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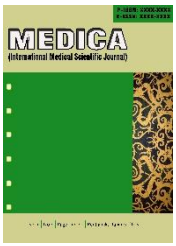

The Impact of Nursing Management Information Systems on Workload and Effectiveness of Inpatient Nursing Services

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Abstract

The implementation of the Nursing Management Information System (NMIS) represents a strategic effort by hospitals to enhance the quality of nursing services through the digitalization of care documentation. However, during the early stages of implementation, the system may exert varying effects on nurses' workload and the effectiveness of nursing services. This study aimed to analyze the influence of NMIS implementation on nurses' workload and the effectiveness of nursing services, with user behavior as a mediating variable, in the inpatient wards of Khidmat Sehat Afiat Regional General Hospital, Depok City, in 2025. This study employed a quantitative analytical observational design with a cross-sectional approach. A total of 94 inpatient nurses were recruited using a total sampling technique. Data collection was carried out using a questionnaire, then analyzed using the Partial Least Square-based Structural Equation Modeling (SEM-PLS) method using SmartPLS 4.0. The results indicated that NMIS implementation had a positive and significant effect on user behavior and the effectiveness of nursing services, while demonstrating a negative and significant effect on nurses' workload. User behavior was found to negatively and significantly influence nurses' workload and positively and significantly affect the effectiveness of nursing services. Furthermore, nurses' workload had a negative and significant impact on service effectiveness. Mediation analysis revealed that user behavior and nurses' workload functioned as significant sequential mediators in the relationship between NMIS implementation and the effectiveness of nursing services. In conclusion, the optimal implementation of NMIS can contribute to reducing nurses' workload and improving the effectiveness of nursing services.

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1. INTRODUCTION

On a global scale, the high workload of nurses has become a critical issue in the delivery of healthcare services. The World Health Organization (WHO) reports that the limited number of nursing personnel, the high patient-to-nurse ratio, and the increasing demands of administrative and clinical tasks contribute to excessive physical and psychological work pressure among nurses (World Health Organization, 2016; World Health Organization, 2019). This condition may lead to a decline in service quality, delays in the implementation of nursing procedures, an increased risk of errors, and reduced patient safety. Furthermore, the WHO emphasizes that poorly managed nurses' workload directly affects the effectiveness of healthcare services, given the pivotal role of nurses in ensuring continuity of care and supporting clinical decision-making processes (World Health Organization, 2020). Therefore, the implementation of a nursing information system is considered a strategic approach to assist nurses in managing their workload, reducing administrative burdens, accelerating documentation processes, and enhancing accurate and responsive clinical decision-making, ultimately improving the effectiveness of nursing services (Tiorentap, 2020).

Evidence from various healthcare settings indicates that the implementation of electronic medical records has significantly contributed to improving the effectiveness of healthcare service delivery in hospitals. However, successful implementation requires optimal organizational support and readiness to encourage healthcare personnel to utilize electronic medical records in accordance with operational standards (Carayon & Gurses, 2008). In addition, effective socialization and the establishment of standard operating procedures (SOPs) are essential to ensure proper use, completion, and management of electronic medical records. This includes aligning system design and documentation processes with institutional regulations and national health insurance requirements under BPJS Kesehatan (Kementerian Kesehatan Republik Indonesia, 2022).

At Khidmat Sehat Afiat Regional General Hospital in Depok City, prior to the implementation of the Nursing Management Information System (NMIS), nursing care documentation was conducted manually using paper-based records. Nurses were required to document care in extensive files, which often led to prolonged recording times, illegible handwriting, and risks of file loss or damage. Additionally, fatigue and time constraints frequently resulted in incomplete documentation. As a consequence, nurses tended to spend more time on documentation tasks than on direct patient care, thereby increasing their physical, mental, and administrative workload (Rachmayanti, Majid, & Yuniar, 2024).

