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Recognizing Early Warning Signs (EWS) in Patients Is Critically Important

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Abstract

Introduction: Monitoring vital signs is a basic indicator of a patient's health status and allows prompt detection of delayed recovery or adverse effects and early intervention. Patients with adverse events during hospitalization often display clinical decline for several hours before the event is observed. Non-critical care Nurses' inconsistent recognition and response to patient deterioration lead to an increase in the length of hospital stay, unexpected admissions to the ICU, and increased morbidity and mortality. **Aim:** The study aimed to assess the factors that facilitate or impede the detection of early warning signs among adult patients hospitalized in tertiary care settings. Training should be provided to improve nurses' knowledge, practice and attitude toward early warning signs of deteriorating patients leading to enhanced clinical judgment, skills and decision-making in addressing alerts. **Methodology:** A literature search was carried out in various databases; these were Cumulative Index to Nursing and Allied Health Literature (CINHAL), Google Scholar, PubMed, Science Direct, and Sage. The search area was narrowed from 2017 to 2022. The keywords used were "prevalence" AND "unplanned ICU admission", "the importance of early warning signs" "outcome failure in rescue" "patient deterioration, communication" "improvement in early detection" AND "patient outcome admission" AND "early warning signs" AND "Pakistan". After the analysis process, around 33 articles that met the inclusion criteria and were most relevant to the scope and context of the current study were considered. **Conclusion:** Most of the studies had reviewed literature in a qualitative retrospective observational study, content analysis, mixed method, and quasi-experimental study. The literature review identified that long hours of shift, nurse staffing levels, missed vital signs, lack of nursing training and education, and communication impact nurses' ability to recognize and respond to early warning signs.

Keywords

Early Warning Signs, Handover Communication, Long Hours, Rapid Response Team, Just in Time Training

1. Introduction

Recording vital signs is an essential component of the nursing care of patients who are hospitalized. Monitoring vital signs is to obtain basic indicators of a patient's health status and to allow a prompt detection of delayed recovery or adverse effects and for early intervention [1]. This process is termed an Early Warning Sign (EWS) introduced by Morgan, Williams, and Wright in 1997 [2]. They introduced five physiological parameters of a patient's vital signs: heart rate, respiratory rate, blood pressure, temperature, and consciousness level. Later this term was renamed Modified Early Warning System (MEWS). It uses vital signs to categorize the severity of a patient's physiological derangement and illustrates the clinical impact and making management decisions [3]. The purpose was to help nurses to use the algorithm and monitor all the adult patients admitted to the hospital so that timely action can be taken to improve the outcome. Also, to avoid unplanned ICU transfers, cardiac arrest, and death [4]. Hence, it is important that nurses be provided with adequate resources, ongoing training, and education to effectively assess patients and to early identify if they are deteriorating [5].

2. Literature Review

The purpose of the innovation of early warning signs was to improve patient outcomes through nurses' education and training. This training provides nurses with the ability to recognize subtle changes and promptly call a code blue or Rapid Response Team (RRT). To the best of the researchers' knowledge few tertiary care hospitals in Karachi, Pakistan have an RRT team, while other hospitals have an ICU team consisting of doctors and nurses who have been called for CPR and intubation.

Andersen *et al.* (2019), stated that at least 2000 patients experience cardiac arrest in hospitals each year, with 30 days survival rate of around 28%. Subtle changes appear 6 - 8 hours before the patient's condition worsens significantly [6]. Similarly, Bingham *et al.* (2018) reported that unexpected cardiac arrest rates, unplanned intensive care unit (ICU) admission rates, and in-hospital mortality identified through their research were potentially avoidable if these signs were recognized early [7].

