

INTENSIVE CARE UNITS OF JOÃO PESSOA'S HOSPITAL, BRAZIL: WORK CAPABILITY OF THE NURSES

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ABSTRACT

The ICU is considered the most aggressive sector of the Hospital Unit, which has a stressful environment, it happens because the professionals are faced with many emergency situations. This situation associated with some personal, occupational and environmental factors interfere with the work ability of the nurses. From the descriptive analysis and the modeling multinomial ordinal logistic regression, for significance level $\alpha = 0.05$, it was found that stability, upgrading formational, balmy workload and controllable thermo physical conditions in ICUs may increase the working ability of the nurses.

1. INTRODUCTION

Patients in hospitals are subject to serious health conditions. These conditions, when associated with environmental factors, shift work, mental workload and others, can lead the professionals to reduce their capability for work and to influence their quality of life [1].

When discussing about the work capability, productivity and worker diseases, we have to consider the environment in which they are inserted [2].

The ability to work, considered as the result of a dynamic process between the individual resources in relation to his work is influenced by several factors, including society demography, lifestyle, aging process and work demands [3, 4, 5].

For the estimation of the capability for work, a group of researchers from the Finnish Institute of Occupational Health has developed a methodology known as Work Ability Index (WAI) that was widespread in Europe and is currently used for health care workers in countries around the world and is considered as a good indicator for evaluation and monitoring of issues facing health at work, having in mind the importance of preserving and maintaining the health of the workers [6]

This methodology is easily applied, consisting of seven items whose sum of points assigned defines the total score of the index. The items have minimum and maximum scores and the equivalence of their values are weighted according to the specific features of the activity at work, sorting the WAI as low, moderate, good and excellent [6].

In relation to health workers studies, researches in Brazil showed the early loss of working capability [7,8].

Researches to estimate the functional capability of the nursing staff of a hospital complex and its relationship with individual characteristics and work-based occupational information, morbidity, demographic and socioeconomic data, concluded that the highest proportion of Low work ability was observed in workers of the intensive care unit (ICU). This study considered the working conditions in ICUs as unsatisfactory and tiresome by stress and emotional and mechanical overload [9].

Another study that analyzes the ability of the nursing work and the relationship between their age and intent to leave nursing in 10 European countries revealed that the ability to work was significantly lower among the older nurses and the association between low work ability and high intention to leave nursing was strongest among the younger nurses [10].

However, not all nurses with a low capability for work reported wanting to leave the job, probably because of the difficulty to finding a new place of work. The researchers concluded that to correct the shortage of nurses in these countries is necessary to increase the capacity for work by improving working conditions and quality of the work environment, inserting new nurses in activities to those that are no longer capable of developing their activities in their current positions, and include nurses in all age categories.

A study developed in five industries, concluded that individual characteristics, habits and working conditions are important factors in WAI [11].

A study to evaluate the relationship of WAI with stress and educational level of nurses of both sexes and aged between 19 and 65 years old at four university hospitals in Croatia, noted that the low capacity for work of nurses was related to work organization, financial issues, lower educational level and age, and that higher levels of

education have shown positive effects on the preservation of the ability to work in good level [12]. Concluded that hospitals should develop strategies to rise and improve the quality of working conditions for nurses, providing education and career growth prospects. By doing that may contribute to reducing the stress levels of the nurses at work and maintain their ability to work (work ability).

A studied on the relationship between work ability and age, particularly in the context of high complexity jobs, as health professionals, pilots, drivers, and others concluded that the older the worker is, the lower is its WAI due to the high level of physical demand for the performance of their tasks, going beyond to the level of priming of aging [13].

A study associating the time spent on work and work ability of some nurses in three hospitals observed a significant association between total workload and low index of work capacity (WAI) for women because of the hours spent in professional activities and household chores [14].

