



Analysis of factors related to the mental workload of nurses during interaction through nursing care in the intensive care unit[☆]

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KEYWORDS

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Abstract

Objective: This research aims to identify the factors most closely related to the mental workload of nurses during interactions through nursing care in the intensive care unit.

Method: This study is quantitative cross-sectional research using a questionnaire for data collection. This study used total population sampling of 129 nurses working in the intensive care unit. The data was analyzed using Chi-Square and multiple logistic regression.

Result: The result of the logistic regression test showed that the motivation factor ($p = 0.022$; $\alpha = 0.05$) is the most influential variable in the mental workload of nurses compared to the other variables (individual, task, and organizational factors).

Conclusion: Hospitals can optimize socialization through a reward system as well as implement a competence and soft skill development program for nurses.

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Introduction

Nurses often face a variety of internal and external hardships while performing their responsibilities.^{1,2} An example of an external issue includes the condition of a patient's

health and their relationship with others, while an example of an internal issue includes the lack of knowledge or skills in nurses regarding the provision of nursing care.³ These issues can cause physical and psychological responses that cannot be ignored because such factors may affect a nurse's performance in the workplace.⁴ Nursing is also one of the most potentially stressful professions that accompanied by a high workload due to the pressures arising from their job demands.

The sustainability of nursing services is strongly influenced by the availability of productive and prosperous individual nurses.⁵ High workload becomes one of the risks of decreasing accuracy, concentration, and job security in

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such a way that the quality and performance of nurses also tends to decline.⁶ Many results from various health cognitive studies conclude that, from many factors that significantly trigger a human error, one is caused by the occurrence of the higher mental workload on the worker.^{7,8}

Nurses working in the intensive care unit are experiencing a great amount of stress. These individuals undertake more responsibilities and are constricted by time limitations that make their workload higher both physically and mentally.^{9,10} The mental workload rate of ICU nurses (82.33%) is higher than that of nurses working in orthopedic treatment rooms (63.5%).¹¹

Several factors undoubtedly influence the occurrence of mental workload on the nurse.¹² The factors affecting the nurse's workload consist of both patient and non-patient factors. This study focuses on non-patient factors such as organizational factors, job factors, individual characteristics, and motivation. The study aims to identify the factors most closely related to the mental workload of nurses in the intensive care unit.

Method

This study is quantitative cross-sectional research using a questionnaire for data collection. The survey was conducted in intensive care units for the military, government, and private hospitals in Jakarta and Tangerang. The sampling technique used the total population sampling method and involved as many as 129 nurses (62 nurses from a military hospital, 45 nurses from a government hospital and 22 nurses from a private hospital). The inclusion criteria in this study were nurses willing to be respondents, nurses working in the intensive care unit, nurses not on leave (active), nurses not on holiday, nurses not in education or training, and nurses not belonging to the new nursing orientation (working less than one year).

The data collection tool used in this research utilizes five types of questionnaires: demographic data questionnaire, motivation questionnaire, nursing perception questionnaire relative to the hospital, nursing perception questionnaire relative to the actual job, and mental workload questionnaire. Researchers have tested the validity and reliability of instruments in Sint Carolus hospital involving 29 nurses with Cronbach's Alpha of 0.753. Researchers designed a demographic survey consisting of age, marital status, educational level, length of work, nutritional status, career level, and training. The motivational questionnaire was adopted from Herzberg's theory,¹³ which explains the internal and external processes of an individual's work duties and consists of twelve questions.

The nurse's perception questionnaire was adopted from Manurung et al.¹⁴ with modifications applied by the researchers. Cronbach's Alpha obtained the revelation of a census of fifteen item statements and reliability tests (0.838). The work factor instrument used the Work Design Questionnaire developed by Morgeson and Humphrey¹⁵ with modifications applied by the researchers. The test reliability with Cronbach's Alpha measured in at 0.742. This survey was developed to examine the design work and measurements of job characteristics including five sub-variables:

task diversity, task identity, time of assignment, work environment, and feedback consisting of 22 revelation points.

The mental workload questionnaire was developed by Mediawati et al.⁸ and consists of ten questions; each question consists of items that total a series of 41 questions. The results of model testing through the Lisrel program obtained p -value = 0.150 ($p > 0.05$) and RMSEA = 0.075 (RMSEA < 0.1). The researcher maintained the ethics of the research by obtaining ethical approval from the Faculty of Nursing Universitas Indonesia Ethics Committee with letter number 66/UN2.F12.D/HKP.02.04/2018 as well as providing informed consent to the respondent before data collection occurred. All data collected from respondents involved in this research is completely confidential and has been used only for research purposes.