Following the implementation of the NMIS, known as the SIMANKEP application, the hospital anticipated significant improvements in nursing documentation management. The system was designed to enhance recording speed, improve data accuracy, and reduce duplication. However, in its early stages, several challenges emerged, including limited computer availability in certain units, unstable internet connectivity, and variations in nurses' digital competencies. As a result, while some nurses experienced increased efficiency, others perceived the system as an additional burden due to the need to adapt to new technology alongside ongoing clinical responsibilities (Davis, 1985).

Prior to NMIS implementation, nurses at the hospital faced substantial administrative burdens from time-consuming manual documentation, particularly during periods of high patient volume. The duplication of reports, such as daily documentation, further intensified this workload (Riyanti & Wulandari, 2025). This condition often resulted in fatigue, decreased concentration, and incomplete documentation. After the implementation of NMIS, documentation processes became faster and more structured. Nevertheless, the

initial adaptation phase posed challenges, as nurses were required to learn system navigation, perform data entry accurately, and manage limited access to available computers, often leading to queuing (Simbolon et al., 2023).

From the perspective of nursing service effectiveness, prior to NMIS implementation, manual documentation frequently hindered service delivery. Delays and incomplete records such as unrecorded intervention plans during shift transitions—often resulted in information gaps, delayed treatments, and inconsistencies in patient care. Team coordination was also affected due to difficulties in accessing up-to-date patient information, which in turn delayed clinical decision-making. Following the implementation of NMIS, the effectiveness of nursing services improved as the system enabled more structured documentation, standardized selection of diagnoses and interventions, and real-time updates of patient information. This facilitated continuity of care, improved coordination among healthcare providers, and ensured timely and appropriate nursing interventions.

Based on these issues observed in various hospitals, including Khidmat Sehat Afiat Regional General Hospital in Depok City, the implementation of electronic medical records particularly the Nursing Management Information System (SIMANKEP) requires further evaluation. Therefore, this study aims to analyze the effect of the implementation of the Nursing Management Information System on nurses' workload and the effectiveness of nursing services, with user behavior as a mediating variable, in inpatient care at Khidmat Sehat Afiat Regional General Hospital, Depok City.

2. METHOD

This study is an observational analytical quantitative study using a cross-sectional design. The data used are primary data obtained directly from respondents through questionnaires. The quantitative approach was chosen because this study aims to measure and statistically analyze the relationship between the implementation of the Nursing Management Information System (SIMK) as an independent variable with nurses' workload and the effectiveness of nursing services as dependent variables, and SIMK usage behavior as an intervening variable. Observational research was chosen because the researcher did not provide specific interventions or treatments, but only observed phenomena that occurred in the field.

A cross-sectional design was used because all study variables were measured and observed simultaneously within a single data collection period. This design was deemed appropriate for determining the actual relationships between variables during the implementation of SIMK in the inpatient ward of Khidmat Sehat Afiat Regional Hospital, Depok City. Through this design, researchers can obtain an overview of the influence of SIMK implementation on nurses' workload and the effectiveness of nursing services, while also assessing the role of system usage behavior in this relationship. The choice of this design is also relevant because the implementation of SIMK in hospitals is still in the adaptation stage, so an initial evaluation of the impact of its implementation in nursing service practices is needed.

Data analysis in this study was conducted using a Structural Equation Modeling (SEM) approach based on Partial Least Squares (PLS) with the assistance of SmartPLS software version 4.0. The SEM-PLS method was chosen because it is capable of analyzing causal relationships between complex latent variables in a single structural model, both direct and indirect relationships. In addition, this method is suitable for use in research with a relatively limited sample size, does not require normal data distribution, and can accommodate both reflective and formative indicators simultaneously. Thus,

SEM-PLS is considered appropriate for testing the conceptual model regarding the influence of SIMK implementation on workload and effectiveness of nursing services through system usage behavior.