Notes the importance of the work done by nurses in the ICU and how some variables can interfere in their activities, causing impacts on the health and productivity of the workers. However, decisions can be taken to minimize these impacts from more precise information based not only on interviews or conclusions, but on statistical analysis. It is important to evaluate the variables in ICUs aggregating information from the nurses personal characteristics, checking what measure these variables affect the nurses work ability, using a methodology that can provide descriptive and inferential information through a multinomial ordinal logistic regression model.

The unknown about the work ability of nurses that working in intensive care units of hospitals in the reality of João Pessoa city, Paraíba (Brazil), and its implication on the health of those involved require intensive research that contributes to the debate and bring the actions to minimize problems arising from the activity in question.

2. METHODOLOGY

The data were collected from the ICUs of public hospitals in the city of João Pessoa. The total population was 87 nursing staff of both genders with work shifts day and night. The Multinomial Ordinal Logistic Regression was used as statistical tool for data analysis instead of Binary Logistic Regression Model, commonly used in similar studies.

The independent variables were: personal, noise, temperature and lighting (ILM1 – lighting at nursing workstation; ILM2 – lighting at sick bed), and perceptual variables with respect to thermo physical comfort, which means those that are inherent in personal perception, that are the subjective parameters related to thermal comfort, which can be understood as psycho physiological human factors about the environment and other personal variables, such as, length of service, age and work shift. The dependent variable was analyzed by the Work Ability Index (WAI) which was observed as an ordinal variable.

The personal and professional variables were collected through a questionnaire consisting of identification of the nurse as: name, age, gender, marital status, educational level, about the workload, such as how many hours spent on the task, how long does the task, that shift work, on how many hospitals work.

2.1 – Thermo physical evaluation

To collect data of “heat” variable thermometers were used that allowed measurement of the dry bulb temperature (DBT), wet bulb temperature (WBT) and globe temperature (Tg), obtaining thus the temperature and humidity as well as the influence of radiation, according to ISO 7730/94 [15] and NBR 6401/80 [16].

The luminous light meter allowed the evaluation according to the NBR 5413/92 [17] which regulates the indoor luminance and NBR 5382/85 [18] which regulates the techniques used to measure the indoor luminance.

A decibel meter was used for the acoustic instrument, according to NBR 10151/00 [19], regulated by Resolução do Conselho Nacional do Meio Ambiente - CONAMA/No. 001, March 8, 1990, published in the Official Gazette of April 2nd 1990.

2.2 - Evaluation of thermal comfort perception

The perceptual variables as thermo physical comfort are subjective parameters related to thermal comfort that can be understood as the feelings of people in psycho physiological about the environment. They were appraised by a recording made of their own perceptions, hour by hour, for twelve hours shifts, getting his average sensation throughout their work shift. The data were collected by a questionnaire, using the 7-point scales, which analyze the thermal perception that varies from very hot to very cold; the thermal evaluation of *comfortable* to *unbearable* and the thermal preference of *warmer* to *less heated*, according to ISO 10551/95 [20] which deals with thermal-ergonomics, evaluating the influence of the thermal environment. The filling out of the scales of perception and preferences allowed through the crossing of their data the deeper knowledge of the degree of discomfort that is subject to the nurse, their thermal sensation when they performed the task, what type of clothes they were supposed to wear, among others.

2.3 - Work Ability Index

The dependent variable (work ability) was collected through self-administered questionnaire Work Ability Index (WAI), developed by the Finnish Institute of Occupational Health adapted to Brazilian needs. This questionnaire reflects the workers' own assessment of their work ability [6].

The WAI questionnaire has questions about the professional identification, occupation, work ability in relation to the physical and mental illnesses demands that belong to the worker, the listing of days not worked due to health problems and their perception to performance activity in the future [6].

The WAI is classified into four tiers according to the resulting value of the test, as shown in Table 1.

Table 1: WAI Classification.

