

ORIGINAL RESEARCH

Fatigue among Intensive Care Unit Nurses

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Key Words: nurses, fatigue, intensive care unit.

Summary. The aim of this study was to assess the relationship between the dimensions of fatigue among nurses in intensive care units.

Material and Methods. A cross-sectional design study was conducted in three intensive care units of Lithuanian hospitals from March to December 2019. Totally, 228 intensive care unit nurses working in intensive care units participated in the study (response rate was 90.8%). The Multidimensional Fatigue Inventory was employed to assess nurse's fatigue. The study protocol was approved by the Bioethics Centre of Lithuanian University of Health Sciences (No. BEC-SL(M)-196).

Results. Nurses assessed general fatigue with the highest scores (41.06 ± 22.82), and the lowest scores indicated reduced activity (26.81 ± 18.23). General fatigue was not associated with the nurses' age and working shift. Physical fatigue was more prevalent among nurses working in 24-h shifts compared with daytime shifts with the scores of 41.20 ± 21.86 and 35.82 ± 25.77 , respectively.

Reduced motivation (31.09 ± 17.86) and mental fatigue (31.70 ± 24.81) were higher in nurses working in the daytime shift than in the 24-h shift. General fatigue correlated significantly positively with physical fatigue ($r = 0.774$, $P < 0.001$), mental fatigue ($r = 0.548$, $P < 0.001$), reduced activity ($r = 0.614$, $P < 0.001$), and reduced motivation ($r = 0.607$, $P < 0.001$).

Conclusions. General fatigue was most frequent among intensive care unit nurses. Daytime shift was associated with reduced nurses' activity; furthermore, younger nurses indicated higher mental fatigue.

Introduction

Nurses as human resources are becoming the most important and active part of the healthcare system, which determines the efficiency of the organization. Nurses are responsible for patient care and quality assurance; however, they are not satisfied with their work due to stress, high workload and fatigue (1). The greater the demands placed upon the work of the medical profession, the more intense the stress and the greater the fatigue experienced by the nurses (2).

The main types of fatigue are general, physical, mental, emotional, power, and force (3). Nurse fatigue is also described as a feeling of emotional, mental or physical fatigue or fatigue caused by nursing. Nurse fatigue also has a direct impact on patient outcomes. It is imperative to ensure the quality of nurses' work and to look for integrated solutions to increase their job satisfaction. Fatigue is linked with burnout and job satisfaction negatively. Burnout has a direct impact on health outcomes through depletion of resources,

negative states characterized by exhaustion, fatigue and social retreat (1, 4–7). Hunsaker et al. (2015) revealed overall low to average level of compassion fatigue and burnout, and generally average to high levels of compassion satisfaction among emergency department nurses. The authors found out that the low level of manager support was a significant predictor of higher levels of burnout and compassion fatigue among emergency department nurses, while a high level of manager support contributed to a higher level of compassion satisfaction (5).

Scientific literature identifies a variety of causes of nurse fatigue related to sleep deprivation or poor quality of sleep (8), personal commitment or other lifestyle factors (9). Fatigue can be caused by long working hours, inadequate recovery between shifts, night shifts, overload and work demands, staff shortages and a hazardous work environment (6). Mental disorders and physical tiredness caused by fatigue can lead to the deterioration of nurses' performance, which may compromise patient safety and satisfaction with care (10–12). When the nurse is constantly tired, the job satisfaction of the nurse also decreases.

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Meeusen et al. found out that Dutch nurse anaesthetists above the age of 50 years show a high fatigue score and, therefore, need special attention to prevent them from harmful physical and psychological effects, and to sustain maximum patient safety (7). The intensive care nurses in the study of Celik et al. (2017) were found to be experiencing fatigue with significant correlations between anxiety, depression, and quality of sleep (13).

Fatigue can result directly from poor working conditions. Ahmed et al. (2015) pointed out that staff shortages and inadequate resources were rather common causes of nurse fatigue (14). When high responsibilities of nurses are met with limited resources, supplies or equipment, rigidity of working hours, improperly scheduled shifts, conflicts and poor relationships between staff, management and patients can occur. This results in a sufficiently high level of nurse fatigue. Significant differences were found between nurses' working conditions, fatigue and performance: nurses' performance is affected by the degree of work status and fatigue levels (14).