The selection of this approach is based on several considerations, namely because the Nursing Management Information System is still in the early stages of implementation, so an empirical evaluation of the impact of its use in the hospital environment is needed. In addition, this study involves more than one dependent variable and one mediating variable, so an analysis method is needed that is capable of testing all of these relationships simultaneously. Through this design and analysis approach, it is hoped that the research can provide a comprehensive picture of the influence of SIMK use on nurses' workload, the effectiveness of nursing services, and its contribution to improving the quality of nursing services in hospitals.

3. RESULTS AND DISCUSSION

Table 1. Results of pre-instrument validity test.

Variable	Number of items	Range of r count	Criteria	Information
Nursing Management Information System	14	0.506 - 0.745	0.170	Valid
Information System User Behavior	15	0.504 - 0.873	0.170	Valid
Nurse Workload	15	-0.742 - -0.556	0.170	Valid
Effectiveness of Nursing Services	15	0.433 - 0.716	0.170	Valid

Based on Table 1 in the results of the Instrument Validity Test, the r table value is obtained in the Pearson Product Moment correlation distribution which is used as a comparative value to determine the validity of each statement item. The determination of the r table is based on the number of respondents (N) and degrees of freedom (*degree of freedom/df*) with the formula df = N - 2. In this study, the number of respondents was 94 people, so that df = 92 was obtained. At a significance level of 5% with one *-tailed testing* , the r table value for df = 92 was 0.170. Based on the results of the validity test using the Pearson Product Moment correlation, all statement items in the variables of Nursing Management Information System, Information System User Behavior, Nurse Workload, and Nursing Service Effectiveness have a calculated r value greater than the r table (r> 0.170) and a significance value less than 0.05 (p <0.05). These results indicate that each statement item is able to measure the construct being studied appropriately, so that all items are declared valid and suitable for use as research instruments.

Table 2. Results of pre-instrument reliability test.

Variables	Number of items	Cronbach's Alpha	Criteria	Information
All Instruments	59	0.895	> 0.70	Very Reliable

Based on the reliability test results in Table 2, a Cronbach's Alpha value of 0.895 was obtained for 59 statement items. This value is above the recommended minimum reliability limit of 0.70 and even approaches the highly reliable category. This indicates that the research instrument has an excellent level of internal consistency and is suitable for

use in data collection. The high Cronbach's Alpha value indicates that all items in the instrument are consistently correlated in measuring the constructs of Nursing Management Information System, Information System User Behavior, Nurse Workload, and Nursing Service Effectiveness.

