Original Article

Association Between Nurses' Compliance With Adult Early Warning Score Implementation and Inpatient Survival: A Cross-Sectional Study

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ABSTRACT

Background: The adult Early Warning Score (EWS) is an essential instrument for early detection of a patient's deteriorating clinical condition. However, the effectiveness of EWS depends on nurses' compliance with its implementation. Non-compliance with EWS implementation can hinder early detection of patients' conditions and affect patient survival. This study aims to analyze the relationship between adult EWS implementation compliance and inpatient survival status. However, the evidence on the effect of compliance with EWS implementation on patient survival in real inpatient settings remains limited. This study aimed to examine the association between nurses' compliance with adult EWS implementation and inpatient survival status.

Methods: This study used an observational, cross-sectional design and was reported according to the STROBE guidelines. The research sample comprised 188 patients selected using a phased sampling technique (cluster sampling followed by simple random sampling). Data were obtained from the medical records of inpatients who met the inclusion and exclusion criteria. The independent variable in this study was compliance with the Early Warning System (EWS), while the dependent variable was the patient's survival status. Statistical analysis was carried out using Fisher's Exact test.

Results: A total of 188 patients were analyzed, with 173 patients (92%) surviving and 15 patients (8%) dying. In the group that did not comply with the Early Warning System (EWS), there were 6 deaths (16.7%) and 30 patients survived (83.3%), while in the group that did comply with the Early Warning System (EWS), there were 9 deaths (5.9%) and 143 patients survived (94.1%). There was a significant association between EWS compliance and inpatient survival status ($p = 0.044$). Patients with EWS adherence had a higher chance of survival than non-compliant patients (OR = 3.18; 95% CI: 1.06–9.54).

Conclusion: The implementation of EWS that is compliant plays an essential role in detecting early deterioration of patient conditions and improving patient survival and safety.

Keywords: Early Warning Score; Inpatients; Mortality; Nursing Assessment; Patient Compliance.

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Implications for Practice:

- The findings can inform clinical practice by supporting the integration of routine screening and individualized management strategies for patients, enabling healthcare providers to monitor relevant clinical indicators better and improve patient-centered outcomes.
- The results can guide health policy by encouraging the development of standardized protocols and resource allocation strategies that strengthen continuity of care and promote more consistent implementation of evidence-based interventions across healthcare facilities.
- The findings are particularly relevant for Midwifery education and practice in Low- and Middle-Income Countries with resource-constrained settings, where incorporating these insights into curricula and training programs can enhance competency, optimize service delivery, and support context-appropriate care.

Introduction

Worsening clinical conditions in inpatients are a global problem that contributes significantly to increased morbidity and mortality. Globally, the inpatient mortality rate is reported to range from 2.17% to 2.34% of the hospital patient population. In addition, most critical events, such as cardiac arrest, are preceded by changes in physiological parameters that occur 6–24 hours prior to the event, but are often not detected or treated in a timely manner (Jayasundera et al., 2018).

The Early Warning Score (EWS) is a tool designed to support clinical decision-making in managing and detecting worsening patient conditions (Tomas et al., 2024). EWS performs physiological measurements, including pulse, blood pressure, and respiratory rate (Mourik et al., 2023). EWS is a category of interventions used to identify patients with worsening conditions and prevent adverse outcomes (Jeppestøl & Kirkevold, 2022; Langkjaer et al., 2021). Nurses play an essential role in implementing EWS (Bassin et al., 2020). Nurses have a responsibility to assess early signs of a patient's deteriorating condition, vital signs, and to initiate an appropriate first aid response (Burke & Conway, 2023). The effective use of EWS requires proper training and education; this has been proven to increase trust and compliance in carrying out EWS actions (David et al., 2023). In addition, the consistent implementation of EWS can be supported by the use of standard protocols and electronic devices (Ismail et al., 2025).

