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Scoping Review

Applying Early Warning Score (EWS) in hospitals for adult mortality risk factors

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Abstract
The mortality rate among adult hospital patients is a significant indicator in assessing the quality of care and health services. High mortality rates can affect a hospital's reputation, reduce the credibility of medical personnel, and trigger public anxiety. Failure to recognize the worsening of a patient's condition can delay appropriate life support management. This scoping review aims to identify and analyze the Early Warning Score (EWS) application for adults with risk factors for death in regional general hospitals (RSUD). The scoping review was conducted by searching literature using electronic databases from January 2018-May 2023, such as PubMed, ScienceDirect, LibMed UGM, and hand searching. Relevant articles were selected based on inclusion criteria. The results contained two main themes: factors related to mortality in adult patients and the benefits of implementing EWS on the clinical outcomes of adult patients. Implementing EWS in adult patients with high-risk factors for mortality at Regional General Hospitals can help identify the worsening of the patient's condition early, reducing the risk of death. Increasing awareness of the importance of EWS, EWS training, and consistent use of EWS according to hospital protocols can help reduce mortality and improve overall patient clinical outcomes.

Keywords: clinical deterioration; early warning score; in-hospital mortality

1. Introduction

Hospitals provide quality, accountable, and open health services to the community, especially patient safety (Al-Jabri et al., 2021; Salih et al., 2021; Zaenal, 2022). Failure to immediately identify a patient's condition worsening in the hospital results in preventable adverse consequences, including medical emergency codes, morbidity, and mortality (Andersen et al., 2016; Nagarajah et al., 2022). Hospital mortality is an important indicator in evaluating the quality of health services (English et al., 2018; Hogan et al., 2015; Kobewka et al., 2017). The high death rate can cause concern among the public and impact the hospital's reputation in the eyes of the public, as well as damage the credibility of the medical personnel who work there (Zaenal, 2022).

Proper and accurate assessment of deterioration has two main objectives. This is not only improving the quality of services provided to patients but also preventing deterioration that may arise, thereby speeding up recovery and increasing the efficiency of the health care system. By reducing morbidity, hospital stays can be shortened, and health expenditures can be reduced, as well as maintaining the best quality of service (Gordo & Molina, 2018; Perkins et al., 2021; Semeraro et al., 2021). Several research results show that a deterioration in the patient's condition can be anticipated within six to twenty-four hours in advance (Andersen et al., 2016; Arévalo-Buitrago et al., 2021; Gordo & Molina, 2018; M. E. B. Smith et al., 2014).

Early Warning Score (EWS) is implemented as a standard approach for assessment and response to critical illness. The EWS tool is an observation chart designed to allow users to track and chart a patient's vital signs progressively and consistently (Elliott et al., 2015). According to Le Lagadec & Dwyer (2017), abnormal vital signs are the initial sign in 85% of serious adverse events. Fox & Elliott (2015) revealed that EWS is easy to use and efficient in detecting worsening patient conditions and does not increase staff workload. Additionally, the validity of the EWS has been independently verified (Fu et al., 2020). Although EWS is acceptable, researchers cautioned that patient EWS charts alone cannot replace accurate clinical judgment because human factors contribute to EWS decision-making (Le Lagadec & Dwyer, 2017).

Le Lagadec & Dwyer (2017) stated that the effectiveness of EWS depends on the patient group, available facilities, staff training, and patient attitudes. Cardiovascular disease is the main cause of death globally among adults aged 35 to 70 years (Dagenais et al., 2020). However, there has not been much review of the implementation of EWS in adult patients with high-risk factors for hospital mortality. This scoping review aims to identify the implementation of EWS in adult patients as a risk factor for high mortality in regional general hospitals.

2. Research Methods

This research uses a scoping review technique. When developing the review focus and search strategy, the researcher applied the Population/Problem, Intervention, Comparison, Outcome (PICO) format to organize and determine the review focus, as shown in Table 1. The question asked in this article is, "Is the implementation of the Early Warning System EWS) associated with mortality rates in adult patients in hospitals?".