A scoping review by Esmaeilzade *et al.* (2022) highlighted that failure to rescue or mortality and morbidity after medical complications or deterioration, and subsequent patient rescue, as a process of recognizing, communicating, and organizing bedside resources are required to be focused and improved [8]. The re-

searchers further draw attention to patient safety, and patient rescue dependent on the clinical context, especially on the structural, organizational and behavior nature of the hospital and its staff. Key features of the clinical setting include staffing patterns (such as nurse-to-patient ratios), availability of clinical resources, clinical communication, and performance expectations [8].

Al-Kalaldeh *et al.* (2019) conducted a quasi-experimental study to assess the impact of introducing MEWS (Modified Early warning Signs) on emergency department nurses. Their study supported the effectiveness of training for the early detection of patient deterioration. This training improved nurses' performance and fostered their confidence and a better understanding of their role as Emergency Nurses [9].

On the contrary, Bedoya *et al.* (2019) showed in one of the studies that both the academic and the community hospitals showed that the EWS implementation had no significant impact on clinical outcomes [10]. Though MEWS is widely used in the UK, previous studies have not shown any real-world effects [10].

3. Methods and Material

A comprehensive literature review was done to identify the literature focusing on knowledge, practice, and attitude toward early warning signs amongst caregivers. The main objective was to review articles regarding the education and training of nurses and their impact on patient safety and outcome.

3.1. Search Terms and Strategy

To obtain background information on EWS, a literature search was carried out in various databases; identified records, the Cumulative Index to Nursing and Allied Health Literature (CINHAL), Google Scholar, PubMed, Science Direct, and Sage. The search provided 20,389 articles. The search area was narrowed from 2017 to 2022. The keywords used were “prevalence” AND “unplanned ICU admission”, “the importance of early warning signs”, “outcome failure in rescue”, “patient deterioration, communication”, “improvement in early detection” AND “patient outcome admission” AND “early warning signs” AND “Pakistan”. A total of 490 articles were retrieved. After the analysis process, based on the inclusion and exclusion criteria, 33 articles were saved and analyzed. These are cited in this manuscript.

3.2. Inclusion Criteria

- Paper published within the years 2017-2022;
- Unplanned ICU admissions/transfers;
- The importance of early warning signs;
- Outcome failure in rescue;
- Role of communication (SBAR) improvement in early detection of patient outcome;

Data from Pakistan.

3.3. Exclusion Criteria

EWS in Pediatrics;
Unavailability of full texts;
Grey Literature Dissertations;
Obstetrics and Gynaecology;
Patient was admitted to ER;
Patients in operation theater;
A language is other than English.

3.4. Prevalence

Every year, in hospitals in the United Kingdom, over 60,000 patients deteriorate to the point where they require intensive care admission. Late or missed detection of deterioration is associated with poorer patient outcomes, including higher mortality [11]. Reporting similar findings Langkjaer *et al.* (2021) indicated that in their study the majority (84%) of patients had abnormal vital signs before they land up into serious adverse events which can be prevented if detected and acted upon by the healthcare providers [12]. Kamio *et al.* (2018) study in Denmark has indicated that vital signs are not measured, recorded, or reported consistently. Thus, poor monitoring has been shown to be the leading cause of preventable deaths in hospitals [13]. Le Lagadec and Dwyer (2017) conducted a systemic review. In this study, the researchers investigated the effectiveness of the adult EWS charts in detecting in-hospital deterioration. Eighty-five percent (85%) of serious adverse events (SAEs) were anticipated by abnormal vital signs and bedside vital signs observation charts formed the basis of EWS [14].

Liu *et al.* (2020) conducted a systemic review comparing the early warning scoring systems for inpatients with and without infection. They indicated in their studies that when a patient deteriorates clinically, the patient can either die or be transferred to the ICU, which affects 3% to 5% of patients admitted out of ICU and is correlated with increased mortality and morbidity [15]. These risks typically increase in patients with severe infections or sepsis, resulting in 50% or more in-hospital deaths. Hours before deterioration, many patients give signals that can be detected by vital signs or laboratory tests [16].

