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FACTORS INFLUENCING CRITICAL CARE NURSES' MENTAL WORKLOAD: A SCOPING REVIEW

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ABSTRACT
The mental workload of critical care nurses significantly impacts their well-being, job satisfaction, and overall performance, ultimately affecting the quality of care in critical care environments. This study aimed to identify and categorize the factors influencing mental workload among critical care nurses through a scoping review guided by Arksey and O'Malley's framework. A comprehensive literature search across five databases (PubMed, ScienceDirect, EBSCOhost - CINAHL Complete, Medline, and Scopus) resulted in the inclusion of 8 relevant studies, which examined the psychosocial, organizational, and environmental factors contributing to critical care nurses' mental workload. The findings revealed that mental workload is influenced by a range of factors, including nurse-to-patient ratios, patient complexity, demographic characteristics (such as age and experience), and psychosocial stressors such as job dissatisfaction, lack of organizational support, and high emotional demands. Additionally, higher patient loads, long shifts, and inadequate support systems were identified as key contributors to mental strain, leading to increased fatigue, burnout, and reduced job satisfaction. The study emphasized the critical role of organizational support, motivation, and leadership in mitigating mental workload. Interventions aimed at improving staffing, work conditions, and leadership quality, alongside the reduction of excessive patient loads, are essential for enhancing nurse resilience, reducing burnout, and ultimately improving patient care outcomes in critical care settings.

Keywords: cognitive workload; critical care; ICU; intensive care unit; mental workload; nurse

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INTRODUCTION

Critical care nurses face unparalleled challenges in the Intensive Care Unit (ICU), where the nature of patient care requires constant attention to complexity and intensity. Despite a relatively low nurse-to-patient ratio, the workload in ICUs remains exceedingly high due to the intricate needs of critically ill patients. ICU nurses face complex multitasking, high patient acuity, and time-sensitive responsibilities, all of which require sustained cognitive and emotional engagement (Ageel & Shbeer, 2022). Moreover, studies have demonstrated that the nurse-to-patient ratio plays a critical role in determining care quality and outcomes for critically ill patients, highlighting the importance of addressing workload challenges in these demanding environments (Neuraz et al., 2015). The environment in which ICU nurses operate is marked by significant psychosocial and professional stressors that compound their mental workload. Nurses are required to engage directly with vulnerable patients, often bearing immense responsibility for critical decisions where errors can have serious consequences. In addition to these professional demands, nurses must confront unpredictable situations involving suffering, pain, and death, develop sound clinical judgment based on medical diagnoses, and navigate emotionally charged interactions with patients' families. Balancing these responsibilities with personal life further intensifies the strain on their mental and emotional well-being (Ceballos-Vásquez et al., 2015). The sustainability and effectiveness of

nursing services depend on addressing the resilience and support systems for nurses working in high-intensity environments. Resilience, hope, and meaning in patient care contribute significantly to reducing burnout and fostering professional satisfaction (Rushton et al., 2015).

Mental workload has been identified as a critical factor influencing human error, particularly in high-stress healthcare settings, as confirmed by various studies in health cognition (Mirzaee et al., 2015). A high workload presents significant risks, such as decreased accuracy, impaired concentration, and reduced job satisfaction, which collectively lead to a decline in the quality of care and performance of nurses (Kang et al., 2016). Psychosocial factors within the work environment, including stress, emotional demands, burnout, job satisfaction, and leadership quality, have been shown to significantly affect mental workload (Nourollahi-Darabad et al., 2024). Similarly, job satisfaction has been linked to mental demands and frustration, with lower levels of satisfaction correlating with increased mental workload and emotional strain (Bazazan et al., 2019).In critical care settings, nurses also face a demanding and emotionally intense environment. They frequently deal with distressing situations, conflicts, and ethical dilemmas while undertaking complex technological tasks. The high acuity, rapid changes in patient condition, and emotional intensity inherent of their work significantly contribute to increased mental workload. Studies indicate that physical workload is closely related to mental workload, which in turn strongly correlates with work fatigue in nurses (Lestari et al., 2023; Nasirizad Moghadam et al., 2021; Pamungkas et al., 2022). Fatigue experienced by critical care nurses can manifest as physical fatigue, mental fatigue, decreased activity, and reduced motivation (Tirvienė et al., 2020). The high mental workload also leads to decreased job satisfaction, increased fatigue, burnout, and a higher likelihood of nurses leaving the profession (Jin et al., 2024; Lestari et al., 2023).