Search for relevant literature using databases such as PubMed, ScienceDirect, LibMed UGM, and hand searching using the Boolean operator "OR/AND". The following keywords were used in the search: "(patients OR inpatients) AND (implementation) AND (EWS OR adult Early Warning Score) AND (mortality OR hospital mortality).

Table 1. Framework PICO

PICO	Keyword
Population/Problem (P)	Inpatients
Intervention (I)	EWS implementation
Comparison (C)	-
Outcome (O)	Mortality

Source: (Eldawlatly et al., 2018)

Article inclusion criteria used in this scoping review: studies discussing the implementation of EWS in adult patients with non-COVID and maternal illnesses in hospital inpatient wards; studies evaluating mortality risk factors associated with incomplete implementation of EWS in hospital inpatient wards; publications available in English or Indonesian; publications published within the last five years (January 2018- May 2023); article search limitations were related data and free full text.

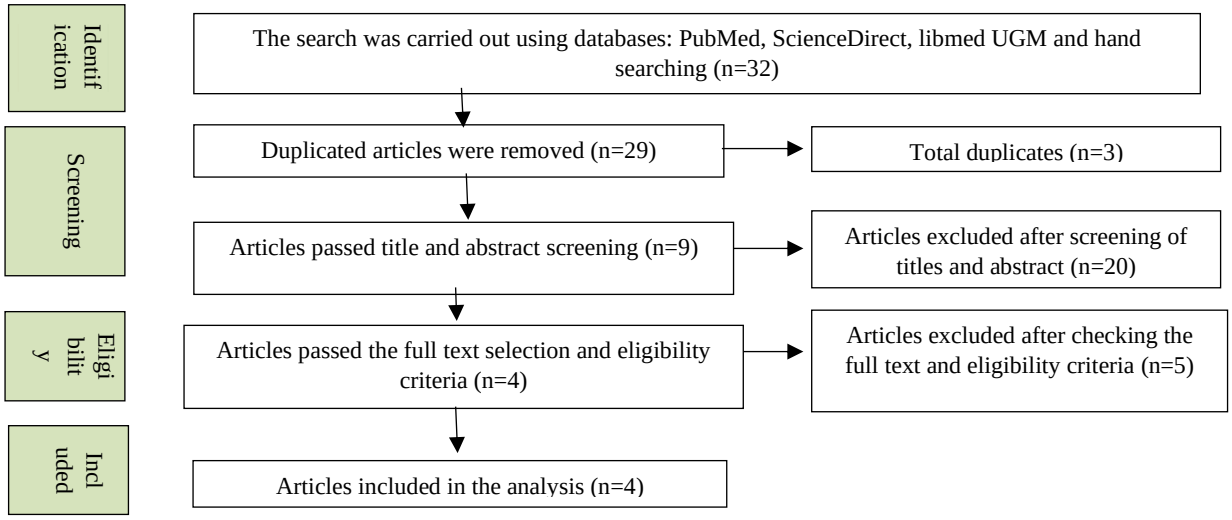

Figure 1. Diagram of Articles Searching Process
Source: (Page et al., 2021)

3. Result and Discussion

3.1.Results

Thirty-two articles were obtained from search results in several databases (PubMed 12, ScienceDirect 11, Libmed UGM 3 and hand s,earchand-searchingcate articles were then identified using the Mendeley application to simplify the search process. Three duplicate articles were removed. The remaining twenty-nine articles were then screey reading the titles and abstracts based on the inclusion criteria. Four articles were selected for analysis. The article search flow diagram appears in Figure 1. A summary of the selected articles is listed in Table 2.

Table 2. Summary of relevant articles

No	Title/ Author/ Year	Research Goals	Desain Research	Sample Characteristics	Results
1	Analysis of Risk Factors for Non-Compliance with Early Warning Score Implementation on Patient Mortality (Sutrisno et al., 2022)	To see the risk of non-compliance with EWS implementation on patient mortality rates and to look at other risk factors for patient d.eath	Retrospective case-control	Case Group: 82 patients who died in the adult inpatient room at Wates Regional Hospital. Control group: 246 adult inpatient rooms at Wates Regional Hospital who did not die orwere kept alive	Mortality Risk Factors : • EWS non-compliance (OR 20.26) • Severity of diseases -high risk (OR 48.13) -moderate risk (OR 18.91) -low risk (OR 4.94) • Stroke diseases (OR 24.63), heart diseases (OR 10.32), Pneumonia (OR 7.05), sepsis (OR