There are ways to reduce fatigue, such as planning one's own activities (scheduling work so that you have enough time to rest between shifts if higher workloads lead to higher pay) (14). A positive work environment and the implementation of preventive stress and fatigue programmes are important (15–16). Teamwork can also have a positive effect on reducing fatigue and increasing job satisfaction (16).

In Lithuania, some studies have evaluated nurse fatigue and related factors. Karpavičiūtė (2016) analysed nurse fatigue in representative Lithuanian population of nurses, although nurse fatigue was not separated according to the specialisations or working units (3). It was determined that nurses who were satisfied with their general life and work assessed their general and physical fatigue, motivation and activity, and perceived stress better than the persons who were dissatisfied. Kandrašvieniė (2016) analysed nurses' mental health fatigue and revealed that the highest was general and physical fatigue, and the lowest was mental fatigue (17). Puskunigienė (2016) assessed the relationship between stress, fatigue and self-esteem among nurses in a clinical hospital and found that clinical hospital nurses mostly expressed decreased motivation; mental fatigue was least common, and self-esteem reduced when nurses experienced more stress (18).

Intensive care nurses provide most of the direct care to patients in life threatening situations within intensive care units. Nurses need to be skilled to assess patients' problems quickly and be capable to use high-tech equipment. Critical care nurses are at risk for fatigue that affect their safety, health, and practice. The healthcare team should be able

to identify team members who are working while fatigued and intervene to protect both the nurse's and patient's safety. When approached in the spirit of respect and cooperation, management teams will be more receptive to looking for an acceptable solution that will allow nurses to avoid fatigue and meet patient needs safely. When both the management team and nurses are educated about nursing fatigue, they can work together to quickly identify when a team member is too fatigued to provide optimal patient care and intervene appropriately.

The aim of this study was to assess the dimensions of fatigue among intensive care unit nurses.

Methods

Study Design and Sample. A cross-sectional study design was implemented. The study was performed in three Lithuanian hospitals: seven intensive care units at one tertiary-level (highly specialized healthcare services) healthcare institution and two secondary-level institutions. The data were collected from March to December 2019. The inclusion criterion was nurse's working experience in an intensive care unit ≥ 0.5 years. Totally, 228 intensive care unit nurses participated in the study (response rate was 90.8%).

Instruments. The Multidimensional Fatigue Inventory was employed in the study. The Multidimensional Fatigue Inventory (MFI-20) was designed by the Netherlands researchers Smets et al. in 1995 (19). The MFI-20 is a self-report measure requiring between 5 and 10 min for completion. In Lithuania, Stankus translated the inventory MFI-20 for learning and research purposes (20).

The MFI-20 consists of five scales (*General fatigue*, *Physical fatigue*, *Reduced activity*, *Reduced motivation*, and *Mental fatigue*), based on different modes of expressing fatigue. *General fatigue* includes general statements concerning a person's functioning such as 'I feel rested'. *Physical fatigue* refers to the physical sensation related to the feeling of tiredness. Possible somatic symptoms of fatigue such as light-headedness or sore muscles are not included in this scale in order to exclude as much as possible the contamination with the symptoms of somatic illness, independent of fatigue. Reduction in activities and lack of motivation to start any activity are covered by the scales *Reduced activities* and *Reduced motivation*, respectively. Finally, cognitive symptoms such as having difficulties concentrating are included in the scale for *Mental fatigue*. Each scale contains four items for which the person has to indicate on a seven-point scale to what extent the particular statement applies to him or her. An equal number of items is worded in a positive and in a negative direction to counteract response tendencies.

The MFI-20 has an even proportion of positively and negatively worded items that was rated on a

5-point Likert scale. Subscale scores (range 4–20) are calculated as the sum of item ratings, and a total fatigue score (range 20–100) is calculated as the sum of subscale scores. Higher scores indicate a higher level of fatigue.

