse managers because of feelings of perceived powerlessness and role conflict or ambiguity (Karasek et al. 1998).

A better understanding of the role of control in nurses' stress relative to their educational level is particularly

important because of the risk of moral distress associated with a low control level (Lutzen et al. 2003). Moral distress was first identified in 1984 as a phenomenon in which the individual knows the right action to take, but is constrained from taking it (Jameton 1993). There is growing recognition of its role in nurses' job strain (Lutzen et al. 2003) and in the development of suffering in the workplace (Theorell and Karasek 1996; Lutzen et al. 2003; Hamric and Blackhall 2007), also known as burnout (Chou et al. 2014). Acute care units are particularly concerned by the deleterious health consequences of moral stress (Hamric and Blackhall 2007). It is considered that individuals who perceive they have no control over specific work situation share a lack of decision latitude, which collectively comprises a precondition for moral distress for nurses (Lutzen et al. 2003). Consequently, being an APRN may be a risk factor for moral distress by increasing experiences and legitimacy for decisions in care, namely in acute care settings, which is characterized by the need for decision-making to respond to emergencies (Hooper et al. 2010; Healy and Tyrrell 2011; Adriaenssens et al. 2012; Garcia-Izquierdo and Rios-Risquez 2012). By taking into account this last result, recommendations should be provided for improving communication management at a collective level and self-affirmation at an individual level. Such programs must be considered for improving the benefits on stress reduction in using interventions based on cognitive-behavioral training, mental and physical relaxation or organizational changes (Ruotsalainen et al. 2015).

This study has some limitations. The response rate may seem low; however, it is higher than previously reported (Lopez et al. 2013). We do not have any information on the age of nurses because age was considered as a potential means of recognizing the identity of nurses within small units. Nonetheless, experience in the workplace could be more informative than age. Gender was also not always declared. These observations invite discourse on the perception of anonymity for workers assessed in their professional context. It appears important to add an evaluation of this perception in the forthcoming further studies (Hite et al. 2014). The role of the qualification level on the lack of control was observed for a single university hospital, albeit from various units. Expansion of future investigations to a larger sample of hospital may improve external validity. Shiftwork history may also help to profile these nurses.

Conclusions

In conclusion, nurses from ECU, AnU and ICU were located in the high stress quadrant of the JDCS model, whereas nurses were previously located in the active

quadrant. They also had a higher level of job demand, a lower level of control and a lower level of social support than the French thresholds, independent of gender. Moreover, nurses with the highest level of qualification had the highest perceptions of job strain and the lowest level of control, independent of the acute care settings. A key factor of job stress for the nurses with the highest qualification degree is in relation to a perception of a lack of decision latitude. The relationship between the perception of a lack of decision and moral distress must be further studied for nurses in the acute care setting. This is a precondition for developing adapted long-term solution for nurses' stress at work.

Compliance with ethical standard

Conflict of interest   The authors declare that they have no competing interests.

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