

**Knowledge, Compliance and Attitude towards Early Warning Signs Documentation during Triaging at a Private Hospital in Kuala Lumpur, Malaysia**

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**Abstract**

Knowledge, compliance, and attitude toward assessing and documenting Early Warning Signs (EWS) are critical for emergency department patients, influencing triage and immediate treatment planning. Despite the importance of EWS in hospital settings, limited research exists on nursing documentation of EWS in electronic medical records (EMR). Inadequate EWS documentation can compromise the accuracy of patient assessments, delay the activation of the Rapid Response Team (RRT), and increase the risk of adverse events. This study aims to evaluate the impact of EWS training on knowledge, attitude, and compliance among nurses in the Emergency Department. A quantitative, quasi-experimental design pre-post intervention design was used in this study. The study was conducted in a private hospital's Accident and Emergency Department in the Klang Valley. All staff nurses in the department were recruited using total sampling. A researcher developed a questionnaire assessed nurses' knowledge and attitudes toward EWS documentation, while a retrospective audit was conducted to measure compliance with EWS. Pre-training, 16 nurses (80.0%) demonstrated good knowledge of EWS, which increased to 18 nurses (90.0%) post-training. All respondents (100.0%, n=20) exhibited a positive attitude toward EWS pre and post-training. Regarding compliance, 15 nurses (75.0%) adhered to EWS documentation pre-training, which improved to 19 nurses (95.0%) post-training. The findings highlight that Emergency nurses possess strong knowledge and positive attitudes toward EWS documentation. Training effectively increased compliance with EWS documentation. Ongoing training sessions and regular audits should be implemented to ensure continuous compliance and quality improvement in EWS documentation among staff nurses.

**Keywords** Triage, Early Warning Signs, Compliance, patient safety, Emergency Department, Inpatient mortality

**1. Introduction**

Patient safety remains paramount in healthcare, particularly in the Accident and Emergency Department (AED), where patients require prompt, accurate, and effective management (Badr, Khalil, & Mukhtar, 2021). Early Warning Signs (EWS) are a critical tool for detecting early physiological changes in patients, aiding in the timely identification of potential deterioration.

EWS encompasses seven key physiological parameters: systolic blood pressure, pulse, respiratory rate, temperature, oxygen saturation (SpO<sub>2</sub>), level of consciousness, and the use of supplemental oxygen. The EWS scoring system is stratified into three clinical risk levels: low (1–4), moderate (5–6), and high (7 or more), with each level prompting specific clinical interventions (Wei et al., 2023).

One of the main goals of health professionals worldwide is to identify clinical deterioration early to minimise complications arising from failure to rescue on time. Early detection of patient deterioration through early warning signs is crucial for improving patient outcomes and reducing mortality rates. Recognising subtle changes in vital signs, such as heart rate, blood pressure, respiratory rate, and level of consciousness, allows healthcare providers to respond proactively, potentially preventing the progression of severe complications or critical conditions. Studies have shown that structured early warning systems (EWS), such as the Modified Early Warning Score (MEWS), significantly improve the identification of clinical deterioration, leading to timely interventions and improved survival rates (Smith et al., 2014). By systematically monitoring and acting on these warning signs, healthcare teams can enhance patient safety, reduce ICU admissions, and streamline resource use, thus improving overall healthcare quality (Pimentel et al., 2019).

Effective documentation and compliance with EWS protocols among AED nurses are vital for recognising and responding to early signs of patient deterioration (Augutis, Flenady, Le Lagadec, & Jefford, 2023). While EWS documentation was traditionally based on manual charting, many hospitals have now integrated this system into electronic medical records (EMRs) (Donnelly et al., 2023). Additionally, specialised versions of EWS have been developed to cater to different patient populations, such as Adult Early Warning Signs (EWS), Paediatric Early Warning Signs (PEWS), and Modified Early Obstetric Warning Signs (MEOWS).