No	Title/ Author/ Year	Research Goals	Desain Research	Sample Characteristics	Results
					7.56)
2	The relationship between the application of the Early Warning Score (EWS) and the clinical outcomes of patients in the adult inpatient unit at RSUP Dr. Sardjito Yogyakarta Yogyakarta (Ramadhan, 2019)	to identify the relationship between EWS implementation and patient clinical outcomes in Adult Inpatient Installations	Cross-Sectional	Secondary data in the medical records installation of RSUP Dr. Sardjito Yogyakarta	Research results show that the implementation of EWS has a significant relationship in anticipating patient outcomes (LOS > 9 days P = 0.008, care escalation P = 0.011, cardiac arrest P = 0,039, and death P = 0,036)
3	Evaluation of the Initial General Ward Early Warning Score and ICU Admission, Hospital Length of Stay and Mortality (Gielen et al., 2021)	The aim was to evaluate the association between initial EWS and mortality in hospital, intensive care unit (ICU), admission, and hospital length of stay (LOS).	Retrospective cohort study	There are 53180 adult patients treated in general hospital wards	Increased in-hospital mortality, increased ICU admission rates, and prolonged hospital LOS was associated with increased baseline EWS scores (low risk: 1.5%, 3.1%, 4 days respectively, and high risk 25.3%, 17.6%, and eight days respectively)
4	The Effect of Using Adult Early Warning Scoring (Aews) on Mortality Rates at Bali Mandara Hospital (Dewi et al., 2020)	To determine the effect of using AEWS on mortality rates.	Quantitative approach with One Group pre-test and post-test design.	The number of samples in this study was 21 people (March-November 2018) for the period before the use of AEWS and 12 people (March-November 2019) for the period after the use of AEWS	Adult Early Warning Scoring (AEWS) affects the mortality rate at Bali Mandara Regional Hospital ($p \leq 0,05$). There was a decrease in deaths before and after the use of AEWS from 21 to 12 people.

Source: (Page et al., 2021)

This scoping review shows consistent results regarding applying the Early Warning Score (EWS) in adult hospital patients and its influence on mortality factors. Adherent implementation of EWS protocols can serve as a tool to assist medical staff in identifying risks and taking appropriate action to prevent or reduce the risk of death. There are two main themes in this scoping review, namely, factors

related to mortality in adult patients (Sutrisno et al., 2022) and the benefits of implementing EWS on the clinical outcomes of adult patients (Dewi et al., 2020; Gielen et al., 2021; Ramadhan, 2019).

3.2.Discussion

3.2.1.Factors Associated with Mortality in Adult Patients

Early Warning Score (EWS) is a tool used in patient monitoring to detect signs of worsening conditions early so that the medical team can take preventive steps and appropriate actions to prevent complications or emergencies that could endanger the patient's life (Alam et al. al., 2014; Hidayat et al., 2020; G. B. Smith et al., 2013). Implementing EWS enables staff to identify worsening patient conditions as early as possible and, if necessary, seek help from competent staff to achieve better care outcomes (Millizia et al., 2023).

Medical staff's involvement, commitment, and compliance in implementing EWS protocols consistently and effectively is very important because this allows early identification and management of high-risk patients (Sutrisno et al., 2022). Implementing the EWS protocol with good compliance is important in controlling the high mortality risk. Sutrisno et al. (2022) found that compliance with implementing the Early Warning Score (EWS) protocol statistically correlated with patient death. This suggests that the higher the level of compliance with the EWS protocol, the lower the patient's risk of death. However, several research results highlight low compliance with the EWS protocol (Credland et al., 2018; Eddahchouri et al., 2021; Petersen et al., 2014). Non-compliance with EWS implementation increases the risk of death by 20.26 times (Sutrisno et al., 2022). Long working hours, lack of motivation, lack of resources, high workload, missed vital signs, lack of knowledge and training, and lack of collaboration and communication are factors that cause non-compliance in implementing EWS (O'Neill et al., 2021; Petersen, 2018; Petersen et al., 2017; Rajagukguk & Widani, 2020; Samani & Rattani, 2023).