Work quality in the unit was measured by the nurses' subjective opinion by a Likert 5-point scale from 1 (very poor) to 5 (excellent). Work quality in an intensive care unit was measured as poor (1 point), fair (2 points), good (3 points), very good (4 points), and excellent (5 point).

Study Organization. The questionnaire was distributed to the intensive care nurses by one of the authors (GT). The author (GT) explained to the nurses the purpose of the survey, nurses' voluntary participation was highlighted, and anonymity and confidentiality were assured.

Ethical Consideration. The study protocol was approved by the Bioethics Centre of Lithuanian University of Health Sciences (No. BEC–SL(M)–196).

Statistical Analysis. Statistical survey data analysis was performed using Statistical Package for the Social Sciences for Window 24.0 version. The study employed descriptive statistics (mean and standard deviation for interval data, absolute numbers and percentage for nominal data), correlation analysis (Spearman's rho coefficient), non-parametric Mann-Whitney U test for the comparison of 2 samples, and the Kruskal-Wallis H test for the comparison of 3 and more samples. With respect to the correlation analysis, $r > 0.5$ was a strong correlation, $0.3 < r < 0.5$ was a moderate correlation, $0.2 < r < 0.3$ was a weak correlation, and $r < 0.2$ was no or a negligible correlation. The significance was defined by a P value of 0.05.

The difference was considered statistically significant when $P \leq 0.05$.

Results

Totally, 228 nurses participated in the study. The demographic and work characteristics of nurses are presented in Table 1. Most nurses (99.1%) were female. The largest group (38.6%) was comprised of the nurses of 40–49 years old. The average experience at an intensive care unit was mostly less than 10 years (36.4%), although general work experience was more than 25 years (37.3%).

The distribution of nurse fatigue scales according to the nurses' age and working shift is presented in Table 2. Nurses evaluated general fatigue with the highest scores (41.06 ± 22.82), and the lowest scores indicated reduced activity (26.81 ± 18.23). Nurses' general fatigue was dominant and had no relationship with age group and working shift. Higher physical fatigue scores were indicated by the nurses working in 24-h shifts compared with daytime shifts (41.20 ± 21.86 and 35.82 ± 25.77 , respectively).

Table 1. Demographic and Work Characteristics of Nurses

| Characteristics | | n (%) |
|-----------------------------------|-----------|------------|
| Gender | Female | 226 (99.1) |
| | Male | 2 (0.9) |
| Age group, years | < 40 | 76 (33.3) |
| | 40–49 | 88 (38.6) |
| | 50–65 | 64 (28.1) |
| Working experience at ICU, years | < 10 | 83 (36.4) |
| | 10–20 | 70 (30.7) |
| | > 20 | 75 (32.9) |
| General working experience, years | ≤ 10 | 74 (32.5) |
| | 11–25 | 69 (30.3) |
| | > 25 | 85 (37.3) |

ICU – intensive care unit.

Table 2. Distribution of Nurse Fatigue Scales According to Nurses' Age and Working Shift

| Item | | Mean \pm SD | | | | |
|------------------|------------|-------------------|-------------------|---------------------|--------------------|--------------------|
| | | General Fatigue | Physical Fatigue | Reduced Activity | Reduced Motivation | Mental Fatigue |
| Age group, years | < 40 | 41.77 \pm 22.73 | 32.48 \pm 22.05 | 25.98 \pm 17.47 | 30.18 \pm 17.95 | 34.04 \pm 21.58 |
| | 40–49 | 40.48 \pm 22.91 | 33.23 \pm 21.68 | 26.27 \pm 18.47 | 28.55 \pm 16.15 | 26.13 \pm 19.03* |
| | > 50 | 41.01 \pm 23.11 | 32.83 \pm 22.03 | 28.51 \pm 18.99 | 30.66 \pm 18.25 | 28.51 \pm 20.40 |
| Working shift | Day time | 40.39 \pm 27.03 | 35.82 \pm 25.77 | 27.43 \pm 21.82 | 31.09 \pm 17.86 | 31.70 \pm 24.81 |
| | 24-h shift | 41.20 \pm 21.86 | 41.20 \pm 21.86 | 26.67 \pm 17.43** | 29.37 \pm 17.22 | 28.94 \pm 19.46 |
| Totally, n = 228 | | 41.06 \pm 22.82 | 32.84 \pm 22.02 | 26.81 \pm 18.23 | 29.69 \pm 17.32 | 29.44 \pm 20.49 |