The demanding nature of their work further places care processes at risk of delays, suboptimal performance, and increased care errors, which directly affects the quality of patient care and nurses' caring behavior (Jin et al., 2024; Sert et al., 2024). These challenges can ultimately impact organizational performance and the overall quality of healthcare services (Jin et al., 2024).Based on these findings, this study seeks to identify and categorize the factors influencing the mental workload of ICU nurses through a comprehensive scoping review. By synthesizing evidence from various studies, this research aims to provide a holistic understanding of the psychosocial, organizational, and environmental elements contributing to mental workload. The insights gained will inform strategies to alleviate these burdens, enhance the resilience and performance of ICU nurses, and ultimately improve the quality of care delivered in critical care settings. The objective of this study was to identify and categorize the factors influencing mental workload among critical care nurses.

METHOD

This study employed a scoping review methodology guided by the framework proposed by Arksey and O'Malley (Arksey & O'Malley, 2005), updated by Levac et al. (2010), improved by the Joanna Briggs Institute (JBI) (Peters et al., 2020), and organized in compliance with the PRISMA-ScR checklist (Tricco et al., 2018). This review aimed to explore and map the literature on mental workload among critical care or intensive care nurses. The literature search was conducted across five databases: PubMed, ScienceDirect, EBSCOhost - CINAHL Complete, Medline, and Scopus. The search strategy utilized specific keywords: "mental workload" OR "cognitive workload" OR "cognitive mental workload" AND "ICU" OR "intensive care" OR "critical care" AND "nurse" OR "nurses" OR "nursing".The Population Concepts Context (PCC) framework for this study focuses on nurses working in critical care or intensive care units, with a specific emphasis on mental workload. The context involves a subjective measure of mental workload, which will be assessed through self-reported data or

other similar subjective methods. The research question is "What are the factors influencing critical care nurses' mental workload?". The inclusion criteria for this study are original research articles published between 2014 and 2024, written in English, and directly related to the topic of mental workload among critical care or intensive care nurses. Conversely, the exclusion criteria include articles published in languages other than English, literature reviews, and studies where the population does not consist of nurses working in critical or intensive care settings.

RESULT

Total 775 articles were found. After duplicates were removed (452 records), 323 unique articles underwent screening based on titles and abstracts. Of these, 199 articles were excluded for irrelevance, and 124 articles were reviewed in full. Following further eligibility assessment, 80 articles were excluded for not aligning with the research topic. Additionally, 37 articles were excluded due to language issues (5 articles), ineligible phenomena of interest (11 articles), inapplicable study contexts (8 articles), and unrelated study populations (12 articles). Ultimately, 44 articles were assessed for eligibility, and 8 were included in the final review. These studies were analyzed to extract and synthesize data on the mental workload experienced by nurses in ICU and critical care settings, offering valuable insights into the contributing factors, challenges, and implications of mental workload in these high-pressure environments.