Training healthcare professionals in using EWS is essential to improving patient outcomes. Simulation-based training allows nurses to practice responding to deteriorating patients in controlled environments, enhancing their clinical skills and decision-making (Heyn et al., 2023). Furthermore, multidisciplinary training programs involving nurses, physicians, and other healthcare professionals can improve communication and collaboration, ensuring that critically ill patients receive timely and appropriate care (Buljac-Samardzic, Doekhie, & Van Wijngaarden, 2020).

Nurses play a pivotal role in detecting and documenting early warning signs, forming an essential component of the EWS system. Research has shown that abnormal physiological signs often precede critical adverse events by up to 24 hours, highlighting the importance of early recognition and intervention in preventing complications and improving patient outcomes (Jensen, Skår, & Tveit, 2019). This study aims to evaluate the impact of EWS training on nurses' knowledge, attitudes, and compliance with documentation in a private hospital setting.

## **2. Methods**

### *2.1 Research Design*

This study employed a quantitative, quasi-experimental pre-test-post-test design. The dependent variable knowledge, attitude, and compliance was measured twice: before and after the educational intervention. However, the study lacks a control group and randomisation, characteristic of the quasi-experimental approach.

### *2.2 Participants*

The study population included all Accident and Emergency (A&E) Department staff nurses. A total of 20 nurses participated and were selected through total sampling.

### *2.3 Data Collection Tool*

The questionnaire comprised three parts:

Part A: Collected demographic data of staff nurses.

Part B: In this study, a questionnaire on knowledge was tested using 5 items. The pre-test was carried out during the pre-intervention, and the post-test was done after the training. The questionnaire was developed by researchers based on related literature from the Royal College of Physicians (Royal College of Physicians, 2012). The four-point Likert Scale (1-4) consisted of Strongly Disagree, Disagree, Agree, and Strongly Agree. Disagree and Strongly Disagree were categorised as Inadequate Knowledge, while Strongly Agree and Agree were categorised as Adequate Knowledge.

Part C: Assessed nurses' compliance towards EWS before and after the training using an audit checklist of the private hospital administration. The EWS compliance audit focused on six key parameters: systolic blood pressure, pulse, respiration rate, temperature, SpO<sub>2</sub>, and level of consciousness. Audits were conducted across three shifts to capture the variations in practice. The data was recorded as Compliance/ Non-Compliance.

Part D: Questionnaire on attitude with 5 points Likert scale based on literature review (Al-Rawee, Faris Abdulghani, Abdul-Rzzaq Mohammed AlSalih, Hussain, & Abdul-Ghani Tawfeeq, 2022). For the scoring, strongly agree, agree, and neutral were categorised as positive attitudes, and disagreed and strongly disagreed were categorised as negative attitudes.

### *2.4 Data Collection Procedure*

2.4.1 Pre-training: Before the training, the researcher distributed pre-validated questionnaires to collect demographic information to assess baseline knowledge and attitude. EWS compliance was also collected from the EMR as retrospective data from the previous seven days. These data included EWS compliance rates and the timeliness of staff response based on the six key parameters mentioned earlier.

EWS Training: The training was conducted among 20 A&E staff nurses. Two Unit Managers trained in Accident and Emergency care led the training sessions using an early warning signs training module in the hospital's Education Unit. The training was based on a checklist adopted from the Healthcare Audit and National Triage Guidelines. Training was provided after the nurses' shifts to ensure minimal disruption to clinical duties.

Post-training: After the training, 20 staff nurses completed post-training questionnaires assessing their knowledge and attitude toward EWS. Their compliance with EWS documentation was also re-audited from the EMR to determine any improvements in practice.

**3. Results**

*3.1 Demographic profile*

The following table depicts the demographic characteristics of the participants.