The implementation of EWS is associated with earlier detection of worsening patient conditions, increased confidence, and improved communication among professionals (Smith et al., 2022). The implementation of EWS can reduce unplanned ICU admissions, overall morbidity, and rapid response team calls (Durantez-Fernández et al., 2021). However, the need for training, delayed response times, and cultural changes in the care environment are challenges that need to be addressed (Langkjaer et al., 2023). Implementing EWS requires a comprehensive approach that includes stakeholder support, practical training, compliance accountability, and real-time monitoring (Nagarajah et al., 2022). The collaboration of various health professionals, including doctors and nurses, also supports the successful implementation as a timely response and in accordance with the patient's condition (Oanesa et al., 2024). Integration between medical records and EWS can directly increase its effectiveness (Ede et al., 2020).

Although EWS has been widely adopted, there is still a lack of a comprehensive understanding of its accuracy in clinical practice (Castro-Portillo et al., 2025). For example, although EWS has shown its effectiveness, specific areas such as cancer, respiratory infections, and cell transplantation remain underexplored

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(Hwang & Kim, 2022). There have been no studies focusing on the long-term effects of EWS implementation; most remain focused on the short term (Albutt et al., 2022). Thus, there remains limited information on the long-term impact of EWS on patient outcomes. This gap underscores the need for longitudinal studies to assess the ongoing effectiveness of EWS implementation in improving patient survival.

This research is necessary because the adult Early Warning Score (EWS) is designed as an early detection tool for systematically identifying worsening inpatient conditions. In clinical practice, nurses play an essential role in implementing EWS by regularly documenting and monitoring patients' physiological parameters. Inaccuracies in the implementation of adult EWS can delay the recognition of critical conditions. Theoretically, EWS is included in the clinical deterioration framework and patient safety model as an early warning tool that helps healthcare workers systematically evaluate the patient's physiological condition. The tool relies on routine monitoring of vital parameters; an increased score indicates a potential worsening, which triggers clinical escalation and interventions. Thus, compliance with EWS implementation improves early detection of clinical changes, enabling faster, more appropriate interventions, which, in turn, can improve the chances of patient survival. Non-compliance or variations in compliance in monitoring and response to scores can lead to delays in deterioration detection and suboptimal responses (Hao et al., 2020).

This context is key especially in low- and middle-income countries (LMICs), where resource constraints, high workloads of health workers, and gaps in clinical training can affect the full and consistent implementation of EWS. Recent evidence suggests that EWS performance in LMIC settings tends to be heterogeneous and highly context-dependent, with implementation still lacking and often based on statistical simulations rather than real implementation studies. Based on these gaps, this study aims to analyze the relationship between nurses' compliance with Early Warning Score (EWS) implementation and the survival status of adult patients in the inpatient setting, with the hope of filling empirical evidence gaps on how compliance with EWS protocols affects measurable and relevant clinical outcomes, as well as providing stronger implementation recommendations in hospital settings (Ulica et al., 2026).

Thus, understanding the relationship between EWS implementation and patient survival status is important as part of efforts to improve patient safety in the inpatient setting. This study offers an approach that focuses on the relationship between EWS implementation and inpatient survival status, using indicators that reflect clinical outcomes between life and Death. This approach emphasizes prediction and risk, providing insight into the relevance of EWS in nursing practice. In addition, this research provides hospital management with a basis for improving compliance and consistency in implementing EWS as part of patient safety, as well as for evaluating the implementation of adult EWS. This study aims to analyze the relationship between the implementation of the Early Warning Score in adults and inpatient survival status.

Methods

Study Design

This study employed a quantitative observational design with a cross-sectional approach, reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparency and reproducibility. The cross-sectional design was chosen to assess

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the relationship between compliance with the Early Warning Score (EWS) and inpatient survival status among adult patients.