Both hospitals and their staff have a crucial responsibility to provide safe and effective care and services to patients. To achieve this, it is important to maintain efficient communication, collaboration, and standardized processes. These steps ensure that care planning, coordination, and implementation are tailored to meet each patient's needs and goals. By the Patient Care Service (PAP) 3.1 assessment element in the 2018 National Hospital Accreditation Standards (SNARS), there are regulations governing the implementation of EWS, training that ensures medical staff is equipped with the necessary knowledge and skills, as well as the ability of medical staff to implement EWS and record. As a result, the potential risk of patient death can be managed better (Komisi Akreditasi Rumah Sakit, 2017). In addition, monitoring and evaluating EWS implementation is also an important part of ensuring the success of this system in identifying risks and taking necessary actions. Individuals and teams will be better prepared to comply with monitoring and escalation processes if they receive buy-in and support, training, clear instructions, engage in interdisciplinary collaboration, and maintain good communication (Credland et al., 2018; Flenady et al., 2020; Stafseth et al., 2016). Conversely, non-compliance with EWS can be attributed to intra- and inter-professional hierarchies within teams and organizations (Flenady et al., 2020).

Other risk factors that significantly influence patient death include the severity of the patient, heart disease, stroke, pneumonia, and sepsis. Disease severity is divided into three groups: severe, moderate, and low risk. Research Susanto (2019) shows that severe, moderate, and low-risk levels increase mortality risk by 48.13; 18.91 and 4.94 times. Meanwhile, heart disease, stroke, pneumonia and sepsis each increase mortality risk by 24.63, 10.32, 7.05, and 7.56 times. These findings emphasize the importance of monitoring and treating these risk factors to reduce patient mortality. Patients at high risk can be given intensive and prioritized treatment, and patients at lower risk can receive treatment according to their condition. This helps avoid unnecessary increases in costs and ensures the effective use of medical resources (Hidayat et al., 2020).

3.2.2. Benefits of EWS Implementation on Clinical Adult Patients

The effective implementation of EWS application to adult patients can improve patient clinical outcomes in hospitals. A study conducted by Ramadhan (2019) shows that the implementation of comprehensive EWS and the clinical response of staff according to the EWS scoring results can prevent unexpected clinical outcomes in most adult inpatients, such as escalation of care, cardiac arrest, mortality, and length of stay. (LOS) more than nine days. Research conducted Dewi et al. (2020) also shows that there is an influence before and after the implementation of EWS in adult patients on mortality rates in regional hospitals.

The Research conducted by Gielen et al. (2021) highlighted the relationship between increasing initial EWS scores and the risk of death in patients treated in general hospital inpatient wards. This study showed that increasing baseline EWS scores in general hospital wards was associated with increased in-hospital mortality, a higher propensity to be admitted to the intensive care unit (ICU), and a longer length of stay (LOS) (Gielen et al., 2021).

The Early Warning Score should not be used as the only tool because its ability to predict death after 24 hours is unreliable and is strongly influenced by other factors (Holland & Kellett, 2023). Digital technology needs to be considered to help optimize EWS because it can monitor patients remotely and facilitate communication between health professionals (Bell et al., 2021; Eddahchouri et al., 2022; Schmidt et al., 2015). Close monitoring and documentation of EWS in electronic health records can help predict clinical deterioration and identify patients who may benefit from timely treatment. By regularly monitoring and documenting EWS, healthcare providers can track changes in vital signs and detect early signs of physiological deterioration. This allows for timely intervention and appropriate escalation of care for patients at risk of adverse events.

We acknowledge that there are limitations to the design of this review. The search criteria were intentionally expanded to capture a wide range of studies and optimize results. The use of keyword searches may result in the loss of some articles. We used inclusion and exclusion criteria to make it easier to group the literature. Quality assessment is difficult with such diverse study designs, and data extraction relies heavily on reviewers' interpretation of the literature, which can introduce bias. However, a narrative approach allows for synthesizing diverse literature into common themes relevant to the research questions.

