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STRATEGIC PLAN FOR THE DEVELOPMENT OF A NURSING CARE DASHBOARD AS A CLINICAL DECISION SUPPORT TOOL

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ABSTRACT

The advancement of information technology has driven the transformation of data-based nursing systems through the utilization of nursing care dashboards to support clinical decision-making. This study aimed to analyze the development of a nursing system based on a nursing care dashboard in supporting clinical decision-making at Hospital A Tangerang. This study employed a case study design with an exploratory approach through observation, interviews, and document review. The respondents in this study consisted of 20 participants, including 10 nurse managers and 10 staff nurses working in inpatient units. The data were analyzed using SWOT, Internal Factor Evaluation (IFE), External Factor Evaluation (EFE), Internal - External (IE) Matrix, and TOWS. The results showed that the system was in a growth and build position with an IFE score of 2.88 and an EFE score of 3.06. Key strengths include integrated data availability, nursing staff competency, and management commitment, while weaknesses include limited analytical capability, suboptimal system integration, and underutilization of the dashboard in clinical decision-making. Strategic development focuses on optimizing dashboard utilization, enhancing nurses' digital competencies, and strengthening system integration. The development of a nursing dashboard-based system has the potential to improve the quality and timeliness of clinical decision-making and enhance nursing care quality.

Keywords: balanced scorecard; clinical decision support system; nursing dashboard; strategic management

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INTRODUCTION

The development of information technology in healthcare services supports improvements in service quality and patient safety through data-based digital transformation, including the utilization of Clinical Decision Support Systems (CDSS) (Coiera et al., 2024). CDSS integrates patient data and clinical knowledge to support accurate and evidence-based decision-making (Mu'minah & Hariyati, 2022). This system strengthens the role of technology as part of clinical processes in modern nursing practice (Coiera et al., 2024). Clinical dashboards represent one form of digital implementation that facilitates integrated and real-time visualization of patient data (Tufanaru et al., 2024). Dashboards support the monitoring of patient conditions, quality indicators, and service performance in a rapid and comprehensive manner (Tufanaru et al., 2024). The utilization of dashboards improves the accuracy of clinical responses and supports data-driven decision-making (Khairat et al., 2022). The use of clinical dashboards has been implemented in various developed countries to support patient safety and healthcare quality (Khairat et al., 2022). Hospitals in the United States, the United Kingdom, and Denmark use dashboards as monitoring tools for clinical indicators and healthcare quality outcomes (Khairat et al., 2022). These implementations contribute

to improving the accuracy of clinical decision-making and reducing the risk of errors in nursing practice (Mu'minah & Hariyati, 2022).

In Indonesia, dashboard implementation has shown progress in supporting patient monitoring and clinical decision-making (Sekarini et al., 2025). The use of digital dashboards improves monitoring effectiveness and enhances the efficiency of clinical processes (Sekarini et al., 2025). The implementation of CDSS also supports the accuracy of nursing interventions and improves the quality of nursing care (Mu'minah & Hariyati, 2022). However, the implementation of nursing dashboards still faces challenges related to system integration, data quality, and user utilization levels (Khairat et al., 2022). Misalignment between the system and clinical workflow remains a barrier to optimizing dashboard utilization (Khairat et al., 2022). Inadequate organizational support also affects the sustainability of digital system implementation (Khairat et al., 2022).

Hospital A Tangerang has the opportunity to further develop a nursing care dashboard as a more effective clinical decision support tool. The existing system utilization still requires strategic analysis of internal and external factors influencing its development. Such analysis is important to support improvements in data-based nursing service quality (Mu'minah & Hariyati, 2022). This report aims to analyze the development of a dashboard-based nursing system through SWOT, IFE, EFE, IE, and TOWS approaches. Strategic analysis is used to identify the organization's strategic position and formulate system development recommendations. The findings are expected to support continuous improvement in the quality of nursing services.