Average	Concepts
77 – 27	Low – restore the capacity of work
228 – 36	Moderate – improve the work ability
337 – 43	Good – improve the work ability
444 – 49	Great – maintain the capacity of work

Source: Tuomi, 2005

2.4 - Multinomial Ordinal Logistic Regression (MOLR)

The dependent variable (WAI) in this case is a categorical variable that has characteristics of its four ordinal categories. The use of MOLR leads you to find the odds ratio for each independent variable, in other words, to verify the impact of the change in an independent variable implicates in the dependent variable. This allows finding risk factors for the occurrence of the event that interest as well as knowing the influence of these factors [21,22].

Initially, the quantitative independent variables collected were subjected to correlation test, to determine which variables are incompatible in the same model, avoiding the problem of co linearity [23]. Table 2 shows the variables that presented a high correlation coefficient, which were not included in this analysis.

Table 2: Independent variables highly correlated

Variable	Pearson Correlation
ILM1 and ILM2	0,74
RUI1 and RUI2	0,99
WBT and RUI2	-0,83
WBT and RUI1	-0,76
DBT and ILM2	-0,86
DBT and ILM1	-0,72
TG and ILM2	-0,89
TG and DBT	0,995

In the MOLR model, the method used for variable selection was the Stepwise Backward method, based on the Wald test, in which the less significant variables are eliminated. For the parameters estimates in the MOLR model, the maximum likelihood method was considered.

3. RESULTS

3.1 - Variables personal and professional

With regarding gender, 85.11% were female, which reflects a profession historically dominated by women and just only 14.89% were male. The middle age of participating nurses was 33 years old with a standard deviance of 8.82 years. About the marital status, 46.81% were single; 36.17% were married, 8.51% were stable, and 8.51% were separated or divorced.

With regard to schooling, 23.4% had completed or incompleting post graduation; 17.02%, were college graduated, 8.51%, had incompleting college; 40.42%, were in technical progress; and 10.64%, had completed their secondary education.

About professional experience, in years or months, the interviewee, on average, had 6.93 years in function, namely, approximately 6 years and 11 months. The deviance standard of the sample was 7.66 years or approximately 7 years and 8 months. As regard to the age which the professional started in job market as a nurse, the average was 24.70 years, standard deviation of 7.60 years.

The nurses experience in carrying out activities in the ICU was more than two years to 65.96% of interviewee, 8.51% between 1 and 2 years, 14.89% from 6 months and one year; 10.64% less than six months.

Of the interviewee nurses, 23.40% were outsourced and 76.60% were effective staff of the institutions that were visited. In relation to the allowance of additional unhealthy or hazardous conditions, 63.83% of the interviewee said

that they did not get the benefit and only 37.27% got it. In fact, only 39.30% of the nurses work during the day and 70.70% work at night.

3.2 - Variable Thermo physical

According to the nurses' opinion about the work environment in where they work, only 14.89% of the interviewee rejected more than accepted the ICU environment.

The thermal perception was assessed by recording each nurse during twelve-hour shifts, getting his average sensation throughout their work shift. The average perception of the participants was -0.76, calling their working environment between neutral and slightly cold; the average of 0.66 was given to the majority of the interviewee considering the environment between comfortable and slightly uncomfortable.

The variable for the thermal preference of each interviewee had an average 0.38, showing that the participants wanted to be (among as how is) and a little warmer.

About the thermal variables of the Earth average temperature ranged between 21.68 and 24.61°C, the dry bulb ranged between 21.61 and 24.84 °C and wet bulb temperature between 18.88 and 19.56 °C. Those ranges of temperatures provide thermal discomfort according to the statement of nurses. The air conditioning systems should be designed or selected to obtain aseptic and comfort for patients and staff member, so they must go through appropriate filtering systems. The air intake must comply with minimum distance of 8.0 m of environment where there are airborne infectious agents or noxious gases. For critical care units with closed modules for patients, the temperature must be adjusted individually, with a range temperature between 24 and 26 Celsius degrees, relative humidity between 40 to 60% [24,25].