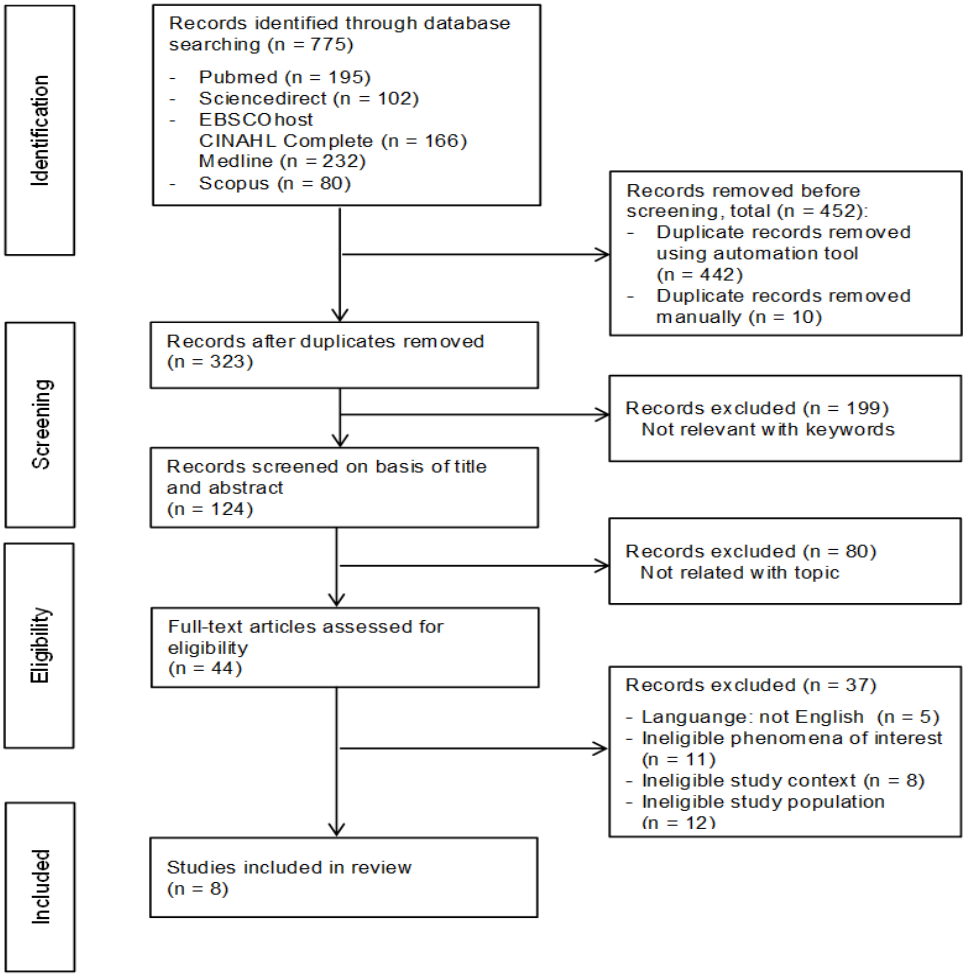

Figure 1. PRISMA Diagram

Table 1.
Summary of included evidence sources

Author and Year	Country	Sample	Research Design	Result
Fischbacher et al. 2024	Switzerland	60 nurses, 765 shifts	Prospective longitudinal cohort	Mental workload was positively associated with objective workload (TISS-28 AOR 0.34 [0.26, 0.43], NEMS AOR 0.39 [0.30, 0.49], PNR AOR 30.45 [18.95, 41.95]). Younger nurses (<30 years) and those with less ICU experience (<5 years) reported higher mental workload. Gender was not a significant factor.
Wihardja et al. 2019	Indonesia	129 nurses	Quantitative cross-sectional	The study found that motivation (AOR 0.022) significantly influenced mental workload. Nurses with high motivation had lower mental workloads. Factors like task complexity and organizational support affected mental workload.
Yanbei et al., 2023	China	479 ICU nurses	Cross-sectional survey	Perceived organizational support moderated the relationship between work frustration and burnout (β = -0.111, P = 0.007). Age, gender, and experience influenced burnout, but perceived support alleviated some mental workload effects.
Mohammadi et al., 2015	Iran	81 ICU nurses	Cross-sectional study	Mental workload correlated with physical demands (mean 84.17). Performance obstacles, such as poor equipment and disorganized workspaces, increased workload. Nurses in critical ICUs reported higher mental workloads.
Moghadam et al., 2019	Iran	105 ICU nurses	Cross-sectional study	Mental workload was influenced by age and patient load (P < 0.05). Younger nurses and those caring for more patients reported higher mental workload (mean score 70.21 ± 12.4).
Nasirizad Moghadam et al., 2021	Iran	105 ICU nurses	Cross-sectional study	The study found that physical and mental workload were significantly correlated (p < 0.001). Age and experience showed no significant relationship with workload. Nurses aged 30-40 reported the highest workload. Gender (96% female) and certification did not significantly impact workload. ICU type: Nurses in specialized ICUs (e.g., cardiac) had lower workloads. Number of patients was positively correlated with physical workload.
Ceballos-Vásquez et al., 2015	Chile	111 ICU nurses	Descriptive, cross-sectional	Significant correlations were found between psychosocial risks (e.g., job dissatisfaction, double shifts) and mental workload. Psychosocial risk explained 38% of the total mental workload.
Hoogendoorn et al., 2021	Netherlands	228 ICU nurses	Prospective cohort study	No significant link between objective and perceived workload (p = 0.06). APACHE-IV score significantly associated with perceived workload (p = 0.02). Age: No direct relationship. Certification: Certified nurses reported lower perceived workload (p = 0.03).