METHOD

This study employed a case report approach with exploratory stages to obtain an in-depth understanding of the implementation of a nursing care dashboard system in supporting clinical decision-making (Gagnier et al., 2013). The case report approach was selected because it enables comprehensive exploration of phenomena within real healthcare service contexts and explains the interaction between systems, work processes, and organizational environments (Yin, 2018). This approach was used to support contextual analysis of system development and strategy formulation in nursing management practice. The study was conducted at Hospital A Tangerang, which has implemented a nursing care dashboard as part of its Clinical Decision Support System (CDSS). The focus of the study was to analyze system development in supporting data-driven clinical decision-making (Coiera et al., 2024). The respondents in this study consisted of 20 participants, including 10 nurse managers and 10 staff nurses working in inpatient units. Participants were selected purposively based on their involvement in the implementation and utilization of the nursing dashboard system.

Data collection was conducted through observations, Focus Group Discussions (FGDs), interviews, and secondary data reviews to obtain relevant information and support triangulation of findings. The FGDs were conducted separately with nurse managers and staff nurses to explore experiences, perceptions, and challenges related to the implementation of the nursing care dashboard system in clinical practice. The data were analyzed using SWOT analysis, followed by evaluation through the Internal Factor Evaluation (IFE), External Factor Evaluation (EFE), and Internal-External (IE) matrices to determine the organization's strategic position (Ayuningtyas, 2022). Development strategies were formulated using the TOWS matrix and translated into performance indicators through the Balanced Scorecard approach (Tufanaru et al., 2024; Kwon & Lee, 2024). All research ethics processes were conducted in accordance with research principles, including data confidentiality and approval from hospital management authorities (Sarikose & Celik, 2024).

RESULT

Hospital A is a Type C hospital with a capacity of 199 beds and has achieved plenary accreditation status. The hospital has evolved from a maternal and child hospital into a general hospital,

accompanied by service expansion and the strengthening of specialized healthcare services. Digital transformation at the hospital began through the implementation of electronic medical records. This development was followed by the implementation of a nursing care dashboard as a clinical decision support tool. The utilization of the dashboard remains in the strengthening phase; However, it is supported by the readiness of nursing human resources and continuous competency development programs. Strategic analysis was conducted using SWOT analysis, followed by the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices to identify strategic factors and determine the organization's strategic position through the Internal-External (IE) matrix. The following section presents the results of the study conducted at Hospital A Tangerang.

Table 1.
SWOT Analysis of the Development of a Nursing Care Dashboard System as a Clinical Decision Support Tool

Strengths	WEAKNESS
1. Availability of patient data integrated in the hospital information system (SIMRS). 2. Having highly qualified nursing human resources (100% Nurses), supported by 6 Specialist Nurses, 4 Nurses in specialist education, as well as 3. The unit coordinator holds a Master's degree (S2) as a driver of quality improvement and service development. 4. Management's strategic commitment to digital transformation	1. The dashboard does not yet fully support predictive clinical analysis. 2. The dashboard has not been integrated with the clinical pathway system or evidence-based guidelines. 3. There is no integrated performance indicator in the dashboard system 4. New nursing human resources are not yet optimal in mastering the use of the nursing care dashboard.
OPPORTUNITIES	**THREATS**
1. Government policy support for digital transformation of health 2. Hospital accreditation standards emphasize patient safety and electronic-based documentation. 3. Opportunities to reduce adverse events through dashboard-based monitoring 4. The development of information technology (AI, data analytics, HIS-EMR integration) allows for increased accuracy in clinical nursing decision-making.	1. Competition from other hospitals that are more advanced in digital health and smart hospitals 2. Dependence on third parties 3. Dynamic changes in government regulations regarding health data and digitalization 4. Very rapid technological development (rapid technological change)

The SWOT analysis shows that the organization has strengths in SIMRS integration, human resource competency, and management support for digital transformation. However, weaknesses remain in the limited dashboard, system integration, performance indicators, and human resource utilization. External opportunities can be identified by digitalization policies, accreditation standards, and technological developments, while threats include competition, regulatory changes, and technological dependency. Overall, these conditions demonstrate the need for strategies to strengthen digital systems and human resource capacity to support improved nursing service quality.