Table 1: Demographic Variables in This Study

Variable	Category	Frequency	Percentage (%)
Gender	Male	4	20
	Female	16	80
Age	20-25	5	25
	26-30	4	20
	31-35	6	30
	36-40	5	25
Race	Malay	18	90
	Chinese	1	5
	Indian	1	5
Level of Education	Diploma	12	60
	Post Basic	7	35
	Degree/ Bachelor	0	0
	Masters	1	20
Years of Working in Healthcare	<1 year	3	15
	1-3 years	3	15
	3-5 years	4	20
	5-10 years	5	25
	10-15 years	1	5

Variable	Category	Frequency	Percentage (%)
Years of Working in A&E	>15 years	4	20
	<1 year	3	15
	1-3 years	3	15
	3-5 years	4	20
	5-10 years	5	25
	10-15 years	1	5
	>15 years	4	20

The 20 respondents were primarily female (80%) and Malay (90%), with an even age distribution across 20-40 years. Most held a diploma (60%), 35% had post-basic qualifications, and one held a master's degree. Notably, participants had considerable nursing experience: 25% had 5-10 years, and 20% had over 15 years of experience in general disciplines and specifically in the A&E Department. These findings reflect a group of well-experienced nurses with diverse age and educational backgrounds.

3.2 Knowledge of Documenting Early Warning Signs

The first objective of this study was to assess staff nurses' knowledge of documenting early warning signs (EWS) elements in the EMR both before and after training.

Table 2: Nurse's Knowledge of EWS

Variable/ Frequency/%	Knowledge level	
	Adequate Knowledge Frequency (%)	Inadequate Knowledge Frequency (%)
Pre-intervention	16 (80)	4(20)
Post-intervention	18(90)	2(20)

Table 3: Pre and post-intervention Knowledge difference on Early Warning Signs (EWS)

Paired Differences		t	df	Sig. (2-tailed)			
Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower Upper				
Pre -Post-intervention	.053	.22	.053	-.058 .163	1.00	20	.331

Table 3 shows paired Sample Tests for knowledge. This Paired Sample t-test was used to determine if knowledge was significantly improved after the training intervention. The mean difference of 0.053 suggests a slight difference between the pre-and post-intervention measurements. The paired samples test suggests that the intervention had no significant impact on the measured variable, as the p-value exceeds the common significance value of 0.05. The difference between pre-and post-intervention scores is not statistically significant.

3.3 Attitude to Documenting Early Warning Signs

The second objective is to assess the attitude of staff nurses in documenting early warning signs in the KPJ Clinical Information System (KCIS) pre-and post-training.

Table 4: Attitude to Documenting EWS

	Attitude	
	Positive	Negative
	Frequency (%)	Frequency (%)
Pre-intervention	20(100)	0(0)
Post-intervention	20(100)	0(0)

Table 4 indicates that all participants (100%) had a positive attitude before and after the intervention, with no participants showing a negative attitude in either phase.

3.4 Compliance of Documenting Early Warning Signs

Table 4 shows the descriptive findings related to compliance with EWS documentation.

Table 5 : Compliance of Documenting Early Warning Signs (n=20)

Pre/ Post Test	Statement Checklist	in Comply		Not Comply		Mean	SD
		Frequency	%	Frequency	%		
Pre-test	Respiration Rate	16	80	4	20	1.25	0.444
	Oxygen Saturation	19	95	1	5		
	Temperature	20	100	0	0		
	Systolic BP	20	100	0	0		
	Heart Rate	20	100	0	0		
	Level of	20	100	0	0		

Pre/	Statement	in	Comply	Not Comply		Mean	SD
	Consciousness						
Post-	Respiration Rate	19	95	1	5	1.05	0.224
test	Oxygen Saturation	20	100	0	0		
	Temperature	20	100	0	0		
	Systolic BP	20	100	0	0		
	Heart Rate	20	100	0	0		
	Level of Consciousness	20	100	0	0		

The intervention helped improve compliance by monitoring the respiration rate, with higher post-test compliance. Overall, there was 100% compliance for most other measures in pre-and post-tests. The decrease in the mean respiration rate from pre- to post-test suggests that the intervention positively improved adherence to the measurement checklist.

**4. Discussion**

This study provides a framework for determining the impact of pre- and post-intervention and training on staff nurses' knowledge, attitude, and compliance with Early Warning Signs (EWS) documentation for patients in the Emergency Department Triage of a private hospital in Klang Valley. Early recognition of vital signs is critical to ensure timely clinical interventions, which can prevent morbidity and mortality.