4. Conclusion

The implementation of Early Warning Score (EWS) application to adult patients in hospitals has a significant influence on mortality factors. EWS helps identify high-risk patients and enables appropriate preventive action by medical personnel. Implementing EWS in adult patients, compliance with EWS protocols, patient severity, and other risk factors influence in-hospital patient mortality rates. Increasing awareness of the importance of EWS, EWS training, and consistent use of EWS according to hospital protocols can help reduce mortality and improve overall patient clinical outcomes. Further research is needed to identify risk factors contributing to patient mortality and develop more effective mortality reduction strategies. Comparison of the effectiveness of EWS with other early warning systems is also necessary to determine which systems are most effective in various clinical settings. Factors such as medical personnel expertise, adequate resources, and patient characteristics must be considered. Policies that are flexible and tailored to patient needs must also be developed. Technological development and innovation in the EWS system can help overcome obstacles and optimize actions.

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References

Alam, N., Hobbelink, E. L., van Tienhoven, A. J., van de Ven, P. M., Jansma, E. P., & Nanayakkara, P. W. B. (2014). The impact of using the *Early Warning Score* (EWS) on patient outcomes: A systematic review. *Resuscitation*, *85*(5), 587–594. https://doi.org/10.1016/j.resuscitation.2014.01.013

Al-Jabri, F., Kvist, T., Sund, R., & Turunen, H. (2021). Quality of care and patient safety at healthcare institutions in Oman: Quantitative study of the perspectives of patients and healthcare professionals. *BMC Health Services Research*, *21*(1), 1109. https://doi.org/10.1186/s12913-021-07152-2

Andersen, L. W., Kim, W. Y., Chase, M., Berg, K. M., Mortensen, S. J., Moskowitz, A., Novack, V., Cocchi, M. N., Donnino, M. W., & American Heart Association's Get With the Guidelines(®) – Resuscitation Investigators. (2016). The prevalence and significance of abnormal vital signs prior to in-hospital cardiac arrest. *Resuscitation*, *98*, 112–117. https://doi.org/10.1016/j.resuscitation.2015.08.016

Arévalo-Buitrago, P., Morales-Cané, I., Olivares Luque, E., Guler, I., Rodríguez-Borrego, M. A., & López-Soto, P. J. (2021). The predictive power of early-warning scores used in hospital emergency departments: A systematic review and meta-analysis. *Emergencias: Revista De La Sociedad Espanola De Medicina De Emergencias*, *33*(5), 374–381.

Bell, D., Baker, J., Williams, C., & Bassin, L. (2021). A Trend-Based *Early Warning Score* Can Be Implemented in a Hospital Electronic Medical Record to Effectively Predict Inpatient Deterioration. *Critical Care Medicine*, *49*(10), e961–e967. https://doi.org/10.1097/CCM.0000000000005064

Credland, N., Dyson, J., & Johnson, M. J. (2018). What are the patterns of compliance with Early Warning Track and Trigger Tools: A narrative review. *Applied Nursing Research: ANR*, *44*, 39–47. https://doi.org/10.1016/j.apnr.2018.09.002

Dagenais, G. R., Leong, D. P., Rangarajan, S., Lanas, F., Lopez-Jaramillo, P., Gupta, R., Diaz, R., Avezum, A., Oliveira, G. B. F., Wielgosz, A., Parambath, S. R., Mony, P., Alhabib, K. F., Temizhan, A., Ismail, N., Chifamba, J., Yeates, K., Khatib, R., Rahman, O., … Yusuf, S. (2020). Variations in common diseases, hospital admissions, and deaths in middle-aged adults in 21 countries from five continents (PURE): A prospective cohort study. *The Lancet*, *395*(10226), 785–794. https://doi.org/10.1016/S0140-6736(19)32007-0

Dewi, B. A. M., Susila, I. M. D. P., & Darmawan3, A. A. K. N. (2020). Pengaruh Penggunaan Adult Early Warning Scoring (AEWS) Terhadap Tingkat Mortalitas di RSUD Bali Mandara. *Jurnal Kesehatan Saelmakers PERDANA (JKSP)*, *3*(2), Article 2. https://doi.org/10.32524/jksp.v3i2.223