*Significant difference compared with the age group of < 40 years, at the $P < 0.05$ level;

**Significant difference compared with the daytime shift, at the $P < 0.05$ level.

In relation to reduced activity, a significant difference was determined: the scores of the nurses who worked in a 24-h shift were lower than those of the nurses working in daytime shifts (26.67 ± 17.43 and 27.43 ± 21.82 , respectively).

Reduced motivation and mental fatigue were more prevalent among nurses working in daytime shifts than among the nurses working in 24-h shifts (31.09 ± 17.86 and 31.70 ± 24.81 , respectively), although there were no significant differences between working shift groups. Mental fatigue was more relevant to younger than 40-year-old nurses than to those of 40–49 years old (34.04 ± 21.58 and 26.13 ± 19.03 , respectively, $P < 0.05$).

The work quality in the unit negatively correlated with physical fatigue ($r = -0.131$), reduced motivation ($r = -0.169$), and mental fatigue ($r = -0.148$) (Table 3). With better work quality in the unit, physical and mental fatigue reduces and motivation of nurse increases.

General fatigue positively correlated with all other types of nurse fatigue: if general fatigue increased, other dimensions of fatigue also increased. Physical fatigue correlated moderately positively with reduced activity ($r = 0.675$), reduced motivation ($r = 0.663$) and mental fatigue ($r = 0.529$).

Nurse’s age and working experience in the intensive care unit significantly correlated with work

quality in the unit ($r = 0.154$ and $r = 0.131$, respectively), although the correlations were negligible (Table 4). The nurses who were older and had more working experience in the intensive care unit evaluated work quality better.

Discussion

In the current study, fatigue experienced by the intensive care nurses was determined, especially general fatigue of all fatigue dimensions. Fatigue is recognised as a concern for nurses, especially those caring for unstable and critically ill patients. Caring for critically ill patients is demanding because nurses need to be vigilant and responsive to minute-to-minute changes; these expectations add additional stress and are linked to mental and physical fatigue (21).

In previous studies, it has been reported that intensive care nurses experienced fatigue (13) and fatigue was common for most nurses (92%) on acute care units (22). Other studies showed similar results. For example, nurses in public hospitals in Teheran experienced general fatigue at the most (23). Jalilian (2019) indicated that the highest score was related to the general nurse fatigue (24). Based on other study findings, general fatigue, physical fatigue, and mental fatigue of nurses who work at teaching hospitals in different wards showed higher mean

Table 3. Correlations Between Fatigue Scales and Work Quality in the Unit

| Items | Work Quality in the Unit | General Fatigue | Physical Fatigue | Reduced Activity | Reduced Motivation | Mental Fatigue |
|--------------------------|--------------------------|-----------------|------------------|------------------|--------------------|----------------|
| Work quality in the unit | 1.000 | -0.114 | -0.131* | -0.104 | -0.169* | -0.148* |
| General fatigue | - | 1.000 | 0.774** | 0.614** | 0.607** | 0.548** |
| Physical fatigue | - | - | 1.000 | 0.675** | 0.663** | 0.529** |
| Reduced activity | - | - | - | 1.000 | 0.649** | 0.588** |
| Reduced motivation | - | - | - | - | 1.000 | 0.622** |

Spearman correlation;

*Correlation is significant at the 0.05 level (2-tailed);