The EFE Matrix, with a total score of 3.06, indicates the organization has a strong ability to respond to external factors. Key opportunities stem from digital policy support, accreditation standards, and technological developments, while key threats include competition, regulatory changes, and technological dependency. These results demonstrate the organization's strong position to capitalize on opportunities and address external challenges.

Table 2.
EFE Matrix for the Development of a Nursing System Based on a Nursing Care Dashboard to Support Clinical Decisions

No	Critical Opportunity Factors	Weight	Scale (1-4)	(Weight) x (Scale)
1	Government policy support for digital transformation of health	0.14	3	0.56
2	Hospital accreditation standards emphasize patient safety and electronic-based documentation.	0.14	3	0.56
3	Opportunities to reduce adverse events through dashboard-based monitoring	0.12	4	0.36
4	The development of information technology (AI, data analytics, HIS-EMR integration) allows for increased accuracy in clinical nursing decision-making.	0.12	4	0.48
			Opportunity Factor Score:	1.96
No	Critical Challenge Factors	Weight	Scale (1-4)	(Weight) x (Scale)
1	Competition from other hospitals that are more advanced in digital health and smart hospitals	0.14	3	0.42
2	Dependence on third parties	0.11	2	0.22
3	Dynamic changes in government regulations regarding health data and digitalization	0.12	2	0.24
4	Very rapid technological development (rapid technological change)	0.11	2	0.22
			Challenge Factor Score	1.1
			Total EFE Score:	3.06

Table 3.
IFE Matrix for the Development of a Nursing System Based on a Nursing Care Dashboard to Support Clinical Decisions at Hospital A Tangerang

No	Critical Strength Factor	Weight	Scale (1-4)	(Weight) x (Scale)
1	Availability of patient data integrated in the hospital information system (SIMRS).	0.14	3	0.56
2	Having highly qualified nursing human resources (100% Nurses), supported by 6 Specialist Nurses, 4 Nurses in specialist education, and a unit coordinator with a Masters degree (S2) as a driver of quality improvement and service development.	0.14	4	0.56
3	The hospital has implemented a digital-based nursing care dashboard.	0.12	3	0.36
4	Management's strategic commitment to digital transformation	0.10	4	0.40
			Strength Factor Score:	1.88
No	Critical Weakness Factors	Weight	Scale (1-4)	(Weight)x (Scale)
1	The dashboard does not yet fully support predictive clinical analysis.	0.13	2	0.26
2	The dashboard has not been integrated with the clinical pathway system or evidence-based guidelines.	0.12	2	0.24
3	There is no integrated performance indicator in the dashboard system	0.13	2	0.26
4	New nursing human resources are not yet optimal in mastering the use of the nursing care dashboard.	0.12	2	0.24
			Weakness Factor Score	1.0
			Total IFE Score:	2.88

The IFE Matrix showed a total score of 2.88, indicating the organization's internal conditions are in the moderately strong category. Key strengths are supported by SIMRS integration, HR competency, dashboard implementation, and commitment to digital transformation. However, weaknesses remain in dashboard feature development, system integration, performance indicators,

and HR capacity. These results indicate the organization has sufficient internal capital to support the development of a dashboard-based nursing system.fter analyzing external and internal factors, the next step is to determine the hospital's position on the Internal-External (IE) matrix to ensure that the strategy is targeted appropriately and appropriately aligns with the existing conditions and situation. The analysis of external and internal factors creates four quadrants, each with its own strategy formulation.