The average noise measured in dB(A) in position 1 (nursing station) varied between 61.71 and 73.46 dB (A) and the average noise of the station 2 (near the bedside) ranged between 60.58 and 75 17dB (A). It is recommended that noise levels in areas of acute care hospitals do not exceed 45 dB (A) during the daytime, 40dB (A) during night and 20 dB (A) during the early morning [26,24,25]. It is important to use floors that absorb the sounds, taking into account the aspects of keeping the hospital infections control and the equipment maintenance and operation. The walls and ceilings shall be constructed with materials with high sound absorption. Attenuators and deflectors roofs can help to reduce the sounds reverberation. The door openings should be lagged to reduce sound transmission.

As for the luminance average measured in lux in post 1 (nursing), the values ranged from 91.78 lux and 250.58 lux and the average luminance measured at station 2 (near the bedside) valued between 90.13 and 211,49 lux. A study conducted by Wedel [25] emphasizes the importance of natural lighting, with general lighting coming from the ceiling to conduct the activities, record by staff and to turn the more comfortable to the patient, although the lighting cannot exceed 320 lux. The night lighting when in continue use may not exceed 70 lux; for short time, should be in the vicinity of 204 lux. It is desirable to a reading lamp for the patient, which should not exceed 323 lux. Specific lighting for emergency procedures should be placed directly above the patient with at least 1614 lux.

3.3 - Work Ability Index (WAI)

In regard to WAI, 23% of nurses had an excellent index, 58% good work ability and 19% had a regular index. It was observed that 46.81% of nurses were single (most of them lived alone) and 55.19% were married or divorced with kids. In all cases observed, the nurses performed household chores after working journey; it reflects that there is a relation between long working hours and reduced work capability, thus increasing the likelihood of WAI decrease.

3.4 - Wald test and odds ratio

As can be seen in Table 3, the following variables were statistically significant at level $\alpha=5\%$: Gender, working journey, hazard pay, shift work, Thermal Evaluation, Dry Bulb Temperature, Noise at the nursing station, Education, Marital Status, Lighting at the nursing station.

Table 3: β , Wald test and Odds Ration

Variable	β	Standard Error	Wald Z	Odds Ratio	P- value
Gender	4,36	1,46	2,98	78,26	0,0029
Working Journey	-0,22	0,07	-3,00	0,80	0,0027
Nightshift	-2,56	0,99	-2,58	0,08	0,0099
Thermal Rating	-1,43	0,63	-2,28	0,24	0,0228
Dry Bulb Temperature	2,31	0,80	2,86	10,07	0,0043
Noise (Nursing services)	0,32	0,12	2,66	1,38	0,0079
Lighting (Nursing services)	0,04	0,02	2,44	1,04	0,0148
Schooling	2,93	1,00	2,91	18,72	0,0036

4. DISCUSSION

According to the Wald test, based on the respective odds ratio for the variables presented in Table 3, we can discuss some important aspects for the study under discussion, namely:

1 - Regarding gender, male nurses are 78.26 times more likely to obtain WAI in a range higher than the female nurses. According to studies conducted by Raffone [9], this frequency could be justified because the women show lower physical endurance, hormonal changes during the menstrual cycle and a triple shifts, that reduce their ability to work. Rotenberg [14] confirms the statement above, showing a significant association between total workload and low WAI for women because they spent hours in their professional activities and in carrying out household tasks, then there is a relationship between long working hours and reduced work ability.

2 - Regarding to education, nurses with college degrees are 18.72 more times likely to have the WAI in a higher range than a technical or nursing assistant. It was observed that the activity of graduated nurses in the ICU is more administrative. However, technicians and nursing assistants perform physically demanding tasks such as washing patients and administer food and drugs. This finding corroborates with the others studies [12]. According to him, the nurses WAI are statistically related to work organization, financial issues lower educational and age. Better educated had shown positive effects on retention of work ability.