**Correlation is significant at the 0.01 level (2-tailed).

Table 4. Correlations between Fatigue Scales, Work Quality Evaluation and Nurses’ Age, Working Experience at the ICU, General Work Experience

| Items | Work Quality in the Unit | General Fatigue | Physical Fatigue | Reduced Activity | Reduced Motivation | Mental Fatigue |
|-------------------------------|--------------------------|-----------------|------------------|------------------|--------------------|----------------|
| Age | 0.154* | -0.013 | 0.027 | 0.072 | 0.035 | -0.088 |
| Working experience at the ICU | 0.131* | 0.003 | 0.047 | 0.030 | 0.036 | -0.118 |
| General working experience | 0.127 | -0.021 | 0.042 | 0.054 | 0.041 | -0.106 |

Spearman correlation;

ICU – intensive care unit;

*Correlation is significant at the 0.05 level (2-tailed).

scores in comparison with reduced activity and reduced motivation (25).

In our study, reduced activity and reduced motivation were less prevalent among the intensive care nurses. Similar results were found out in Bazanan et al.'s (2018) study, where reduced activity and reduced motivation were less frequent compared with other fatigue types, while the physical and mental aspects of fatigue were found to be more problematic (23).

The similar results were found out by Krzeminska (2018) as nurses working in intensive care units experienced high levels of fatigue that was most severe with regard to motivation, followed by physical fatigue, and then activity. In addition to the importance of fatigue, some specific symptoms were distinguished and the most significant included "heaviness in the legs", "wanting to lie down", "becoming nervous", "back pain" and "feeling thirsty" (26).

In our study, the daytime working shift was more associated with reduced nurses' activity. Conversely, in another Lithuanian study, nurses working on a nightshift assessed their general and physical fatigue, reduced activity and motivation and perceived stress worse than persons working on a rotating shift (3). Moreover, in the mentioned study, no significant association was observed between the type of shift and the level of fatigue (13). Nurses suffer from fatigue and professional burnout, which results in poorer health and quality of work (4, 12, 15). Literature sources indicate that fatigue causes poorer job performance, less attention, and a chance of mistakes at work (10–11). A strong positive correlation between poor sleep quality and the level of fatigue has been proved by the researchers (13).

The study found a statistically significant relationship between the quality of work in the unit and the assessment of fatigue scales. The nurses with a lower quality of work experienced more fatigue at all the scales analyzed. As the quality of work in the unit increases, physical and mental fatigue diminishes, so does motivation. Reducing fatigue among nurses requires the development of a positive work environment focused on employee well-being, and the implementation of prevention, stress, fatigue, burnout, and violence reduction programmes to en-

hance the health and well-being of healthcare professionals (15, 16, 27).

For clinical relevance of the research findings, Hunsaker et al. (2015) suggested that improving recognition and awareness of compassion satisfaction, compassion fatigue and burnout among nurses may prevent emotional exhaustion and help to identify interventions that will help nurses remain empathetic and compassionate professionals (5). Nurses should continually assess their working conditions, lifestyle practices, and stress levels, because all of these can contribute to their physical and mental fatigue. Some specific lifestyle practices associated with fatigue include physical inactivity, poor sleeping habits, food and alcohol intake, and prescription medications (28). Karpavičiūtė (2016) proved that participation in arts activity had a positive impact on nursing staff health, reducing stress and fatigue, awaking creativity and increasing a sense of community at work; arts activity as a workplace intervention can be used to promote nursing staff health, help to reduce stress and fatigue, and strengthen a sense of community at work (3). Both nurses themselves and administration staff should pay attention to the different type of nurse fatigue and take prevention measurement. Future studies could be organized to reveal what factors are more significant and most effective to prevent nurse fatigue in intensive care units.

Conclusions

General fatigue was most prevalent among intensive care unit nurses. The daytime working shift was positively associated with reduced nurses' activity; furthermore, younger nurses indicated higher mental fatigue. The work quality in the unit negatively correlated with physical fatigue, reduced motivation and mental fatigue.

The result of the current study can be of benefit in rethinking measures which may be used to reduce different types of fatigue among intensive care nurses, especially the fatigue related to work organization.

Statement of Conflict of Interest

The authors state no conflict of interest.

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Received March 2020

Accepted June 2020