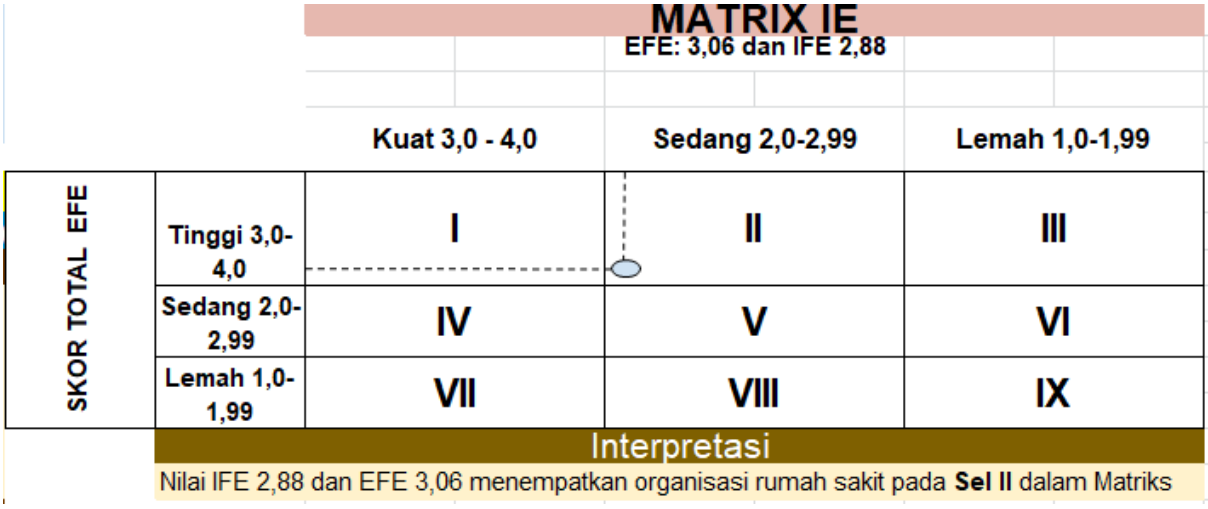

Figure 1. IE Matrix for the Development of a Nursing System Based on a Nursing Care Dashboard to Support Clinical Decisions at Hospital A Tangerang

Table 4.
TOWS Matrix for the Development of a Nursing System Based on a Nursing Care Dashboard to Support Clinical Decisions

Internal/External Factors	Strengths (S)	Weakness (W)
Opportunities (O)	1. Development of SIMRS data-based analytical dashboard for nursing decisions. 2. Utilization of nurse competencies in the use of data-based dashboards. 3. Optimizing the dashboard to improve the accuracy of nurses' clinical decisions.	1. Dashboard integration with evidence-based clinical pathways for nursing decisions. 2. Development of predictive features for patient risk detection by nurses. 3. Integration of nursing performance indicators in the dashboard.
Threats (T)	1. Strengthening dashboard usage through SOPs and periodic evaluations 2. Improving nurses' digital competence in using dashboards 3. Development of a phased system to support nursing decisions	1. Strengthening dashboard data quality for nurses' clinical decisions. 2. Improving nurses' readiness in adapting to health technology. 3. Increasing the use of dashboards in nursing clinical practice.

Based on the IE matrix of Hospital A, it shows that the Hospital's *Strategic Business Unit (SBU) with an EFE score of 3.06 and an IFE score of 2.88 is in cell II, which can be described as Grow and Build.* The appropriate strategy for this SBU is an intensive strategy in the form of *market penetration, market development,* and *product development* ; and an integrative strategy in the form of *backward integration, forward integration,* and *horizontal integration* (Ayuningtyas, 2022). Based on the analysis of internal and external factors identified through SWOT analysis and the organization's position in the IE Matrix, a strategy was formulated using the TOWS Matrix. This

strategy was tailored to the conditions of the nursing system based on the nursing care dashboard to support clinical decision-making at Hospital A Tangerang.

The TOWS Matrix analysis results presented in the results section indicate that the dashboard-based nursing system development strategy focuses on optimizing internal strengths to capitalize on external opportunities and improving weaknesses to address various challenges. This strategy is then translated into performance indicators through a Balanced Scorecard approach to support more effective clinical decision-making.

