

THE RELATIONSHIP BETWEEN HYBRID DOCUMENTATION PRACTICES AND NURSES' COGNITIVE LOAD IN HOSPITAL INPATIENT WARDS

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ABSTRACT

The incomplete transition to Electronic Medical Records (EMRs) has required nurses to continue performing hybrid documentation, using both paper-based and electronic documentation systems simultaneously. This practice may increase nurses' cognitive load due to duplicate documentation across two different media. This research aimed to examine the relationship between hybrid documentation practices and nurses' cognitive load in the inpatient wards of RS AM. This research employed a correlational cross-sectional design. A total of 92 nurses were selected using proportionate stratified random sampling. Data were collected using the Hybrid Documentation Practices Questionnaire and the National Aeronautics and Space Administration Task Load Index (NASA-TLX). The data were analyzed using the Pearson product-moment correlation test. The results showed that hybrid documentation practices were categorized as high, with a mean score of 36.61. Nurses' cognitive load was also categorized as high, with a mean score of 71.18. Among the six dimensions of the NASA-TLX, the effort dimension demonstrated the highest mean score (79.75). Pearson correlation analysis revealed a significant positive correlation between hybrid documentation practices and nurses' cognitive load ($r = 0.363$, $p < 0.001$). These findings indicate that higher levels of hybrid documentation practices are associated with greater perceived cognitive load among nurses. Therefore, optimizing the full implementation of EMRs should be considered to reduce nurses' cognitive load, improve documentation efficiency, and enhance patient safety.

Keywords: *Cognitive load, Electronic Medical Records, Hybrid documentation, Nursing documentation*

INTRODUCTION

Digital transformation has become a global strategy for improving healthcare quality, efficiency, and patient safety. The World Health Organization (2019) emphasizes that digital health technologies are essential for strengthening health systems and supporting high-quality healthcare delivery. In Indonesia, this commitment is reinforced through the Regulation of the Minister of Health Number 24 of 2022, which mandates the implementation of Electronic Medical Records (EMRs) in all healthcare facilities (Menteri Kesehatan RI 2022). Proper implementation of EMRs is expected to improve information accessibility, facilitate interdisciplinary communication, reduce documentation errors, and support continuity of care (Rusdiana and Sanjaya 2024).

Despite these expected benefits, the transition from paper-based records to fully electronic documentation remains incomplete in many hospitals. Consequently, nurses continue to perform hybrid documentation by recording identical clinical information in both paper-based and electronic systems. Recent evidence indicates that 66.6% of nurses still use paper-based documentation, while 24.7% simultaneously use paper and electronic documentation during the transition period (Ernawati and Permaida 2025). Documentation activities consume approximately 35–50% of nurses' working hours, substantially reducing time available for direct patient care (Cho et al. 2024). Consequently, documentation burden has emerged as one of the major challenges during digital transformation. Moreover,

documentation redundancy has become one of the primary contributors to documentation burden among healthcare professionals (Moy et al. 2023).

According to Lewin's Change Theory, organizational change consists of three stages: unfreezing, moving, and refreezing (Marquis and Huston 2019). Hospitals implementing EMRs often remain in the transition (moving) stage, where paper-based and electronic systems coexist. During this stage, organizations often experience workflow instability before a new system becomes fully institutionalized. This incomplete transition requires nurses to duplicate documentation to satisfy organizational policies and legal requirements, thereby increasing administrative workload without improving clinical outcomes.

The Job Demands-Resources Model explains that excessive job demands require sustained physical and psychological effort and may result in occupational strain when not balanced by adequate organizational resources (Bakker and Demerouti 2019). Hybrid documentation represents an additional job demand because nurses must repeatedly enter identical patient information, verify data consistency across multiple media, and frequently switch between paper records and electronic systems. Poor system usability and technical interruptions further increase workflow fragmentation and documentation burden (Carayon et al. 2020; Doherty et al. 2025; Strudwick et al. 2022).

From the perspective of Cognitive Load Theory, working memory has limited processing capacity, and excessive unnecessary information processing increases extraneous cognitive load (Sweller 2024). Repeated documentation, redundant information processing, and frequent task switching consume cognitive resources that should otherwise be allocated to clinical decision-making. Previous studies have demonstrated that increased cognitive workload may reduce situational awareness, impair clinical performance, and increase the likelihood of medical errors (Colligan et al. 2015; Gephart et al. 2022; Moore, Garnett, and Garnett 2025). Furthermore, nurses using inefficient electronic documentation systems commonly report high levels of mental workload, particularly in the dimensions of effort and temporal demand (Asgari et al. 2024; Wilbanks and McMullan 2018).