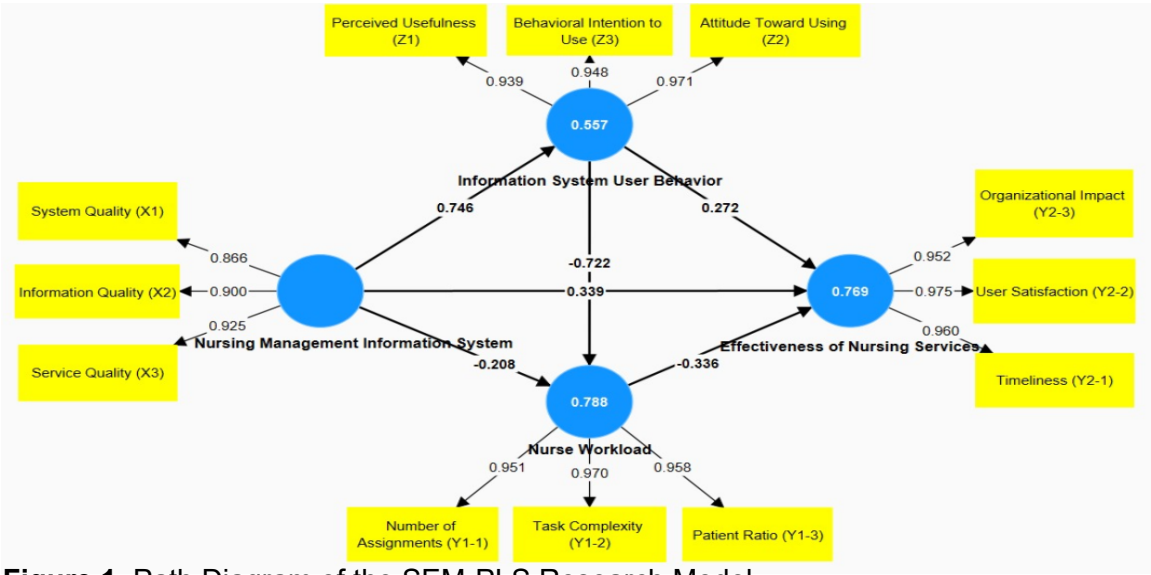

Figure 1. Path Diagram of the SEM-PLS Research Model.

Based on Figure 1, the SEM-PLS Research Model Path Diagram shows a path diagram of the SEM-PLS-based research model that describes the measurement model (outer model) and the structural model (inner model) simultaneously. The measurement model is used to explain the relationship between latent constructs and their constituent indicators, while the structural model is used to describe the causal relationship between latent constructs in the study. Through this model, the validity and reliability of the indicators are tested before continuing with testing the relationships between latent constructs.

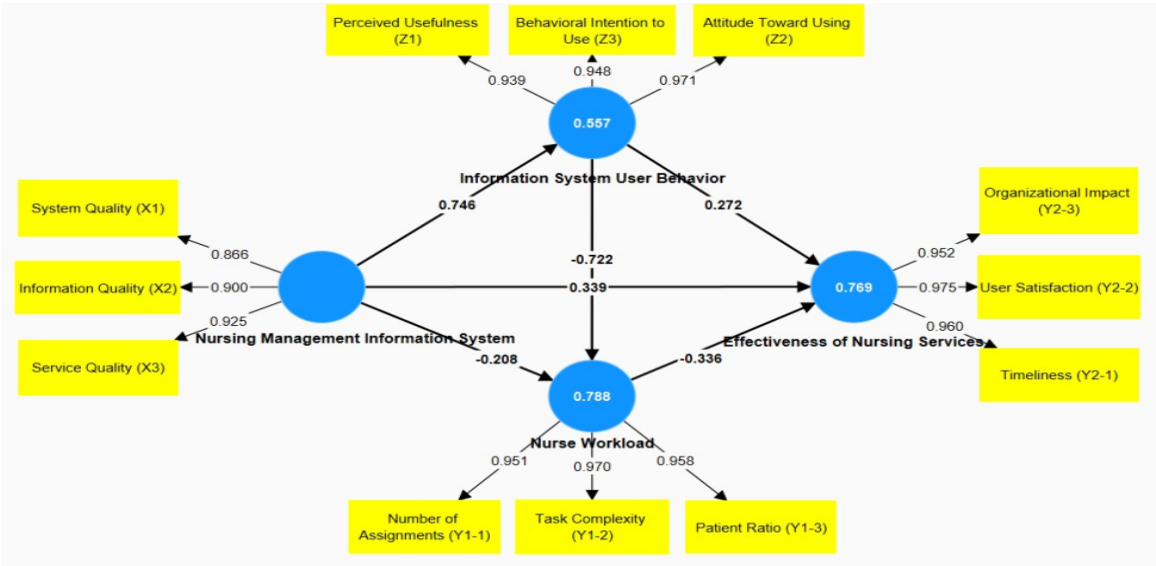

Figure 2. Path Diagram of Measurement Model Estimation Results (Outer Model)

Based on Figure 2, it can be seen that all indicators in each latent construct show high outer loading values and are above the recommended minimum limit, thus meeting the convergent validity criteria. The indicators in the variables Nursing Management Information System, Nursing Management Information System User Behavior, Nurse Workload, and Nursing Service Effectiveness consistently reflect the constructs they measure.