DISCUSSION

Mental workload is a multidimensional construct arising from the interaction between the demands of a task and the cognitive resources available to an operator, referring to the mental effort required to accomplish a task within a specific timeframe. It encompasses the cognitive cost incurred to meet task demands, which depends on the complexity of the task and the operator's cognitive capacity, often constrained by limited internal resources (Longo et al., 2022). As a multidimensional construct, MWL is influenced by task qualities (e.g., demands, performance), operator characteristics (e.g., skill, attention), and, to some extent, the ambient context in which performance takes place (Young et al., 2015). This scoping review synthesizes evidence from multiple studies to identify and categorize factors influencing the mental workload of ICU nurses. By examining psychosocial, professional, and environmental factors, the review provides a comprehensive understanding of the elements contributing to the mental demands faced by ICU nurses. The findings indicate that mental workload is shaped by objective workload measures, demographic characteristics, psychosocial influences, and work environment factors, offering insights to guide strategies aimed at reducing mental strain, enhancing nurse well-being, and ultimately improving patient care outcomes.

Workload Measures and Objective Workload

One of the most prominent findings across multiple studies is the strong association between objective workload measures and the perceived mental workload of ICU nurses. Fischbacher et al. (2024) found that mental workload was positively correlated with objective workload indicators, such as the TISS-28, NEMS, and PNR. Specifically, higher scores on these objective workload measures were linked to an increase in mental workload. The TISS-28, which is used to assess the severity of illness in patients, reflects the complexity and intensity of care required by patients. NEMS, the nurse evaluation of workload, reflects the effort required to provide nursing care, while PNR, the number of patients assigned to each nurse, directly indicates the distribution of workload among staff (Fischbacher et al., 2024).The findings from Fischbacher et al. (2024) suggest that as the number of patients per nurse increases, or as the severity of the patients' conditions rises, the mental strain experienced by nurses also increases. This was further corroborated by Hoogendoorn et al. (2021), who found that nurses with higher objective workload scores, as reflected in their NAS scores, reported higher mental workload according to the NASA-TLX, a tool used to assess perceived workload (Hoogendoorn et al., 2021). These results emphasize that objective workload measures, such as patient-to-nurse ratios and the complexity of patient conditions, are critical in understanding and managing ICU nurses' mental workload. It is clear from these studies that reducing the number of patients per nurse and ensuring appropriate distribution of care tasks may alleviate some of the mental strain on ICU nurses.

Demographic Factors: Age, Experience, Gender, and Certification

Demographic factors, including age, experience, gender, and certification, play a significant role in determining the mental workload experienced by ICU nurses. Several studies have shown that younger nurses and those with less ICU experience tend to report higher levels of mental workload. Fischbacher et al. (2024) found that nurses under 30 years of age, and those with less than five years of ICU experience, reported higher levels of mental workload. This is likely due to the inexperience of younger and newer nurses in managing the complex and emotionally demanding environment of the ICU, which may increase the stress and cognitive load placed upon them. The fast-paced nature of ICU care, along with the high level of critical thinking required, may be particularly challenging for less experienced nurses, which is reflected in their higher perceived mental workload. Moghadam et al. (2019) further supported this finding, noting that younger nurses, particularly those under 30, had higher

mental workload scores compared to their older counterparts. However, Nasirizad Moghadam et al. (2021) reported no significant relationship between ICU experience and workload, suggesting that while experience may help with task management and coping strategies, it may not always be a direct factor in mental workload perceptions (Nasirizad Moghadam et al., 2021). Interestingly, gender did not have a significant impact on mental workload in most studies reviewed, even though the majority of ICU nurses are female. This suggests that while gender may play a role in shaping the overall work experience, it may not be a direct factor influencing mental workload in ICU settings (Fischbacher et al., 2024; Nasirizad Moghadam et al., 2021).

Workload and Patient Care

Patient load has been consistently shown to have a significant effect on ICU nurses' mental workload. The number of patients assigned to a nurse directly impacts the complexity and intensity of their work. Several studies indicated that ICU nurses caring for a higher number of patients reported higher levels of mental workload. Moghadam et al. (2019) found that nurses responsible for more patients reported a higher mental workload, which was exacerbated by the challenges of managing multiple critically ill patients at once. The increased cognitive demands of monitoring several patients, adjusting care plans, and managing complex medical treatments contribute to the mental load experienced by these nurses (Moghadam et al., 2019).Moreover, Nasirizad Moghadam et al. (2021) demonstrated that physical workload was also correlated with patient load, as nurses with more patients under their care reported higher physical workload levels (Nasirizad Moghadam et al., 2021). This suggests that the physical and mental demands of ICU nursing are intertwined, with higher patient numbers contributing to both the physical and cognitive load nurses must manage. The findings further support these conclusions, showing that nurses with higher patient-to-nurse ratios perceived a greater workload, although the association became less significant after adjusting for other factors such as patient acuity (Hoogendoorn et al., 2021; Umansky & Rantanen, 2016). These findings highlight the importance of adequate staffing and balanced patient load to prevent excessive mental strain on nurses and to ensure quality patient care.