Participants

The study was conducted at Dr. Soedirman Hospital in Kebumen, Indonesia, focusing on adult acute inpatient wards. The target population comprised all medical records of adult patients discharged between January 1, 2022, and December 31, 2023, totaling 18,949 records. The minimum sample size for this correlational study was calculated using G*Power software, assuming a moderate effect size (r = 0.30), a significance level (α) of 0.05, and a statistical power (1−β) of 0.80, which yielded a required minimum of 84 participants. To ensure population representativeness and account for sampling variability, the Slovin formula was also applied, resulting in a final sample size of 188 respondents. The final sample size exceeded the minimum requirement from the power analysis and was considered adequate to detect the relationship between the study variables. A multistage sampling technique was used, involving two sequential methods: cluster sampling and simple random sampling. In the cluster sampling stage, based on ward location, the adult inpatient units were grouped into five clusters, namely Arumbinang, Cempaka, Dahlia, Kenanga, and Teratai, each representing a specific ward in the adult acute care setting, with an equal allocation of 37 respondents per cluster (188 total respondents divided by 5 clusters). In the simple random sampling stage, individual patient records within each cluster were randomly selected and screened against inclusion and exclusion criteria to ensure eligibility. Records were included if they had clear, identifiable medical record documentation, a discharge date between January–December 2022 and January–December 2023, and patients aged 18 years or older. Records were excluded if they had a length of stay of less than 24 hours, were obstetric cases, or involved transfer to the intensive care unit (ICU) during the same hospitalization. Of the 210 medical records initially selected, 22 were excluded due to incomplete documentation or because they met exclusion criteria, such as ICU transfer, obstetric care, or insufficient length of stay. The final analytical sample comprised 188 records, all of which met the inclusion criteria and were included in the statistical analysis.

Instruments

The instruments used in this study consisted of a Demographic Data Sheet and an Early Warning Score (EWS) Observation Sheet. The researchers developed the Demographic Data Sheet to collect patient information from medical records, including initials, age, medical record number, date of birth, sex, ward or room, admission and discharge dates, and comorbidities. This sheet served as background variables and was developed in consultation with experts from the Resuscitation Team and the Training Department of Dr. Soedirman Hospital, Kebumen, Indonesia, to ensure content relevance and clarity. The Early Warning Score (EWS) Observation Sheet was also designed and developed by the researchers to assess nurses' compliance with EWS implementation. In this study, the independent variable was nurse compliance with EWS implementation, measured using a structured checklist based on the hospital's EWS protocol, which included assessing vital signs, calculating the EWS score, and executing escalation procedures when indicated.

In contrast, the dependent variable was patient survival status at discharge (alive or deceased). Compliance was scored dichotomously: "compliant" indicated that

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all protocol steps were correctly executed, and "non-compliant" indicated that one or more steps were missed. Each patient's compliance score was calculated as the percentage of checklist items correctly completed. Both instruments were validated by three clinical experts, including resuscitation nurses and hospital quality assurance staff, to ensure content relevance and clarity, and reliability was assessed using inter-rater agreement (Cohen's kappa = 0.90), indicating high consistency between observers. The EWS observation sheet was adapted from the hospital's official EWS protocol at Dr. Soedirman Hospital.

Data Collection

Data collection was conducted between January 2022 and December 2023 at Dr. Soedirman Hospital, Kebumen, Indonesia, using secondary data obtained from patient medical records in accordance with the established inclusion and exclusion criteria. The research team first identified eligible medical records based on the following inclusion criteria: patients aged 18 years or older, a length of stay of at least 24 hours, non-obstetric cases, and no transfer to the intensive care unit (ICU). The selected records were then assigned to two trained enumerators under the supervision of the principal investigator, and data extraction was conducted using the researcher-developed Demographic Data Sheet and the Early Warning Score (EWS) Observation Sheet. The principal investigator subsequently cross-checked each record to ensure completeness and accuracy. Collected data were entered into Microsoft Excel and then imported into SPSS version 25 for statistical analysis, while all data files were stored on password-protected computers to maintain confidentiality. To ensure data quality, double-entry verification was implemented to minimize entry errors, and validation checks were performed to identify outliers and inconsistencies in key variables, including age, admission and discharge dates, and EWS scores. Missing or incomplete data were carefully documented, and records with essential missing variables required for the primary analysis were excluded; for minor missing demographic variables, no imputation was applied, and analyses were conducted using available data only to ensure transparency. All procedures were conducted in accordance with ethical standards, and patient confidentiality was strictly maintained throughout data collection and handling.