The data collected through research was analyzed using a computer statistics program to determine the relationship between some independent and dependent variables. Univariate analysis of this research was performed using a descriptive test, relationship analysis with the Chi-Square test, and multivariate analysis with a multiple logistic regression of $\alpha = 0.05$. Logistic regression analysis was performed to identify factors most closely related to the mental workload of nurses during interactions through nursing care in the intensive care unit.

Results

The results of this study are the results obtained through processing research instruments. Characteristic data of nurses (Table 1) based on age with a mean of age of 36.27 years had a standard deviation of 8.576. The majority of nurses participating in the study are between 20 and 40 years old (72.9%), and the average length of nursing work per individual is 12.24 years with a standard deviation of 9.117. The majority of nurses have a working period of greater than five years (84.5%).

Nurse characteristics data (Table 1) found that the majority of nurses were married (78.3%) and had obtained a nursing diploma (75.2%). As many as 82 nurses level Clinical Nurse III and lower included ranked at a poor nutritional status (BMI lowest that 19 or greater than 25), while as many as 73 individuals from all career levels ranked at the same poor nutritional status.

Most nurses working in the intensive care unit have a high motivation (71.3%) (Table 2). Intrinsic motivation includes subjective judgments regarding achievement, endeavor, and meaningfulness, while extrinsic motivation comprises subjective judgments regarding salary, work environment, supervision, and rewards.

The nurse's perception of the organization (Table 2) shows almost equal values between less favorable (48.8%) and more favorable (51.2%). Organizational factors include an assessment of the complexity, formalization, and centralization of the nurse's workplace organization. In contrast to regulatory elements, the majority of nurses perceived that the work assigned to them was meaningful (74.4%) (Table 2). Job factors include an assessment of the diversity of assignments, job identity, work time, work environment, and work feedback.

Table 1 Characteristics of nurses based on age, working experiences, education background, marital status, nutritional status, career level, and training experiences in intensive care unit in 2018 ($N = 129$).

No			
		<i>n</i>	%
	<i>Age</i>		
1	20–40 year	94	72.9
2	≥40 year	35	27.1
	<i>Working Experiences</i>		
1	<5 year	20	15.5
2	≥5 year	109	84.5
	<i>Educational Background</i>		
1	Nursing Diploma	97	75.2
2	RN/Nursing Master [*]	32	24.8
	<i>Marital Status</i>		
1	Unmarried	28	21.7
2	Married	101	78.3
	<i>Nutritional Status</i>		
1	Less or more than BMI	73	56.6
2	Normal BMI	56	43.4
	<i>Career Level</i>		
1	Non-Clinical Nurse	14	10.9
2	Clinical Nurse 1	30	23.3
3	Clinical Nurse 2	38	29.5
4	Clinical Nurse 3	46	35.7
5	Clinical Nurse 4	1	0.8
	<i>Training Experiences (≤5 year)</i>		
1	No Training	57	44.2
2	Training	72	55.8

* There's only one nursing master of all research samples.

Table 2 Nurse motivation, nurse perceptions of organizations and work in intensive care unit in 2018 ($N = 129$).

No	Variable	Total	
		<i>n</i>	%
<i>Motivation</i>			
1	Low Motivation	36	28.7
2	High Motivation	93	71.3
<i>Organizational Factor</i>			
1	Not Good	62	48.8
2	Good	67	51.2
<i>Work/Task Factor</i>			
1	Not Good	32	25.6
2	Good	97	74.4

The dependent variable for the mental workload (Table 3) shows that the mental workload level is almost equally thought to be low (45.7%) and high (54.3%). The results of the relationship analysis showed that age, length of work, education, marital status, nutritional status, and career level were not significantly related to the mental workload of nurses ($p > 0.05$) (Table 4). Nursing training and nurse

Table 3 Nurse mental workload during interaction through nursing care in the intensive care unit in 2018 ($N = 129$).

No	Variable	Total	
		<i>n</i>	%
<i>Mental Workload</i>			
1	Low	59	45.7
2	High	70	54.3

motivation in the last five years both showed a significant relationship with mental workload at $p = 0.047$; $\alpha = 0.05$ and $p = 0.004$; $\alpha = 0.05$, respectively (Table 4).