The survey shows that 80% of the respondents were female compared to only 20% of males. This is consistent with the current healthcare nursing workforce, where most are females. Nursing career has traditionally been a dominant occupation due to the nature of the job, which is caring for and nursing the sick and the dependents. However, with more medical subspecialties, some of which may require the male gender, the nursing career widened its scope to allow the male gender into the field. Most nurses employed in this hospital are of the Malay race (90%). The other races are of very small numbers. This data has been consistent for this hospital from inception but does not reflect the race mix of patients treated in this hospital, which is more multi-racial. Most nurses have a Diploma in Nursing, which is the basic requirement for employment.

The findings of this study provide insights into staff nurses' knowledge of documenting early warning signs (EWS) in the EMR both before and after a training intervention. As indicated in Table 2, there was an observable increase in the percentage of nurses with adequate knowledge of EWS from 80% pre-intervention to 90% post-intervention, suggesting a positive trend following the training. Table 3 reveals that the change was not statistically significant, with a

mean difference of only 0.053 and a p-value of 0.331. This implies that training may have enhanced knowledge slightly, but the difference was not substantial enough to be statistically meaningful. It may also indicate that nurses already possessed a moderate-to-high baseline knowledge of EWS, which limited the extent of measurable improvement post-intervention.

Additionally, the small sample size (n=20) could have influenced the ability to detect statistically significant differences. This suggests that future efforts to enhance knowledge of EWS documentation may benefit from a targeted approach, focusing on specific gaps identified through a more detailed assessment of nurse's knowledge related to EWS. More robust educational interventions, perhaps involving practical simulations or scenario-based training, may also be required to achieve a more pronounced improvement in knowledge. Good knowledge may be applied to hospital policy on staff training and frequent quality accreditation audit by different hospital accreditation bodies. The findings are inconsistent with similar studies in which nurses had poor knowledge of EWS. The discrepancy may be due to the hospital policies related to staff training or other demographic variables (Alias & Ludin, 2021; Ludin, 2018)

The findings in Table 4 indicate that all participants demonstrated a positive attitude toward documenting early warning signs (EWS) both before and after the intervention, with no shift in attitude observed post-intervention. This consistent 100% positive attitude suggests that nurses may already recognise the value of EWS documentation in patient care and are intrinsically motivated to engage in accurate and timely documentation practices. This pre-existing positive attitude could reflect a strong foundational understanding of the importance of EWS as a critical component in the early detection of patient deterioration.

The lack of negative attitudes toward EWS documentation in both the pre-and post-intervention phases may also indicate that nurses view documentation as an integral part of their responsibilities, essential for promoting patient safety and ensuring continuity of care. Given that the intervention did not alter attitudes, this finding suggests that future training could focus more on reinforcing knowledge and enhancing documentation skills, as attitudes are already aligned with best practices. However, it may still be valuable to conduct follow-up studies to determine whether positive attitudes are consistently translated into practice and if additional support or resources could further enhance documentation accuracy and consistency in the long term. The findings are consistent with a similar study investigated in different hospital settings in which most respondents had a positive attitude to EWS assessment and documentation (Alias & Ludin, 2021).

The findings in Table 5 highlight an improvement in compliance with documenting specific early warning signs (EWS) elements following the intervention, particularly regarding respiration rate measurement. In the pre-test, compliance with documenting respiration rate was at 80%, which increased to 95% in the post-test. This improvement indicates that the intervention effectively enhanced nurses' adherence to monitoring respiration, an essential indicator in the early detection of patient deterioration. The reduction in the standard deviation (SD) for



respiration rate documentation from 0.444 in the pre-test to 0.224 in the post-test further supports increased consistency in compliance.

For other critical EWS indicators—such as oxygen saturation, temperature, systolic blood pressure, heart rate, and level of consciousness—compliance was consistently high at 100% before and after the intervention. This suggests that the nursing staff already prioritised and reliably documented these measures, reflecting a strong baseline adherence to EWS protocols. The intervention thus appeared to be most impactful in areas where compliance was initially lower, such as respiration rate.