Eddahchouri, Y., Koeneman, M., Plokker, M., Brouwer, E., van de Belt, T. H., van Goor, H., & Bredie, S. J. (2021). Low compliance to a vital sign safety protocol on general hospital wards: A retrospective cohort study. *International Journal of Nursing Studies*, *115*, 103849. https://doi.org/10.1016/j.ijnurstu.2020.103849

Eddahchouri, Y., Peelen, R. V., Koeneman, M., Touw, H. R. W., van Goor, H., & Bredie, S. J. H. (2022). Effect of continuous wireless vital sign monitoring on unplanned ICU admissions and rapid response team calls: A before-and-after study. *British Journal of Anaesthesia*, *128*(5), 857–863. https://doi.org/10.1016/j.bja.2022.01.036

Eldawlatly, A., Alshehri, H., Alqahtani, A., Ahmad, A., Al-Dammas, F., & Marzouk, A. (2018). Appearance of Population, Intervention, Comparison, and Outcome as research question in the title of articles of three different anesthesia journals: A pilot study. *Saudi Journal of Anaesthesia*, *12*(2), 283–286. https://doi.org/10.4103/sja.SJA_767_17

Elliott, D., Allen, E., Perry, L., Fry, M., Duffield, C., Gallagher, R., Iedema, R., McKinley, S., & Roche, M. (2015). Clinical user experiences of observation and response charts: Focus group findings of using a new format chart incorporating a track and trigger system. *BMJ Quality & Safety*, *24*(1), 65–75. https://doi.org/10.1136/bmjqs-2013-002777

English, M., Mwaniki, P., Julius, T., Chepkirui, M., Gathara, D., Ouma, P. O., Cherutich, P., Okiro, E. A., & Snow, R. W. (2018). Hospital Mortality – a neglected but rich source of information supporting the transition to higher quality health systems in low and middle income countries. *BMC Medicine*, *16*(1), 32. https://doi.org/10.1186/s12916-018-1024-8

Flenady, T., Dwyer, T., Sobolewska, A., Lagadec, D. L., Connor, J., Kahl, J., Signal, T., & Browne, M. (2020). Developing a sociocultural framework of compliance: An exploration of factors related to the use of early warning systems among acute care clinicians. *BMC Health Services Research*, *20*, 736. https://doi.org/10.1186/s12913-020-05615-6

Fox, A., & Elliott, N. (2015). *Early Warning Score*s: A sign of deterioration in patients and systems. *Nursing Management (Harrow, London, England : 1994)*, *22*, 26–31. https://doi.org/10.7748/nm.22.1.26.e1337

Fu, L.-H., Schwartz, J., Moy, A., Knaplund, C., Kang, M.-J., Schnock, K. O., Garcia, J. P., Jia, H., Dykes, P. C., Cato, K., Albers, D., & Rossetti, S. C. (2020). Development and Validation of *Early Warning Score* System: A Systematic Literature Review. *Journal of Biomedical Informatics*, *105*, 103410. https://doi.org/10.1016/j.jbi.2020.103410

Gielen, A., Koekkoek, K., van der Steen, M., Looijen, M., & van Zanten, A. R. H. (2021). Evaluation of the Initial General Ward *Early Warning Score* and ICU Admission, Hospital Length of Stay and Mortality. *The Western Journal of Emergency Medicine*, *22*(5), 1131–1138. https://doi.org/10.5811/westjem.2021.6.50657

Gordo, F., & Molina, R. (2018). Evolution to the early detection of severity. Where are we going? *Medicina Intensiva (English Edition)*, *42*(1), 47–49. https://doi.org/10.1016/j.medine.2017.12.002

Hidayat, D. I., Agushybana, F., & Nugraheni, S. A. (2020). Early Warning System pada Perubahan Klinis Pasien terhadap Mutu Pelayanan Rawat Inap. *HIGEIA (Journal of Public Health Research and Development)*, *4*(3), Article 3. https://doi.org/10.15294/higeia.v4i3.37842