There was a significant correlation between the nurse perception regarding organizational factors ($p = 0.003$, $\alpha = 0.05$), and nurse perception of work factors ($p = 0.023$; $\alpha = 0.05$) on the mental workload of nurses during interaction through nursing care in intensive care (Table 5). The variable selection contains several variables possessing p -values (< 0.25) that are included in the multivariate analysis, including training ($p = 0.167$), nurse motivation ($p = 0.123$), organizational factors ($p = 0.132$), and length of work ($p = 0.224$). Job factor variables are factors that are significantly related to bivariate analysis and are essential substances of mental workload that cannot be eliminated; therefore, the coefficient for the employment factor is included in the multivariate analysis.

Five variables have a p -value greater than 0.05, which are eliminated one by one from the largest p -value of the job factor ($p = 0.441$) (Table 6). The results show that only one variable has a p -value < 0.05 , which is the organizational factor variable ($p = 0.040$). Next, the elimination of training variables was carried out with $p > 0.05$, where two variables with a p -value < 0.05 were obtained, including motivational ($p = 0.039$) and organizational factors ($p = 0.039$). The next analysis tests the interaction between motivation variables and regulatory factors to differentiate between the contributions of each variable (Table 7). The results of the interaction test on intrinsic motivation variables and organizational factors resulted in $p = 0.728$ ($p > 0.05$), which indicates there is no interaction between the two variables.

Variables with $p < 0.05$ were organizational and motivational factors, so it can be concluded that these two variables were the factors most related to the mental workload of nurses during interaction through nursing care in the intensive care unit (Table 8). A greater odds ratio (OR) resulted in motivational factors, rendering the element the most influential factor on the dependent variable for the mental workload of nurses.

Nurses with low motivation have an opportunity of 2.6 times greater to perceive a high psychological workload after being controlled by organizational factors. Nurses who understand that their organization is not right to have a chance of 2.2 times to feel a high mental workload, after being controlled by motivational factors (Table 8). The calculation of the logistic regression equation concluded that if the nurse's motivation is low, then the nurse's mental workload will increase by 0.967 times, and if the nurse's perception of the organization is not accurate, then the mental workload will increase by 0.821 times (Fig. 1).

Table 4 Relationship between nurse characteristics (age, working experiences, educational background, marital status, nutritional status, career level, and training experiences) with motivation with nurse mental workload during interaction through nursing care in the intensive care unit in 2018 ($N = 129$).

Variable	Nurse mental workload		Total <i>n</i> (%)	OR 95% CI	<i>p</i> value
	Low <i>n</i> (%)	High <i>n</i> (%)			
Age					
20–40 year	42 (44.7)	52 (55.3)	94 (100)	0.855 (0.39;1.86)	0.845
>40 year	17 (48.6)	18 (51.4)	35 (100)		
Working Experiences					
<5 year	7 (35.0)	13 (65.0)	20 (100)	0.590 (0.21;1.59)	0.421
≥5 year	52 (47.7)	57 (52.3)	109 (100)		
Educational Background					
Nursing Diploma	46 (47.4)	51 (52.6)	97 (100)	1.318 (0.58;2.96)	0.642
RN/Nursing Master	13 (40.6)	19 (59.4)	32 (100)		
Marital Status					
Unmarried	11 (39.3)	17 (60.7)	28 (100)	0.714 (0.30;1.67)	0.575
Married	48 (47.5)	53 (52.5)	101 (100)		
Nutritional Status					
Less or more than BMI	32 (43.8)	41 (56.2)	73 (100)	0.838 (0.41;1.68)	0.752
Normal BMI	27 (48.2)	29 (51.8)	56 (100)		
Career Level					
Level < Clinical Nurse 3	35 (42.7)	47 (57.3)	82 (100)	0.714 (0.34;1.46)	0.462
Level ≥ Clinical Nurse 3	24 (51.1)	23 (48.9)	47 (100)		
Training Experiences					
No Training	20 (35.1)	37 (64.9)	57 (100)	0.457 (0.22;0.93)	0.047*
Training	39 (54.2)	33 (45.8)	72 (100)		
Nurse Motivation					
Low	9 (24.3)	28 (75.7)	37 (100)	0.270 (0.11;0.63)	0.004*
High	50 (54.3)	42 (45.7)	92 (100)		

Table 5 Relationship between nurse perception of organization and work with nurses mental workload during interaction through nursing care in the intensive care unit in 2018 ($N = 129$).