Data Analysis

Data collected from patient medical records were analyzed using SPSS version 26. Initially, descriptive statistics were performed to summarize the characteristics of the respondents, including age, sex, and comorbidities, and were presented as frequencies, percentages, means, and standard deviations, as appropriate. Missing data were carefully evaluated; records with missing values for primary variables, such as nurse compliance with EWS or patient survival status, were excluded from the analysis, while minor missing demographic information was handled using available-case analysis. Before performing inferential analysis, assumptions for categorical data were assessed. Because some cells had expected counts less than 5, the Fisher's Exact Test was selected to examine the relationship between nurse compliance with adult EWS implementation and inpatient survival status. The strength of association was quantified using Odds Ratios (ORs), with 95% confidence intervals (CIs) reported to indicate the precision of the estimates. Statistical significance was set at $p < 0.05$. All analyses were conducted in accordance with the principles of data quality and

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ethical standards, and with the STROBE guidelines for observational studies.

Ethical Considerations

This study was reviewed and approved by the Medical and Health Research Ethics Committee (MHREC) of the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Indonesia (Approval Number: KE/FK/0048/EC/2024). The research was conducted in accordance with the Declaration of Helsinki on ethical principles for medical research involving human subjects. Before data collection, the study protocol was carefully designed to ensure confidentiality and anonymity of patient information. All data obtained from medical records were coded and stored securely, with no personally identifiable information disclosed in the analysis or reporting. As this study used secondary data, the ethics committee waived informed consent, as the data were analyzed anonymously and used solely for research purposes.

Results

The demographic and clinical characteristics of the study respondents are presented in **Table 1.**

Table 1. Demographic Characteristics of Respondents (n=188)

Characteristic	Category	n (%)
Gender	Male	124 (66)
	Female	64 (34)
Age (years)	19-59 years	90 (47,9)
	>60 years	98 (52,1)
Comorbidity	Yes	172 (91,5)
	Yes	16 (8,5)
Total		188 (100)

Based on **Table 1**, most respondents were elderly (52.1%) aged 60 or older. The gender distribution is more than half (66%) male. Most of the participants had comorbidities, namely as many as (91.5%) who stated a high prevalence of the underlying condition. Furthermore, the relationship between adult Early Warning Score compliance and inpatient survival status is presented in **Table 2.**

Table 2. The relationship between adult Early Warning Score compliance and inpatient survival status

		Survival Status			P Value
		Died	Life	Total	
Compliance	Non-compliant	6 (16,7%)	30 (83,3%)	36 (100%)	0.044
	Obedient	9 (5,9%)	143 (94,1%)	152 (100%)	
Total		15 (8%)	173 (92%)	188 (100%)	

Table 2 shows the relationship between EWS caregiver compliance and inpatient survival. Of the 188 respondents, most were in the living and obedient group (173, 92%). This suggests that compliance tends to be associated with better survival status. The results of the Fisher Exact test showed a p-value of 0.044 ($p < 0.05$), indicating a significant relationship between compliance and patient survival, with compliant patients having a higher chance of survival than non-compliant patients (OR = 3.18; 95% CI: 1.06–9.54).

Discussion

The results of the study stated that more than a few nurses were in the category of complying with the application of the adult early warning score (EWS). This states that EWS has been well implemented in the inpatient room. In addition, the life category dominates in survival status. This suggests that implementing EWS can help prevent deterioration and support patient safety. The study also found that nurses' compliance with implementing EWS

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differed. These differences suggest that compliance with EWS implementation is associated with increased patient survival.

The results of the statistical test indicating a statistically significant relationship between compliance with the implementation of adult EWS and the patient's survival status. This states that implementing EWS is not only an administrative procedure but also includes nursing interventions that significantly impact patients' clinical outcomes, such as the risk of mortality during treatment.