Hogan, H., Zipfel, R., Neuburger, J., Hutchings, A., Darzi, A., & Black, N. (2015). Avoidability of hospital deaths and association with hospital-wide mortality ratios: Retrospective case record review and regression analysis. *BMJ (Clinical Research Ed.)*, *351*, h3239. https://doi.org/10.1136/bmj.h3239

Holland, M., & Kellett, J. (2023). The United Kingdom's National *Early Warning Score*: Should everyone use it? A narrative review. *Internal and Emergency Medicine*, *18*(2), 573–583. https://doi.org/10.1007/s11739-022-03189-1

Kobewka, D. M., van Walraven, C., Turnbull, J., Worthington, J., Calder, L., & Forster, A. (2017). Quality gaps identified through mortality review. *BMJ Quality & Safety*, *26*(2), 141–149. https://doi.org/10.1136/bmjqs-2015-004735

Komisi Akreditasi Rumah Sakit. (2017). *Standar Nasional Akreditasi Rumah Sakit, Edisi 1* (1st ed.). Komisi Akreditasi Rumah Sakit. http://snars.web.id/2018/fokus-pasien/pap/penilaian-pap/

Le Lagadec, M. D., & Dwyer, T. (2017). *Scoping review*: The use of early warning systems for the identification of in-hospital patients at risk of deterioration. *Australian Critical Care*, *30*(4), 211–218. https://doi.org/10.1016/j.aucc.2016.10.003

Millizia, A., Rizka, A., & Mellaratna, W. P. (2023). Time Saving is Life Saving: Pelatihan Early Warning Scoring System dan Code Blue untuk Tenaga Kesehatan Ruang Rawat Inap RSUD Cut Meutia Aceh Utara | Millizia | Jurnal Malikussaleh Mengabdi. *Jurnal Malikussaleh Mengabdi*, *2*, 242–250. https://doi.org/10. 29103/jmm.v2n1.9397

Nagarajah, S., Krzyzanowska, M. K., & Murphy, T. (2022). *Early Warning Score*s and Their Application in the Inpatient Oncology Settings. *JCO Oncology Practice*, *18*(6), 465–473. https://doi.org/10.1200/OP.21.00532

O'Neill, S. M., Clyne, B., Bell, M., Casey, A., Leen, B., Smith, S. M., Ryan, M., & O'Neill, M. (2021). Why do healthcare professionals fail to escalate as per the early warning system (EWS) protocol? A qualitative evidence synthesis of the barriers and facilitators of escalation. *BMC Emergency Medicine*, *21*(1), 15. https://doi.org/10.1186/s12873-021-00403-9

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*, *372*. https://doi.org/10.1136/bmj.n71

Perkins, G. D., Graesner, J.-T., Semeraro, F., Olasveengen, T., Soar, J., Lott, C., Van de Voorde, P., Madar, J., Zideman, D., Mentzelopoulos, S., Bossaert, L., Greif, R., Monsieurs, K., Svavarsdóttir, H., Nolan, J. P., & European Resuscitation Council Guideline Collaborators. (2021). European Resuscitation Council Guidelines 2021: Executive summary. *Resuscitation*, *161*, 1–60. https://doi.org/10.1016/j.resuscitation.2021.02.003

Petersen, J. A. (2018). *Early Warning Score* challenges and opportunities in the care of deteriorating patients. *Danish Medical Journal*, *65*(2), B5439.

Petersen, J. A., Mackel, R., Antonsen, K., & Rasmussen, L. S. (2014). Serious adverse events in a hospital using *Early Warning Score*—What went wrong? *Resuscitation*, *85*(12), 1699–1703. https://doi.org/10.1016/j.resuscitation.2014.08.037

Petersen, J. A., Rasmussen, L. S., & Rydahl-Hansen, S. (2017). Barriers and facilitating factors related to use of *Early Warning Score* among acute care nurses: A qualitative study. *BMC Emergency Medicine*, *17*, 36. https://doi.org/10.1186/s12873-017-0147-0

Rajagukguk, C. R., & Widani, N. L. (2020). Faktor-Faktor yang Berhubungan dengan Kepatuhan Pelaksanaan Monitoring *Early Warning Score*. *Carolus Journal of Nursing*, *2*(2), Article 2. https://doi.org/10.37480/cjon.v2i2.37