Variable	Nurse mental workload		Total <i>n</i> (%)	OR 95% CI	<i>p</i> value
	Low <i>n</i> (%)	High <i>n</i> (%)			
Organizational Factor					
Good	39 (59.1)	27 (40.9)	66 (100)	0.322 (0.15;0.66)	0.003*
Not Good	20 (31.7)	43 (68.3)	63 (100)		
Work Factor					
Good	50 (52.1)	46 (47.9)	96 (100)	0.345 (0.14;0.81)	0.023*
Not Good	9 (27.3)	24 (72.7)	33 (100)		

* = statistically significant $p < 0.05$

Discussion

The relationship between individual characteristics and nurses' mental workload

Age is an individual socio-demographic factor that is often investigated because it is relative to one's ability, maturity, and perspective.¹⁶ The results of this study show that some

nurses belong to a productive age range, meaning that these nurses are in the most optimal condition for applying their competencies.¹⁷ Similarly, in this study, the productive age is defined by a period of maturity and a nurse's application of her maturity in the provision of optimal nursing care.

Statistical analysis showed no significant relationship between nurses age and mental workload.^{18,19} Other research concluded that there was no significant relationship

Table 6 First modeling of multivariate modeling logistic regression.

Variable	B	S.E.	Wald	p value	OR 95% CI
Working Experiences (1)	0.670	0.544	1.514	0.219	1.954 (0.67;5.67)
Training Experiences (1)	0.587	0.394	2.215	0.137	1.798 (0.83;3.89)
Motivation (1)	0.783	0.529	2.190	0.139	2.187 (0.77;6.16)
Organizational Factor (1)	0.676	0.417	2.632	0.105	1.967 (0.86;4.45)
Work Factor (1)	0.404	0.524	0.593	0.441	1.497 (0.53;4.18)
Constant	-0.804	0.315	6.504	0.011	

Table 7 Variable interaction test (N = 129).

Variable	B	S.E.	Wald	p value	OR 95% CI
Motivation (1)	0.736	0.809	0.827	0.363	2.087 (0.42;10.19)
Organizational Factor (1)	0.753	0.442	2.906	0.088	2.124 (0.89;5.05)
Motivation (1) by Organizationalfactor (1)	0.345	0.993	0.121	0.728	1.412 (0.20;9.89)
Constant	-0.448	0.267	2.817	0.093	

Table 8 Last modeling of multivariate modeling logistic regression.

Variable	B	S.E.	Wald	p value	OR 95% CI
Motivation (1)	0.967	0.469	4.256	0.039	2.630 (1.04;6.58)
Organizational Factor (1)	0.821	0.398	4.269	0.039	2.274 (1.04;4.95)
Constant	-0.473	0.258	3.360	0.067	0.623

$$y \text{ (nursing mental workload)} = -0.473 + 0.967 \text{ (nurse motivation)} + 0.821 \text{ (organizational factor)}$$

Figure 1 Logistic regression equation.

between the age of nurses and their mental workload. Many other factors also influence nurses in the productive range age in response to stimulation from their work. Characteristics involving work duration showed no significant relationship between work duration and mental workload. The length of time a person takes to complete one or several actions can cause boredom and create work stress in the nurse, but this happens due to several other factors inside or outside the nurse's capacity.²⁰

The characteristics of nurses based on education show that most of the nurses who work in intensive care units have a Diploma in Nursing (75.2%). The results of the relationship analysis found that there was no significant relationship between training and the mental workload of nurses. School is one of the individual characteristics that can increase the knowledge of nurses but does not directly influence the nurses' subjective perceptions of workload.

Characteristics of marital status indicate no significant relationship between marital status and mental workload of nurses.^{21–23} Similar to other nursing research that there is no significant relationship between marital status and workload for nurses.²⁴ The finding is most likely true because a person's marital status does not always affect a person's work

ethic or performance in the workplace.²⁵ Nurses who are either married or unmarried can experience problems both inside and outside of work, but the problem-solving ability is very much dependent on coping mechanisms specific to each person.

The description of nutritional status also showed similar results in that there was no significant relationship between nutritional status and mental workload of nurses.^{25,26} Some literature claims that nutritional status does not affect fatigue as it relates to mental workload in nurses. Nutritional status may be directly related to the strength of the body, energy, and a nurse's physical performance, but it does not directly influence one's perception of mental workload.

The results showed no significant relationship between career levels and a mental workload in nurses.²⁷ Different from this study, the author found that the level of nurse competence is related to the level of workload and patient safety. Nurses also should be motivated to improve their competence through a career path system in which they can reap benefits.²⁸ Appropriate competencies that even exceed the career level can reduce workload both for nurses as individuals and their colleagues.