Conceptually and physiologically, EWS functions as an early warning system for detecting patient deterioration (Park et al., 2025). Critical events often begin with subtle changes in vital signs, and systematic EWS assessment enables timely recognition of these changes (Cruz-Bello, 2023). Early detection allows for prompt interventions, such as enhanced monitoring, timely collaboration with physicians, or medical interventions, which can improve patient survival (Markey et al., 2025).

However, the presence of deaths in the compliant group shows that the implementation of EWS is not entirely sufficient in preventing patient Death. This indicates that other factors play a role in influencing the patient's survival, such as the presence of comorbidities, severity, age, and speed, as well as the accuracy of nurses responding to increased Ews scores (Ede et al., 2025; Martín et al., 2021; Nima et al., 2019). Previous research has shown that the success of EWS does not depend solely on the scoring process but also on prompt, precise follow-up after the score is identified (Badr et al., 2021; Balshi et al., 2022; Hwang & Chin, 2020).

In addition, nurses' compliance in implementing EWS is related to the timeliness of measurements, consistency in escalation and reporting, and the accuracy of recording, not only to scoring (Eddahchouri et al., 2021; Briscoe. Non-compliance with EWS implementation can reduce its effectiveness as an early warning system (Flenady et al., 2020). Thus, the results of this study highlight the importance of continuous training for nurses, strengthening the culture of patient safety, and supervising the implementation of operational standards for EWS procedures in hospitals.

Overall, this study supports the conclusion that adherence to adult EWS implementation is significantly associated with inpatient survival status. The implementation of EWS has the potential to reduce patient mortality in the inpatient setting if carried out consistently and accompanied by adequate clinical response. The results of this study are expected to serve as a basis for hospitals in their efforts to improve patient safety and service quality by enhancing EWS absorption.

Implications and limitations

The results of this study contribute to the development of nursing science by examining the role of adult EWS implementation compliance in patient survival status. The results of this study strengthen the evidence that EWS is part of an early warning system, not just a physiological monitoring tool. Scientifically, this study's findings underscore the importance of integrating EWS for early detection of patient deterioration. The limitations of this study include its small sample size and study location, which limit the representativeness of the respondents. In addition, the use of secondary data can introduce limitations in recording accuracy and completeness, thereby affecting the assessment of nurse compliance. Therefore, further research is recommended, using larger sample sizes, conducted across several hospitals, and combining secondary medical record data with direct observation to improve data quality and accuracy.

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Relevance to Practice

Consistent implementation of Early Warning System (EWS) compliance can improve early detection of worsening patient conditions and support patient safety through evidence-based nursing interventions. These findings also reinforce the importance of updating hospital protocols, particularly by strengthening EWS compliance monitoring systems and clarifying clinical escalation procedures. In addition, the EWS implementation strategy can be adapted to various service settings, including environments with limited resources, to optimize patient outcomes efficiently and sustainably.

Conclusion

This study concludes that compliance with the implementation of the Early Warning Score (EWS) for adults is associated with inpatient survival status. Effective EWS implementation plays an essential role in enabling early emergency detection and appropriate clinical decision-making, thereby improving patient safety. Therefore, the consistent and standardized implementation of EWS should be a significant concern for nursing practices and health care systems.

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CrediT Authorship Contributions Statement

Novia Faizatiwahida: Conceptualization, Methodology, Investigation, Data Curation, Writing – Original Draft.
Viky Noviani Hemu: Investigation, Data Curation, Formal Analysis, Writing – Original Draft.
Rondhianto: Methodology, Validation, Formal Analysis, Supervision, Writing – Review & Editing.
Baskoro Setioputro: Conceptualization, Supervision, Writing – Review & Editing.
Rismawan Adi Yunanto: Validation, Resources, Writing – Review & Editing.
Ruris Haristiani: Visualization, Data Curation, Writing – Review & Editing.
Superzeki Zaidatul Fadilah: Project Administration, Resources, Funding Acquisition, Writing – Review & Editing.

Conflicts of Interest

There is no conflict of interest.

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