World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:17, No:12, 2023

The Mental Workload of Intensive Care Unit Nurses in Performing Human-Machine Tasks: A Cross-Sectional Survey

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Abstract : Aims: The present study aimed to explore Intensive Care Unit (ICU) nurses' mental workload (MWL) and associated factors with it in performing human-machine tasks. Background: A wide range of emerging technologies have penetrated widely in the field of health care, and ICU nurses are facing a dramatic increase in nursing human-machine tasks. However, there is still a paucity of literature reporting on the general MWL of ICU nurses performing human-machine tasks and the associated influencing factors. Methods: A cross-sectional survey was employed. The data was collected from January to February 2021 from 9 tertiary hospitals in 6 provinces (Shanghai, Gansu, Guangdong, Liaoning, Shandong, and Hubei). Two-stage sampling was used to recruit eligible ICU nurses (n=427). The data were collected with an electronic questionnaire comprising sociodemographic characteristics and the measures of MWL, self-efficacy, system usability, and task difficulty. The univariate analysis, two-way analysis of variance (ANOVA), and a linear mixed model were used for data analysis. Results: Overall, the mental workload of ICU nurses in performing human-machine tasks was medium (score 52.04 on a 0-100 scale). Among the typical nursing human-machine tasks selected, the MWL of ICU nurses in completing first aid and life support tasks ('Using a defibrillator to defibrillate' and 'Use of ventilator') was significantly higher than others ($p < .001$). And ICU nurses' MWL in performing human-machine tasks was also associated with age ($p = .001$), professional title ($p = .002$), years of working in ICU ($p < .001$), willingness to study emerging technology actively ($p = .006$), task difficulty ($p < .001$), and system usability ($p < .001$). Conclusion: The MWL of ICU nurses is at a moderate level in the context of a rapid increase in nursing human-machine tasks. However, there are significant differences in MWL when performing different types of human-machine tasks, and MWL can be influenced by a combination of factors. Nursing managers need to develop intervention strategies in multiple ways. Implications for practice: Multidimensional approaches are required to perform human-machine tasks better, including enhancing nurses' willingness to learn emerging technologies actively, developing training strategies that vary with tasks, and identifying obstacles in the process of human-machine system interaction.

Keywords : mental workload, nurse, ICU, human-machine, tasks, cross-sectional study, linear mixed model, China
Conference Title : ICHNE 2023 : International Conference on Health and Nursing Education
Conference Location : Sydney, Australia
Conference Dates : December 04-05, 2023