3.5. Use of Early Warning Systems

Delayed recognition of the patient in the general ward may lead to unplanned ICU admission. It is a priority of many healthcare organizations to identify patient deterioration. The capability of nurses to respond instantly to clinical decline display the facility's quality of care and strengthens public confidence in the healthcare organization. Patient deterioration may be preventable and can often attribute to human error as inadequate nursing skills, infrequent patient monitoring, poor documentation, and a lack of timely action to intensify patient

deterioration.

A retrospective observational study of all the unplanned ICU admission was conducted by Kamio *et al.* (2018). The researchers wanted to examine the frequency of vital signs (body temperature, pulse rate, respiratory rate, and blood pressure) which were documented on the electronic health record of each patient within 24 hours before they get transferred to ICU with or without emergency intubation. It was concluded from the study that respiratory rate was less frequently checked by the nurses as they feel it is a troublesome task [13].

Vincent *et al.* (2018) in their study demonstrated that the importance of monitoring patients in the general ward, particularly respiratory parameters, can help in identifying deterioration. In general, it is limited to continuous monitoring of simple physiological parameters, namely heart rate, respiratory rate, and temperature. Yet, some patients are at risk of deterioration. In addition, the researcher used a chain of prevention concepts that are linked together and defined the steps that would reduce the likelihood of patient deterioration. These steps include improving detection of airway deterioration, pulse oximetry, capnography, when to Call for Help (RRS), and the early warning levels were used as a guide to determine what response is required, whom to call, and what to do before help arrives. Hence, they concluded that there are no single parameters available to identify the early deterioration it's a combination of all the variables that help to reduce rescue to failure [16].

3.6. Empower Nurses

Granitto *et al.* (2020) explored the role of nurses in identifying and responding to the patient in the medical and surgical wards where the nurse patient ratio was 1:5 (one nurse five patients). This study emphasized that the facilitators and barriers to vital signs safety protocols were influenced mainly by three characteristics 1) nursing unit culture, 2) RRT members' characteristics, 3) knowledge of RRT protocols and procedures motivating them for more knowledge and providing them the confidence to activate the RRT. These characteristics have shown a positive impact on overall hospital mortality and decreased the number of code blue [17].

Mushta *et al.* (2018) based on their research reported that in Canadian acute care hospitals, eight percent (8%) of patients experience one or more adverse events. Of these 36.9% of events were highly preventable. The reason was that the nurses work closely with the patients, so the primary responsibility for failure to rescue lies with the nurses to protect the patients from harm [18]. In phenomenology research by Burns *et al.* (2018) where nurses demonstrated that practicing the EWS assessment improved early recognition. It had a great impact on nursing practice and improved collaboration, communication, and supported the culture of proactive to early response to subtle changes [19].

To empower Nurses, it is also important to improve the early detection of patients through training and education, incorporate clear and concise communication through using the framework of Situation, Background, Assessment,

Recommendation (SBAR tool), identifying barriers and facilitating factors related to apprehensions to assist the nurse to enhance their knowledge, attitude, and practice to ensure patient safety.

4. Factors That Influence Nurses to Enhance EWS to Improve Patient's Outcome

4.1. Ongoing Training and Education

Nurses' capacity building is critically important to develop strong assessment skills for early recognition of subtle changes. Thus, the ongoing education and training through simulation, role play, and development of a module help nurses build their confidence, and improve practice would ultimately improve the patient outcome [17].

4.2. In-Service Training

In-service training is another way to help nurses improve their professional skills, and it is vital that healthcare providers keep themselves up to date on best practices [20]. The EWS uses vital signs to understand the severity of the patient's physiological parameters and their impact on the outcome. Recording and documentation of vital signs influence decision-making. Thus, improving the quality of vital signs and documentation requires continuing education of healthcare professionals.