Table 5.
Balanced Scorecard Dashboard for Nursing System Development Based on the Nursing Care Dashboard in Supporting Clinical Decisions at Hospital A Tangerang

Perspective	Strategic Objectives	KPI	Target	KPI Owner
Financial	Optimizing investment in nursing dashboard development	Percentage of system development budget realization	≥ 90% per year	Finance Manager
	Digital-based operational cost efficiency	Reduction in operational costs related to manual documentation	≥ 20%	Finance & IT Manager
	Increasing ROI of digital systems	Return on Investment (ROI) dashboard system	Positive in 2 years	Directors & Finance
Customer (Patient)	Improving patient safety	Decrease in the number of adverse events	↓ ≥ 30%	Head of Nursing Division
	Improving the quality of nursing services	Patient satisfaction index	≥ 85%	Hospital Quality Team
	Faster clinical response	Nurse response time to patient condition	≤ 5 minutes	Head of Room
Internal Process	Optimizing the use of nursing dashboards	Percentage of dashboard usage by nurses	≥ 90%	Head of Nursing Division
	System integration with clinical pathway	Percentage of dashboard integration with clinical guidelines	≥ 80%	IT Team & Nursing Committee
	Predictive-based dashboard development	Availability of predictive analytics features	Implementation of ≥ 1 feature	IT Team
	Monitoring and evaluation system	Dashboard evaluation frequency	Minimum 1x per month	Quality & IT Team
Learning & Growth	Improving digital competence of human resources	Percentage of trained nurses dashboard	≥ 100%	Hospital Training
	Strengthening digital culture	Level of technology adoption by nurses	≥ 90%	Head of Nursing Division
	Nursing system innovation	Number of dashboard innovations/developments	≥ 2 innovations/year	IT & Nursing Team
	HR satisfaction with the system	Dashboard user satisfaction index	≥ 85%	HR Team

The Balanced Scorecard demonstrates a nursing care dashboard development strategy focused on four perspectives. From the financial perspective, the strategy focuses on optimizing investment, operational efficiency, and increasing the return on investment of digital systems. From the customer perspective, the focus is on improving patient safety, service quality, and faster clinical response. From the internal process perspective, the strategy includes optimizing dashboard usage, integrating with clinical pathways, developing predictive features, and conducting regular monitoring and evaluation. Meanwhile, from the learning and growth perspective, the focus is on

improving human resources' digital competency, strengthening digital culture, system innovation, and dashboard user satisfaction. Overall, the Balanced Scorecard demonstrates an integrated strategic direction to support service quality and data-driven clinical decision-making.

DISCUSSION

The analysis results indicate that the organization is positioned in the “grow and build” category, suggesting that the development of a dashboard-based nursing system is supported by both internal strengths and external opportunities. The integration of the Hospital Management Information System (HMIS), nursing competencies, and management commitment serves as strategic capital for the development of digital healthcare systems. These findings are consistent with the concept of nursing information systems, which emphasizes system integration and user readiness as critical factors for the successful implementation of nursing technology (Nurbaeti & Hariyati, 2023). Similar findings were also reported by Chen et al. (2025), who emphasized that digital decision-support systems improve nursing workflow efficiency and support managerial decision-making processes.

The identified weaknesses, including limited predictive analytics, suboptimal integration with clinical pathways, and the lack of integrated performance indicators, indicate the need to strengthen system functions. These conditions support TOWS strategies focused on dashboard optimization and system integration enhancement. This finding aligns with the concept of Clinical Decision Support Systems (CDSS), which highlights decision support and data integration quality as essential components of effective clinical digital systems (Mu'minah & Hariyati, 2022). Tsan et al. (2024) also reported that CDSS implementation in nursing documentation significantly improves data accuracy and supports evidence-based nursing interventions.

The high EFE score indicates that the organization has significant opportunities to leverage digital policy support, accreditation standards, and technological advancements. This condition supports intensive strategies through system development and the strengthening of digital innovation. These findings are relevant to the concept of strategic healthcare management, which emphasizes organizational growth through innovation adaptation and responsiveness to external environmental changes (Ayuningtyas, 2022). Furthermore, Cato et al. (2026) explained that nursing digital platforms contribute to leadership effectiveness and organizational responsiveness in healthcare service management.

The Balanced Scorecard approach demonstrates the relationship between strategies and performance indicators through financial, customer, internal process, and learning and growth perspectives. From the financial perspective, benefits are reflected in documentation efficiency and optimization of digital system investments. These findings are consistent with studies reporting that nursing information systems improve work process efficiency (Nurbaeti & Hariyati, 2023). Other studies also report that clinical dashboards contribute to operational efficiency and reduce process duplication (Khairat et al., 2022). Mozzarelli et al. (2024) additionally highlighted that the Balanced Scorecard model supports the measurement of nursing management competencies and organizational performance sustainability.