These results indicate that the measurement model used was able to accurately describe the relationship between the latent constructs and their indicators. By meeting the convergent validity criteria in the outer model, all indicators were deemed suitable for use in further testing, namely construct reliability evaluation, discriminant validity, and structural model testing (inner model).

Table 3. Results of the Construct Reliability Test and Average Variance Extracted (AVE).

Variable	Cronbach's Alpha	Composite Reliability (Rho_A)	Composite Reliability (Rho_C)	Average Variance Extracted (AVE)
Nurse Workload	0.957	0.958	0.972	0.921
Effectiveness of Nursing Services	0.960	0.961	0.974	0.926
Nursing Management Information System User Behavior	0.949	0.951	0.967	0.908
Nursing Management Information System	0.880	0.901	0.925	0.805

Based on Table 3 on the results of the construct reliability analysis, Nurse Workload has a Cronbach's Alpha value of 0.957, Composite Reliability (Rho_A) of 0.958, and Composite Reliability (Rho_C) of 0.972. These values are above the minimum required limit, so it can be concluded that the indicators in the Nurse Workload construct have a very good level of internal consistency.

The construct of Nursing Service Effectiveness also showed an excellent level of reliability, with a Cronbach's Alpha value of 0.960, Composite Reliability (Rho_A) of 0.961, and Composite Reliability (Rho_C) of 0.974. These results indicate that the indicators forming the effectiveness of nursing services are able to measure the construct consistently and reliably.

Furthermore, the Nursing Management Information System User Behavior construct has a Cronbach's Alpha value of 0.949, Composite Reliability (Rho_A) of 0.951, and Composite Reliability (Rho_C) of 0.967. These values indicate that the information system user behavior indicators have very good internal consistency in measuring the intended construct.

Meanwhile, the Nursing Management Information System construct has a Cronbach's Alpha value of 0.880, Composite Reliability (Rho_A) of 0.901, and Composite Reliability (Rho_C) of 0.925. These values indicate that the indicators of system quality,

information quality, and service quality consistently and reliably represent the Nursing Management Information System construct.

In addition, the results of convergent validity testing through the Average Variance Extracted (AVE) value show that all constructs have an AVE value above 0.50 , which indicates that each construct is able to explain more than half of the variance of its indicators. The AVE value for the Nurse Workload construct is 0.921, Nursing Service Effectiveness is 0.926, Nursing Management Information System User Behavior is 0.908, and Nursing Management Information System is 0.805.

Based on the results of the construct reliability and convergent validity tests, it can be concluded that all constructs in this study have met the reliability and convergent validity criteria, so that the measurement model is declared reliable and suitable for use in the next analysis stage, namely the evaluation of the structural model (inner model).

Table 4. Results of the indirect effects test.

Variable	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p-values
Nursing Management Information System User Behavior (Z) → Nurse Workload (Y1) → Nursing Service Effectiveness (Y2)	0.242	0.249	0.125	1.942	0.026
Nursing Management Information System (X) → Nurse Workload (Y1) → Effectiveness of Nursing Services (Y2)	0.070	0.069	0.054	1.293	0.098
Nursing Management Information System (X) → Nursing Management Information System User Behavior (Z) → Nurse Workload (Y1) → Nursing Service Effectiveness (Y2)	0.181	0.188	0.097	1.869	0.031
Nursing Management Information System (X) → Nursing Management Information System User Behavior (Z) → Nursing Service Effectiveness (Y2)	0.203	0.216	0.126	1.614	0.053

Based on Table 4, the results of the indirect effects test using the bootstrapping method on the structural model, it was found that not all mediation paths in this study showed a statistically significant influence, either through single mediation or chain mediation.

The Influence of Nursing Management Information System User Behavior (Z) on the Effectiveness of Nursing Services (Y2) through Nurse Workload (Y1) has an indirect influence coefficient value (original sample) of 0.242, with T-statistics of 1.942 and P-values of 0.026. P-values smaller than 0.05 indicate that Nurse Workload acts as a significant mediator variable in the relationship between Nursing Management Information System User Behavior and Nursing Service Effectiveness.