Psychosocial and Organizational Factors

Psychosocial and organizational factors play a crucial role in influencing ICU nurses' mental workload. These factors include motivation, organizational support, leadership, and the work environment. Wihardja et al. (2019) identified motivation as a key factor influencing mental workload. Nurses with higher motivation reported lower mental workloads, suggesting that motivation may act as a buffer against the demands of ICU nursing. Motivated nurses are likely to be more engaged in their work, which can reduce perceived mental strain (Wihardja et al., 2019). In contrast, a lack of motivation can exacerbate the mental load by reducing job satisfaction and increasing the emotional toll of high-stress environments.Organizational support is another critical factor that can alleviate mental workload. A correlation was identified between organizational characteristics and the mental workload of nurses during interactions with patients in the intensive care unit (Wihardja et al., 2019). Yanbei et al. (2023) found that perceived organizational support moderated the relationship between work frustration and burnout. Nurses who felt supported by their organization experienced less mental strain and burnout, highlighting the importance of supportive leadership and adequate resources in reducing mental workload. The study indicated that organizational support helped nurses cope with work frustration, which is a common stressor in ICU settings (Yanbei et al., 2023). Similarly, Ferramosca et al. (2023) found nurses' work organization was significantly related to physical, mental, and emotional nursing workloads (Ferramosca et al., 2023). Ceballos-Vásquez et al. (2015) found that psychosocial risks, such as job

dissatisfaction, lack of social support, and the demands of double shifts, were significantly correlated with higher mental workload. These psychosocial factors explained a substantial proportion of the variance in perceived mental workload, indicating that a negative work environment can significantly contribute to mental strain (Ceballos-Vásquez et al., 2015). Furthermore, a lack of positive psychological resources, such as psychological capital, resilience, and self-efficacy, is clearly linked to increased mental workload (Shan et al., 2021). An additional study demonstrated that psychological capital exerts a positive influence on mental workload relief (López-Núñez et al., 2020).

Moreover, the type of ICU and the availability of resources have been shown to influence mental workload. Nasirizad Moghadam et al. (2021) found that nurses working in specialized ICUs, such as cardiac ICUs, reported lower mental workloads compared to those working in general ICUs, suggesting that the type of care provided and the level of support available may impact workload perceptions (Nasirizad Moghadam et al., 2021). In examining the occupational factors contributing to nurses' mental workload, it became evident that chronic fatigue and burnout were the predominant negative factors. These factors were found to increase nurses' fatigue and burnout, which in turn led to higher levels of psychological distress, occupational dissatisfaction, and reduced motivation, thus resulting in a significant mental workload among nurses (Bakhshi et al., 2019).This highlights the importance of creating work environments that provide the necessary support and resources to manage the complexity of ICU care effectively. A recent study demonstrated that the establishment of a supportive and constructive work environment can effectively mitigate the prevalence of occupational burnout and job-related stress while simultaneously improving patient care quality (Falguera et al., 2021).

CONCLUSION

Critical care nurses face significant mental workload due to the complex, high-intensity nature of patient care, which is further compounded by a low nurse-to-patient ratio and the lack of highly trained professionals. The mental workload of ICU nurses is influenced by a variety of factors, including objective workload measures such as patient-to-nurse ratios and the complexity of patient conditions, as well as demographic factors such as age and experience. Younger and less experienced nurses tend to report higher mental workloads due to the cognitive and emotional demands of the ICU environment. Psychosocial and organizational factors, including motivation, organizational support, leadership, and work conditions, also play a crucial role in shaping mental workload. High patient loads, long shifts, and inadequate support systems exacerbate mental strain, leading to fatigue, burnout, and reduced job satisfaction. Ensuring adequate staffing, improving organizational support, and providing a positive work environment are essential to alleviating mental workload, enhancing nurse well-being, and improving patient care outcomes in critical care settings.

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