The customer perspective focuses on patient safety, response time, and the quality of nursing care. The utilization of Clinical Decision Support Systems supports the accuracy of nursing interventions and data-driven clinical decision-making (Mu'minah & Hariyati, 2022). Dashboard utilization also enables real-time patient monitoring and accelerates clinical responses (Tufanaru et al., 2024). Improvements in healthcare service quality contribute to higher patient satisfaction as an important healthcare performance indicator (Hants et al., 2023). Rachmawaty et al. (2025) also found that integrated clinical pathway-based nursing systems improve patient outcomes, patient satisfaction, and healthcare cost efficiency.

The internal process perspective emphasizes the importance of integrating dashboards with clinical pathways, system monitoring, and predictive feature development. Nursing information systems support work process effectiveness and facilitate data utilization in clinical decision-making (Nurbaeti & Hariyati, 2023). The integration of clinical dashboards also improves service coordination and the quality of clinical decisions (Coiera et al., 2024). Furthermore, the development of predictive features is essential to improve anticipation of patient clinical risks (Newton et al., 2025). Chen et al. (2025) further emphasized that predictive analytics integrated into nursing systems enhances early detection of patient deterioration and improves response accuracy.

The learning and growth perspective highlights the importance of digital competencies, training programs, and human resource readiness. Competency development through continuous learning supports organizational readiness for system implementation changes (Ardian & Hariyati, 2017). Technology adoption levels are also influenced by experience, training, and organizational support (Hill et al., 2024). These findings support the importance of competency development indicators within dashboard implementation strategies. Cato et al. (2026) also stated that ongoing digital competency training is essential to optimize healthcare technology utilization among nursing staff and nurse managers.

The translation of strategies into Key Performance Indicators (KPIs) strengthens implementation by making it operational and measurable. Dashboard utilization rates, reductions in adverse events, and system evaluations are important indicators for assessing implementation success (Kwon & Lee, 2024). Clinical decision support-based systems have also been reported to contribute to improvements in patient safety and nursing service efficiency (Sarikose & Celik, 2024). In addition, Mozzarelli et al. (2024) demonstrated that measurable performance indicators are necessary to evaluate managerial effectiveness and organizational quality improvement initiatives.

Overall, the integration of SWOT, IE, TOWS, and Balanced Scorecard analyses demonstrates that the development of a nursing care dashboard has the potential to become a digital transformation strategy that supports clinical decision-making and improves the quality of nursing services. The resulting strategies are not only conceptual but also operational and measurable. This synthesis reinforces the relevance of dashboard development based on organizational strategies and nursing evidence to support the sustainability of digital transformation in nursing services. Findings from recent studies by Chen et al. (2025), Cato et al. (2026), and Rachmawaty et al. (2025) further strengthen the evidence that integrated nursing dashboard systems contribute positively to organizational performance, patient outcomes, and healthcare service quality.

CONCLUSION

Based on the SWOT, IFE, EFE, IE matrix, TOWS analysis, as well as the implementation of the Balanced Scorecard and Key Performance Indicators (KPIs), the development of a dashboard-based nursing care system has the potential to support clinical decision-making, improve service quality, and strengthen patient safety at Hospital A Tangerang. The organization's position within the “growth and build” quadrant indicates that continuous system development strategies are aligned with the hospital's internal and external conditions.

The organization's primary strengths lie in data integration, human resource competencies, and management commitment, while aspects requiring further improvement include dashboard analytical features, integration with clinical pathways, and integrated performance indicators. The resulting strategies emphasize system optimization, strengthening digital competencies, and dashboard integration through measurable and operational approaches. Overall, the nursing care dashboard has the potential to become a digital transformation strategy that supports clinical decision-making and continuously improves the quality of nursing services at Hospital A Tangerang.

REFERENCES

Ardian, P., & Hariyati, RTS (2017). Continuing nursing education through the implementation of case reflection discussions (CRD): Pilot study. Holistic Health Journal, 11 (4), 234–241. (Verify the volume, issue, and page numbers according to the final article you are using)

Ayuningtyas, D. (2022). Strategic management of health service organizations . Jakarta: Rajawali Pers.