Furthermore, the influence of the Nursing Management Information System (X) on the Effectiveness of Nursing Services (Y2) through Nurse Workload (Y1) shows an indirect influence coefficient value of 0.070, with a T-statistic of 1.293 and P-values of 0.098. P-values greater than 0.05 indicate that the mediation path through Nurse Workload is not statistically significant, so that Nurse Workload has not been able to directly mediate the influence of the Nursing Management Information System on the Effectiveness of Nursing Services.

Further testing shows that the influence of the Nursing Management Information System (X) on the Effectiveness of Nursing Services (Y2) through the Behavior of Nursing Management Information System Users (Z) and Nurse Workload (Y1) sequentially has an indirect influence coefficient value of 0.181, with T-statistics of 1.869 and P-values of 0.031. These results indicate that the multiple mediation pathway through User Behavior and Nurse Workload has a significant effect on the Effectiveness of Nursing Services.

Meanwhile, the influence of the Nursing Management Information System (X) on the Effectiveness of Nursing Services (Y2) through the Behavior of Nursing Management Information System Users (Z) shows an indirect influence coefficient value of 0.203, with a T-statistic of 1.614 and P-values of 0.053. P-values that are slightly greater than 0.05 indicate that this mediation path is not yet statistically significant.

Table 5. Results of total indirect effects test.

Variables	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	p-values
Nursing Management Information System User Behavior (Z) → Nursing Service Effectiveness (Y2)	0.242	0.249	0.125	1.942	0.026
Nursing Management Information System (X) → Nurse Workload (Y1)	-0.539	-0.542	0.092	5.875	0.000
Nursing Management Information System (X) → Effectiveness of Nursing Services (Y2)	0.453	0.473	0.117	3.883	0.000

Based on Table 5 on the results of the total indirect effects test using the bootstrapping method in the SEM-PLS model, an overview of the overall indirect influence between variables in the research model through one or more mediator variables used is obtained .

The Influence of Nursing Management Information Systems on the Behavior of Nursing Management Information System Users

Based on the results of the SEM-PLS analysis, the Nursing Management Information System has a positive and significant effect on the Behavior of Nursing Management Information System Users (Venkatesh et al., 2003). These findings indicate that the quality and implementation of good information systems can shape more positive nurse behavior in using nursing information systems. Thus, the hypothesis stating that there is an influence of the Nursing Management Information System on user behavior can be accepted statistically .

This positive influence indicates that the better the Nursing Management Information System implemented, the higher the tendency of nurses to use the system consistently and optimally to support (Delone & McLean, 2016). The implementation of nursing tasks. System factors, such as ease of use, system usefulness, clarity of information, and service support, play an important role in shaping attitudes, interests, and behavior in using nursing information systems. This finding confirms that the success of implementing a Nursing Management Information System is largely determined by the quality of the system itself in meeting the needs of users in the nursing work environment (Delone & McLean, 1992).

The results of this study are in line with the Technology Acceptance Model (TAM) proposed by Davis (1985). TAM explains that perceived usefulness and perceived ease of use are the main determinants that influence the attitudes, intentions, and actual behavior of users towards information systems. When the Nursing Management Information System is perceived as being able to help nurses' work become faster, more accurate, and more efficient, as well as being easy to learn and operate, nurses will show a positive attitude and a higher tendency for user behavior. In other words , system quality becomes the main stimulus that shapes user behavioral responses.

This finding can also be explained through the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003). Within the UTAUT framework, performance expectancy, effort expectancy, social influence, and facilitating conditions are key factors influencing technology use behavior. Implementing a Nursing Management Information System supported by adequate organizational facilities, training, and technical support will increase nurses' confidence in the system, thereby encouraging consistent use of the system in daily nursing practice.

The Influence of Nursing Management Information Systems on Nurses' Workload.