3 - The night shift influenced considerably on nurses WAI, with 92% more likely to have WAI in a lower level than who work during the day. This occurs due to circadian rhythms, individual differences in adaptation to night work, the risk of errors and accidents resulting from the reduction of mental concentration, reduction of time with their family as well as the fact of the sleep quality during the day is lower [2]. For Fischer and Martins the shift has been described as a continuous and multiple sources of health problems and social and family disruption [27,28]. The main problems which affect the workers are the biological rhythm disturbances, difficulties in balancing work and home life, poor posture, musculoskeletal overload, exacerbation of pre-existing symptoms and mental illness.

4 - Each year in the ICU, because of the unsafe activities, increases on 24.61% of chances to reduce the WAI. It was observed that the nurse performs complex tasks involving high workload which is linked to care quality, patients' welfare and many others situations that could happen at the same time. These aspects are also allied with the agility and ability to solve problems in case of in emergencies activities involving critically ill patients, bedridden, dependent care, personal care, with risk of death; also coexists with urgency, as when the patient changes in vital signs and are required emergency procedures to save it. Therefore, how longer nurses spend their activity in the ICU their physical and emotional stress will increase, thus contributing to a low WAI.

5 - Each Celsius degree increased on dry bulb temperature in the ICU, the possibility of nursing staff to have a higher WAI increases their levels in 10.07 times. In this case it was observed in ICUs studied the temperature increase reflects on work ability in a good way. Because of cold environments at ICU, this small increase in temperature by one Celsius degree could make them more pleasant, allowing professionals to develop their activities more comfortable.

6 - 1 dB higher in each nursing station increases the probability on 1.38% in having upper range on WAI. It was observed that noise levels which nurses are exposed within these ICUs are: average noise in post 1 (nursing station) between 61.71 dB and 73.46 dB, the average noise of the station 2 (near the patients' bed) between 60.58 dB and 75.17 dB, being recommended by the NBR - 10.152/87 between 45 and 55 dB. It means that noise level is above the recommended, in which case the interviewees reported that they are already accustomed to the "beep" of equipment and not listen to them anymore.

7 - Increasing the lighting at the nursing station in one lux, increases the possibility of nurses in 1.04% have a higher range of WAI. Which means, if we adjust the lighting better on nurse station probably the results of their activities performance be on a highest quality. It was observed in ICUs studied that the average luminance of the post 1 (nursing station) was between 91.78 and 250.58 lux, luminance and average station 2 (near the bedside) between 90.13 and 211.49 lux, contradicting the NBR - 5413/92 which recommends to activities in ICUs between 150-200-300 lux values.

The lighting is an important factor that determines the comfort or discomfort in one workplace [29]. When poorly disseminated, may have implications not only in terms of requirements of the visual system, but also indirect effects, such as the adoption of awkward postures, lower productivity, high rates of accidents, negative psychological influence on people and other symptoms such as headaches, body aches, etc.

5. CONCLUSION

Personal, occupational and environmental factors interfere significantly in the nurse WAI. Minimizing the chances for a low WAI may be linked to control actions on these variables according to their interference degree and the convenience of the hospital administration.

The higher workload in nurses' tasks in the ICU has bigger probability of chance to compromising their work ability.

Nurses who work at night are more likely to have low WAI than who work during the day because of a poor sleep quality during the day, individual circadian rhythm, and individual differences in adaptation to night work, risk of errors and accidents resulting from the reduction of mental concentration, loss of family life and the lack of leisure.

When the dry bulb temperature of the ICU increases by one Celsius degree the WAI also increases, because when the temperature increases it makes the environment more enjoyable. Not being able to raise the temperature of the ICU because of infection control and equipment maintenance, the solution is to adapt the clothes of the professionals who work there.

Male nurses, with less working journey, more education, working during the day and getting unhealthy benefit are more likely to maintain a high level WAI.

6. REFERENCES

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