Although previous studies have evaluated EMR usability, workflow interruptions, and nurses' perceptions of electronic documentation (Asra et al. 2024; Shan et al. 2023), limited evidence specifically investigates the cognitive consequences of hybrid documentation during the digital transition period. Most existing studies primarily focus on electronic documentation systems rather than the simultaneous use of paper and electronic documentation. Consequently, empirical evidence regarding the relationship between hybrid documentation practices and nurses' cognitive load remains limited.

Therefore, this study aimed to examine the relationship between hybrid documentation practices and nurses' cognitive load among inpatient nurses at RS AM. The findings are expected to provide empirical evidence supporting hospital managers in optimizing EMR implementation, eliminating unnecessary documentation redundancy, reducing nurses' cognitive burden, and improving patient safety.

METHOD

This study employed a quantitative correlational design with a cross-sectional approach to examine the relationship between hybrid documentation practices and nurses' cognitive load. A correlational cross-sectional design is appropriate for identifying

relationships between variables measured simultaneously without manipulating the study environment (Creswell and Creswell 2023).

The study was conducted in the inpatient wards of RS AM, Indonesia. The study population consisted of registered nurses providing direct patient care. A total of 92 nurses were selected using proportionate stratified random sampling to ensure proportional representation across inpatient units.

Hybrid documentation practices were measured using a researcher-developed questionnaire comprising 10 items derived from Lewin's Change Theory, the Job Demands–Resources Model, and prior literature on documentation burden. Before data collection, the validity and reliability of the instrument were evaluated. The validity test confirmed that all ten items were valid, as the calculated r-values (r-count) exceeded the r-table threshold. Furthermore, the instrument demonstrated a high level of internal consistency, yielding a Cronbach's alpha coefficient of 0.927. Nurses' cognitive load was assessed using the National Aeronautics and Space Administration Task Load Index (NASA-TLX), which evaluates six dimensions: mental demand, physical demand, temporal demand, performance, effort, and frustration (Hart and Staveland 1988). The NASA-TLX has demonstrated satisfactory validity and reliability for measuring cognitive workload in healthcare settings (Prawatya et al. 2023; Tubbs-cooley et al. 2018).

For descriptive analysis, hybrid documentation practices scores were categorized into low, moderate, and high levels using Bloom's cut-off criteria. Cognitive load scores were categorized into low, moderate, and high workload levels according to the NASA-TLX workload classification. However, Pearson Product-Moment correlation analysis was performed using the total continuous scores of both variables.

After obtaining ethical approval and institutional permission, eligible nurses were invited to participate voluntarily. Participants completed the questionnaires after providing informed consent. Confidentiality, anonymity, and participants' right to withdraw from the study at any time were maintained throughout the research process.

Descriptive statistics were used to summarize respondent characteristics and study variables. The relationship between hybrid documentation practices and nurses' cognitive load was analyzed using the Pearson Product-Moment correlation test with a significance level of $p < 0.05$. Statistical analysis was performed because both variables were continuous and normally distributed (Creswell and Creswell 2023).

FINDING AND DISCUSSION RESULT

A total of 92 nurses participated in this study. The majority of respondents were from Generation Z (62.0%), had less than one year of working experience (60.9%), were assigned to Ward F (18.5%), and had a Bachelor of Nursing/Professional Nurse educational background (70.7%). Detailed respondent characteristics are presented in Table 1.

Table 1: Characteristics of Respondents (n = 92)

Characteristic	Value (n%)
Age (generation)	
Generation Z	62.0%
Millennials	35.9%
Generation X	2.2%
Working Experience	
<1 year	60.9%
1-3 years	4.3%
>3 years	34.8%
Working Unit	
Ward A	15.2%
Ward B	12%
Ward C	8.7%
Ward D	6.5%
Ward E	8.7%
Ward F	18.5%
Ward G	10.9%
Ward H	7.6%
Ward I	12%
Education	
Diploma	29.3%
Bachelor/Ners	70.7%

Source: Primary data (2026)

Table 2: Descriptive Statistics of the Study Variable

Variable	Mean±SD	Min-Max	Category		
			Low	Moderate	High
Hybrid Documentation Practices	36.61± 6.18	21 - 50	7 (7.6)	54 (58.7)	31 (33.7)
Cognitive Load	71.18±15.77	34 - 100	6 (6.5)	55 (59.8)	31 (33.7)

Table 2 presents the descriptive statistics of the study variables. The mean score of hybrid documentation practices was 36.61 ± 6.18 (range: 21-50), with most nurses categorized as having moderate hybrid documentation practices (58.7%). The mean cognitive load score was 71.18 ± 15.77 (range: 34-100), and most nurses experienced a moderate level of cognitive load (59.8%). Among the NASA-TLX dimensions, effort demonstrated the highest mean score.