Based on the results of the SEM-PLS analysis in testing the direct effect, it can be concluded that the Nursing Management Information System has a negative and significant effect on Nurse Workload. These findings indicate that the implementation of the Nursing Management Information System is directly able to reduce the workload of nurses (Pane et al., 2023).

The negative correlation indicates that the better the implementation of the Nursing Management Information System, the lower the nurses' workload. This reduction in workload can occur because the nursing information system assists nurses in supporting the nursing care documentation process, expediting access to patient information, and reducing manual and repetitive administrative tasks. Thus, the information system acts as a work support tool that increases the efficiency of nursing tasks (Hidayatuloh, 2025).

Although the path coefficient value indicates a significant influence, the magnitude of this influence is moderate, so it can be interpreted that the Nursing Management Information System is not the only factor that determines nurse workload (Kinanti &

Pertiwi, 2021). Nurse workload is still influenced by various other factors , such as the number of patients, case complexity, nurse-patient ratio, time pressure, and high service demands in the nursing service unit (Hinonaung et al., 2023).

If related to the Technology Acceptance Model (TAM) proposed by Davis et al. (1985), the results of this study show that when an information system is perceived as useful (*perceived usefulness*) in supporting the work of nurses, the system can have a positive impact on working conditions, including reducing the workload. The implementation of a Nursing Management Information System that is able to simplify workflows and facilitate task completion contributes to nurses' work efficiency (Damanik, 2020).

The Influence of Nursing Management Information Systems on the Effectiveness of Nursing Services

Based on the results of the SEM-PLS analysis, the Nursing Management Information System was proven to have a positive and significant effect on the Effectiveness of Nursing Services. These findings indicate that the implementation of the Nursing Management Information System is directly able to increase the effectiveness of nursing services in inpatient wards (Ikawati, 2024).

These results indicate that an integrated and optimally used information system can support nurses in implementing nursing care more precisely, efficiently, and in accordance with service standards (Luthans, Luthans, & Luthans, 2020). With easy data access, increased timeliness of documentation, and support for clinical decision-making, the Nursing Management Information System makes a significant contribution to improving the quality and effectiveness of nursing services (Istiqamah, 2025).

These findings indicate that the Nursing Management Information System assists nurses in providing more timely, coordinated, and sustainable services (Trafimoq, 2009). The information system allows nursing care documentation to be carried out electronically and in a structured manner, so that information regarding patient conditions, intervention plans, and nursing evaluations can be accessed quickly and accurately. This condition supports smooth service, especially during shift changes, because the nurse can immediately continue care without losing important information.

4. CONCLUSION

Based on the results of the analysis and discussion regarding the influence of the Nursing Management Information System on nurses' workload and the effectiveness of nursing services, it can be concluded that the Nursing Management Information System has a positive and significant effect on user behavior and the effectiveness of nursing services, and a negative and significant effect on nurses' workload. This indicates that good system quality, information quality, and support services can shape positive attitudes and behaviors in using the system among nurses, while also supporting the timeliness of services, continuity of care, and more effective coordination of nursing services. On the other hand, the implementation of the system has also been shown to help reduce nurses' workload, especially in the aspects of documentation and information management, although this effect is still influenced by other factors such as the nurse-patient ratio, case complexity, and clinical service demands. This study also shows that the behavior of Nursing Management Information System users has a negative and significant effect on nurses' workload and a positive and significant effect on the effectiveness of nursing services, which means that the better the behavior of using the system, the lighter the workload and the higher the effectiveness of the services provided. Furthermore, nurses'

workload has been shown to have a negative and significant effect on the effectiveness of nursing services, so that workload management is an important factor in supporting service quality. In addition, nurses' workload and user behavior of the Nursing Management Information System were shown to act as significant chain mediators in the relationship between the Nursing Management Information System and the effectiveness of nursing services. Thus, the success of implementing a Nursing Management Information System in improving service effectiveness does not only depend on technological aspects, but is also greatly influenced by user behavior, workload management, and ongoing organizational and managerial support.

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