The results of the analysis showed that there was a significant relationship between training and the mental workload of nurses.^{29,30} Similarly, the other study shows that practice directly relates to nurses' workload. Nurses' relevant knowledge and skills increased after attending a training, thus enabling them to work independently toward resolving difficulties at work.³¹ Nurses who work in intensive care units are often faced with demands for specific actions and skills such as administering drugs through a syringe pump, suctioning patients with ventilators, etc. When these actions are completed quickly and skillfully by the nurse, she can perceive that there is no work pressure while working in the intensive care unit.

The relationship between organizational and job-related factors regarding nurses' mental workload

The results of the analysis showed that there was a correlation between organizational characteristics and mental workload of nurses during interaction with patients in the intensive care unit ($p < 0.05$). The organizational factors drive the emergence of mental workload,⁸ and the nurse will likely display a more loyal attitude if she feels a sense of involvement and satisfaction within the organization, balancing workload with capability.

The results of the analysis show that there is a relationship between the factors of work and the mental workload of nurses when interacting with patients in the intensive care unit ($p < 0.05$).^{32,33} The same condition found in another study that employment factors are significantly associated with nurses' mental workload and that individual and occupational characteristics strongly influence moderate to severe mental workloads that occur in nearly 90% of nurses. A productive nurse will work following the abilities and needs of her occupation so that the tasks assigned to her are not considered excessive or burdensome during her practice.³⁴

Motivation as the factor most associated with the mental workload in nurses

Motivation and ability are two things that significantly affect a nurse's performance.³² The intrinsic motivation comes from within, along with demographic aspects, talents, skills, and commitments that can affect performance. Extrinsic motivation is the motivation that results from a nurse's external environment and surroundings. Workload and motivation are two things that are assumed to influence each other because workloads that are too heavy can reduce motivation levels, and vice versa.³³ Work motivation is a psychological process that is important in determining an individual's attitudes, perceptions, and decision-making tendencies.³⁶ Nurses who are equipped with internal stimuli perform their work based on careful calculations and use moderate risk in their nursing care. Nurses who work carefully have the opportunity to avoid mistakes in providing nursing care, which prevents the possibility of additional workloads that were not taken into account beforehand.³⁵ These results of the study are supported by other research in Indonesia which states that there is a significant relation-

ship between salary as a sub-variable motivation and nurse performance.³⁸ Income that does not meet expectations can cause a decrease in motivation. If the reward obtained is less than the nurse's expectations, it is easy to lose motivation and take less care with job responsibilities.

The result of the multivariate analysis showed that motivation correlated most with the mental workload.⁸ Nurses must have adequate motivation to remain in safe control of their responsibilities and avoid mental fatigue. Motivation is the most influential factor because it is closely related to the behavior and performance of nurses when providing nursing care. Motivation has been proven to be a fundamental value and internal stimulus that moves and instructs an individual toward responding to occurrences related to that individual.³⁹ The best way to work is by implementing emotional intelligence into one's responsibilities.⁴⁰ Emotional intelligence consists of five components, one of which is motivation.

The results from the logistics model analysis demonstrated probability calculations indicating that nurses who perceive that the organization is not suitable and have low work motivation together contribute 91.8% to a nurse's mental workload. This probability estimation shows that both factors play a significant role in influencing the emergence of nurses' mental workload. Other factors may be affected by a patient as well as external factors from other nursing jobs. The nurse must have adequate motivation to retain her self-control and efficiently prevent mental fatigue.

Motivation can push a person to work passionately to achieve their highly self-committed goals.⁴¹ The results of the study illustrate that nurses working in intensive care rooms have high work motivation, and therefore incorporate their emotional intelligence into their work. The nurse can build a perception of a balanced mental workload so that her assigned responsibilities are not considered stressors that negatively affect her mental workload.

McClelland's motivation theory explains that motivation can bring someone to action.³⁷ This action is based on a person's basic willingness to exert effort without the pressure of achieving a goal. Nurses who have high work motivation are ready to display their best energy and utilize their specialized skills while working, without the burden of feeling depressed or mentally exhausted. The workload is closely related to motivation because the source of mental workloads, such as long working hours, the possibility of working night shifts, a lack of appreciation, and the imbalance of nursing personnel can cause a nurse to lack motivation.⁴²

Conflict of interests

The authors declare no conflict of interest.

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