Cato et al. A Nursing Clinical Care Services Platform to Support Leadership Decision Making Cato, K., Duarte, S., Tickner, M., Higgins, T., McCabe, M., & Curley, M. A. Q. (2026). A nursing clinical care services platform to support leadership decision making. Studies in Health Technology and Informatics, 315. https://doi.org/10.3233/SHTI240193

Chen et al. Deep Learning-Based Decision Support System for Nurse Staff in Hospitals Chen, J., He, F., Tang, L., & Gu, L. (2025). Deep learning-based decision support system for nurse staff in hospitals. Big Data, 13(2). https://doi.org/10.1089/big.2024.0122

Coiera, E., et al. (2024). Clinical decision support systems: Theory and practice in healthcare. Journal of Medical Systems , 48(2), 1–12.

Gagnier, J. J., Kienle, G., Altman, D. G., Moher, D., Sox, H., & Riley, D. (2013). The CARE guidelines: Consensus-based clinical case reporting guideline development. Journal of Clinical Epidemiology, 67 (1), 46–51. https://doi.org/10.1016/j.jclinepi.2013.08.003

Hants, A., et al. (2023). The role of nursing documentation and decision support systems in improving care quality. International Journal of Nursing Practice , 29(4), e13145.

Hill, A.M., et al. (2024). Digital competency and technology adoption among healthcare professionals. BMC Health Services Research , 24, 112.

Khairat, S., et al. (2022). Clinical dashboards and their impact on patient safety and quality of care. Journal of the American Medical Informatics Association , 29(3), 450–458.

Kwon, S., & Lee, J. (2024). Performance measurement and data-driven decision-making in healthcare organizations. Healthcare Management Review , 49(1), 25–34.

Mozzarelli et al. Mapping Ward Managers' Core Competencies Using the Balanced Scorecard Model Mozzarelli, F., Catinella, A., & Tuccio, C. (2024). Mapping ward managers' core competencies using the Balanced Scorecard model. Nursing Management, 31(4), 29–34. https://doi.org/10.7748/nm.2024.e2107

Mu'minah, & Hariyati, RTS (2022). Clinical decision support system in nursing. Muhammadiyah Nursing Journal, 7 (2), 171–175.

Newton, S., et al. (2025). Artificial intelligence and predictive analytics in healthcare decision-making. Health Informatics Journal , 31(1), 1–12.

Nurbaeti, RF, & Hariyati, RTS (2023). Nursing information system in health services. Journal of Telenursing (JOTING), 5 (1), 1438–1445. https://doi.org/10.31539/joting.v5i1.5072

Rachmawaty et al. Exploring Patient's Clinical Outcomes, Hospital Costs, and Satisfaction After the Implementation of Integrated Clinical Pathway-Based Nursing Practice Model Rachmawaty, R., Wahyudin, E., & Bukhari, A. (2025). Exploring patient's clinical outcomes, hospital costs, and satisfaction after the implementation of integrated clinical pathway-based nursing practice model. Cost Effectiveness and Resource Allocation, 23(38). https://doi.org/10.1186/s12962-025-00645-5

Sarikose, S., & Celik, S. (2024). The impact of clinical decision support systems on patient safety and nursing efficiency. Nurse Education Today , 134, 105456.

Sekarini, R., et al. (2025). Implementation of digital dashboard systems in Indonesian healthcare services. Journal of Health Services Management , 28(1), 15–24.

Tsan et al. Effectiveness of Using Clinical Decision Support System in Nursing Records Tsan, C.-Y., Tsai, C.-M., & Wang, Y.-C. (2024). Effectiveness of using clinical decision support system in nursing records. Studies in Health Technology and Informatics, 315, 655–656. https://doi.org/10.3233/SHTI240264

Tufanaru, C., et al. (2024). The effectiveness of clinical dashboards in improving healthcare outcomes. International Journal of Medical Informatics , 178, 105207.

Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). SAGE Publications.