Ramadhan, M. D. (2019). *Hubungan Penerapan Early Warning Score (EWS) dengan Clinical outcomes Pasien di Instalasi Rawat Inap Dewasa RSUP Dr. Sardjito Yogyakarta* [Universitas Gadjah Mada]. https://etd.repository.ugm.ac.id/penelitian/detail/178712

Salih, S. A., Abdelkader Reshia, F. A., Bashir, W. A. H., Omar, A. M., & Ahmed Elwasefy, S. (2021). Patient safety attitude and associated factors among nurses at Mansoura University Hospital: A cross sectional study. *International Journal of Africa Nursing Sciences*, *14*, 100287. https://doi.org/10.1016/j.ijans.2021.100287

Samani, S., & Rattani, S. A. (2023). Recognizing Early Warning Signs (EWS) in Patients Is Critically Important. *Open Journal of Nursing*, *13*(1), Article 1. https://doi.org/10.4236/ojn.2023.131004

Schmidt, P. E., Meredith, P., Prytherch, D. R., Watson, D., Watson, V., Killen, R. M., Greengross, P., Mohammed, M. A., & Smith, G. B. (2015). Impact of introducing an electronic physiological surveillance system on hospital mortality. *BMJ Quality & Safety*, *24*(1), 10–20. https://doi.org/10.1136/bmjqs-2014-003073

Semeraro, F., Greif, R., Böttiger, B. W., Burkart, R., Cimpoesu, D., Georgiou, M., Yeung, J., Lippert, F., S Lockey, A., Olasveengen, T. M., Ristagno, G., Schlieber, J., Schnaubelt, S., Scapigliati, A., & G Monsieurs, K. (2021). European Resuscitation Council Guidelines 2021: Systems saving lives. *Resuscitation*, *161*, 80–97. https://doi.org/10.1016/j.resuscitation.2021.02.008

Smith, G. B., Prytherch, D. R., Meredith, P., Schmidt, P. E., & Featherstone, P. I. (2013). The ability of the National *Early Warning Score* (NEWS) to discriminate patients at risk of early cardiac arrest, unanticipated intensive care unit admission, and death. *Resuscitation*, *84*(4), 465–470. https://doi.org/10.1016/j.resuscitation.2012.12.016

Smith, M. E. B., Chiovaro, J. C., O'Neil, M., Kansagara, D., Quiñones, A. R., Freeman, M., Motu'apuaka, M. L., & Slatore, C. G. (2014). Early warning system scores for clinical deterioration in hospitalized patients: A systematic review. *Annals of the American Thoracic Society*, *11*(9), 1454–1465. https://doi.org/10.1513/AnnalsATS.201403-102OC

Stafseth, S. K., Grønbeck, S., Lien, T., Randen, I., & Lerdal, A. (2016). The experiences of nurses implementing the Modified *Early Warning Score* and a 24-hour on-call Mobile Intensive Care Nurse: An exploratory study. *Intensive & Critical Care Nursing*, *34*, 25–33. https://doi.org/10.1016/j.iccn.2015.07.008

Susanto, E. (2019). *ASUHAN KEPERAWATAN PADA NY.E DENGAN GAGAL GINJAL KRONIK DI RUANG AISYAH DALAM LT.2 RSUD SEKARWANGI KABUPATEN SUKABUMI* [Diploma, Universitas Muhammadiyah Sukabumi]. http://eprints.ummi.ac.id/924/

Sutrisno, S., Pramusinto, H., & Setiyarini, S. (2022). Analisis Faktor Risiko Ketidakpatuhan Penerapan *Early Warning Score* Terhadap Mortalitas Pasien. *Jurnal Ilmiah Keperawatan*, *17*(2), Article 2. https://doi.org/10.30643/jiksht.v17i2.188

Zaenal. (2022). Pengaruh Kebijakan dan Pengawasan terhadap Penerapan Pencegahan dan Pengendalian Infeksi Nosokomial di RSUD Kota Makassar | Syntax Literate ; Jurnal Ilmiah Indonesia. *Jurnal Ilmiah Indonesia*, *7*(Spesial Issue Syntax Literate). https://doi.org/10.36418/syntax-literate.v7i2.6194