Table 3: Pearson Correlation Analysis

Variable	r	Sig. (2-tailed)	N
Hybrid Documentation Practices	0.363**	0.001	92
Cognitive Load			

Pearson product-moment correlation analysis revealed a statistically significant positive correlation between hybrid documentation practices and nurses' cognitive load ($r = 0.363$, $p < 0.001$).

DISCUSSION

This study found a statistically significant positive relationship between hybrid documentation practices and nurses' cognitive load. The findings indicate that greater involvement in hybrid documentation is associated with increased cognitive workload among nurses. These results support the hypothesis that documentation redundancy constitutes an important occupational demand during the transition toward fully integrated Electronic Medical Records.

The high level of hybrid documentation observed in this study reflects the incomplete implementation of digital documentation systems. Nurses were required to document identical clinical information in both paper-based and electronic records, resulting in duplicated work and fragmented workflows. Similar findings have been reported by Cho et al. (2024), who demonstrated that documentation activities consume a substantial proportion of nurses' working hours. Likewise, Moy et al. (2023) reported that duplicate documentation significantly increases documentation burden without improving the quality of patient care.

The findings are consistent with Lewin's Change Theory, which explains that organizations undergoing digital transformation frequently experience challenges during the transition (moving) stage before new practices become fully established (Marquis and Huston 2019). During this period, coexistence of paper and electronic documentation may unintentionally increase administrative complexity and reduce workflow efficiency. Inadequate technological infrastructure and incomplete system integration may further prolong this transitional phase (Handayani and Hariyati 2023; McGonigle and Mastrian 2025).

The observed association also supports the Job Demands–Resources Model proposed by Bakker and Demerouti (2019). Hybrid documentation functions as an additional job demand requiring continuous concentration, repeated information processing, and frequent task switching. Without sufficient organizational resources, such as efficient EMR systems, technical support, and workflow redesign, prolonged exposure to these demands may increase occupational stress and reduce work performance.

Consistent with Cognitive Load Theory, redundant documentation increases extraneous cognitive load by requiring nurses to repeatedly process identical information using limited working memory capacity (Sweller 2024). Frequent switching between documentation media further interrupts cognitive processing and increases mental effort. Similar observations have been reported by Colligan et al. (2015) and Shan et al. (2023), who found that inefficient electronic documentation systems significantly increase nurses' mental workload and task interruptions.

Among the NASA-TLX dimensions, effort demonstrated the highest mean score, indicating that nurses perceived considerable mental and physical effort during documentation activities. This finding is comparable with previous studies showing that healthcare professionals experience elevated effort and temporal demand when interacting with complex electronic documentation systems (Asgari et al. 2024; Wilbanks and McMullan

2018). High cognitive workload may reduce situational awareness, impair clinical judgment, and increase the risk of documentation errors and patient safety incidents (Gephart et al. 2022; Moore et al. 2025).

These findings have important implications for nursing management. Hospitals should prioritize the completion of EMR implementation, eliminate duplicate documentation requirements, improve system usability, strengthen technical infrastructure, and provide continuous training for nurses. Organizational support during digital transformation may reduce unnecessary cognitive demands while allowing nurses to allocate greater attention to direct patient care (Mega Suciani, Ratnasari, and Yanto 2024; Quintary et al. 2025; Strudwick et al. 2022).

This study has several limitations. First, the cross-sectional design does not allow causal relationships between hybrid documentation practices and nurses' cognitive load to be established. Second, data were collected using self-reported questionnaires, which may be subject to response bias. Third, this study did not objectively measure the actual time spent on documentation through time-motion observations; rather, it relied entirely on the nurses' subjective perceptions of their documentation practices. In addition, this study was conducted in a single hospital, which may limit the generalizability of the findings to other healthcare settings. Future studies are recommended to employ longitudinal or observational designs involving multiple hospitals to further explore the causal mechanisms underlying cognitive workload during hybrid documentation.

CONCLUSION

Hybrid documentation practices were significantly associated with nurses' cognitive load. Nurses who experienced greater documentation redundancy reported higher levels of cognitive workload. The findings suggest that incomplete digital transformation may unintentionally increase mental demands during nursing documentation.

Healthcare organizations should prioritize the implementation of fully integrated Electronic Medical Records, eliminate duplicate documentation processes, improve system usability, and strengthen technical support. These strategies may reduce nurses' cognitive burden, improve documentation efficiency, and ultimately contribute to safer and higher-quality patient care.

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