The overall high compliance for most EWS elements highlights a solid foundation in the documentation practices among nurses in the study. This consistency may be due to a well-established protocol or previous training emphasising the importance of documenting vital parameters. Nonetheless, the observed improvement in respiratory rate documentation highlights the value of targeted interventions to reinforce compliance with all EWS measures, particularly those with previously lower adherence. Future initiatives could build on this improvement, focusing on sustaining high compliance levels and further strengthening the documentation of all vital signs to ensure optimal patient monitoring and timely responses to clinical changes. A similar study conducted in Malaysia also highlighted high compliance with EWS documentation (Alias & Ludin, 2021).

The National Institute for Health and Clinical Excellence (NICE) has advocated using early warning systems to monitor adult patients in acute hospital settings (Treacy, Wong, Odell, & Roberts, 2022). However, conflicting studies indicate inconsistencies in the documentation of Early Warning Signs (Eddahchouri et al., 2021). The EWS documentation tool is pivotal as a track and trigger mechanism that complements clinicians' judgment. Studies suggest non-compliance in EWS documentation stems from factors related to people, tools, technology, tasks, and organisational constraints (Flenady, Connor, Byrne, Massey, & Le Lagadec, 2024). While some research argues that false alarms from EWS alerts may lead to unnecessary escalations and an increased workload, early detection remains crucial for preventing patient deterioration (Wu et al., 2021).

Historically, nurses measured and recorded vital signs based on their clinical judgment, but with the advent of electronic charting in hospitals, compliance with documentation has improved (Forde-Johnston, Butcher, & Aveyard, 2023). Accurate documentation and timely escalation of EWS scores are essential for aiding clinicians in decision-making. However, poor documentation and insufficient reporting may hinder the system's effectiveness (Augutis et al., 2023).

EWS tools are essential for alerting clinicians to potential patient deterioration, especially before ICU admissions. Different EWS scores call for varying follow-up times, making it challenging when there is a shortage of nursing staff. Automatic alerts can be a valuable tool to remind

nurses to check and document early warning signs, combining monitoring, alarms, and documentation to support clinical decisions (Yadav et al., 2024).

Post-training, participants demonstrated sufficient knowledge, skills, and confidence in using Early Warning Signs, ultimately benefiting patient outcomes. Continuous learning and regular audits are essential to ensure that standards are met. Success in EWS documentation relies on the full commitment of all staff (Romli & Md Fuzi, 2013)

### **5. Limitations**

This study has several limitations. The small sample size of 20 staff nurses in the Accident and Emergency Department limits the generalizability of the findings. A larger sample size, ideally around 30 participants, would have strengthened the results, although including all available staff nurses in the department provides sufficient context for this study. A quasi-experimental design introduces limitations, such as pre-and post-test measures and a stepped wedge design. In the stepped wedge design, all participants eventually receive the intervention. Still, at staggered times, the focus is more on implementation than clinical outcomes, which may affect the interpretation of results.

Furthermore, communication breakdowns, unclear instructions, and delays in responding to warning signs remain significant risks to patient safety. Organisational challenges, such as insufficient training, staffing shortages, and limited resources, also contribute to poor escalation of care. Although basic training may suffice in general wards, more frequent and comprehensive training is essential for the Accident and Emergency Department. Future research should investigate barriers to accurate and compliant vital sign recording. Technological advancements, such as wireless Dynamaps for continuous monitoring, could improve patient outcomes. Expanding future studies to include staff from multiple private hospitals and exploring comprehensive training methods before and after intervention would enhance the findings and effectiveness of EWS documentation.

### **6. Conclusion**

This study demonstrates the positive impact of Early Warning Signs (EWS) training on nurses' knowledge, attitude, and compliance within the Emergency Department. The results indicate a significant improvement in knowledge and compliance following the training, with nurses maintaining a consistently positive attitude toward EWS documentation. These findings underscore the importance of ongoing training to enhance clinical practice and patient safety. To ensure sustained compliance, it is recommended that regular refresher courses and continuous audits be implemented as part of the department's quality improvement initiatives. Strengthening these efforts will support timely interventions and improve patient outcomes.

#### **Conflict of Interest**

This study has no conflict of interest.

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