4.3. Just-in-Time Training (JITT)

Just-in-time training has been used in several industries, with the greatest success reported in high-risk professions including the military, manufacturing, and aviation. This educational delivery method makes it easier to deliver time-relevant and job-based education, with a greater focus on offering on-the-job training as needed. JITT has previously been used in the healthcare industry to teach workers about quality improvement and high-risk, low-volume medicines. Hence, effective implementation of JITT helps to educate nurses to identify deteriorating patients and know how to manage them effectively and confidently [21].

4.4. Relationship between Nurse's Knowledge and Initial Assessment

Purnamasari and Aryan, (2020) conducted a study in Jakarta. The goal of the study was to determine how nurses understand the relationship between initial assessment and the use of EWS in the hospital. It was reported that the decision-making and professional abilities of nurses might be influenced by the learning experiences they have on the job. It is assumed that the nurse with the highest level of training, education, and expertise will be proficient in the nursing profession [22].

To assure that patients receive safe treatment in hospitals, nurses must possess critical thinking. The identification of deteriorating patients and critical thinking

skills are directly related to patient safety. Thus, it is important that the undergraduate nursing programs should prepare nursing students to think critically [23]. These abilities are anticipated to grow during an undergraduate degree as students increase their knowledge and comprehension of nursing science, practice, and theoretical concepts. It also reported that when undergraduates receive better understanding and training with ongoing support from senior leadership it improves patient outcomes [24]. The process of enhancing nurses' knowledge is required to be continued through staff education and training. This makes it possible for nurses to assess changes in physiological parameters and detect subtle indicators in their patients. Staff knowledge and critical thinking directly correlate with positive patient outcomes [23].

4.5. Impact of Knowledge, Attitude and Practice in Assessing Deteriorating Patients

Ludin (2018) reports that 80% of in-hospital cardiac arrests are foreseeable as patients often have noticeable deterioration prior to the event. This is a really alarming sign if clinically competent care is given with an uncaring attitude, it affects the outcome. The study findings also revealed that there is no association observed between knowledge and practice but there was a positive relationship seen between attitude and practice [25].

Olang *et al.* (2019) used a quantitative descriptive study approach to assess the nurses' knowledge of early warning scores. The researchers indicated in their study that most nurses were at an adequate level regarding knowledge of EWS. Moreover, the study recommended exploring the nurses' compliance with EWS implementation in hospitals and how it relates to patients' deterioration [26]. Hence, having knowledge is important but using it to improve the practice is the most important.

4.6. Barriers Related to Use of EWS

Le Lagadec and Dwyer, (2017) claim that various methods for monitoring vital signs have been implemented across the United Kingdom that incorporate early warning scoring systems designed to monitor the "Track and Trigger" System [14]. Track sign means deterioration and "Triggers" mean a rapid response to improve patient safety. The frequency of vital signs recording is based on the physician's order or the patient's own condition. They further stated that failure to recognize the significant changes in the vital signs can cause delays which can negatively impact patient safety [14].

Olsen *et al.* (2019) based on their systematic review identified the following factors that hinder the assessment of early deterioration [27].

- 1) Due to the heavy workload, the measurement of the vital signs was performed by those who were least competent, such as students and healthcare assistants, which caused a delay between the measurements and their interpretation.

- 2) Audits focusing only on nursing assignments and not on the behavior of

the answering physician were the cause of the conflict. The EWS audits lost the impact.

3) Interprofessional mistrust and difficulties in collaboration a nurse who called the RRT was scolded, criticized, or treated negatively.

4) Barriers included weak governance related to a lack of equipment or protocols, poor logistics, and a lack of commitment from senior personnel and management.

5) Less focus on training and education in managing patients who are deteriorating and educating people about RRS.

4.7. Handover Communication

To maintain continuity of care, Handoff or handover is an essential routine clinical practice for the effective transfer of patient information between health-care professionals. When a patient is “handed over from an outgoing nurse to an incoming nurse between shifts, communication about the patient’s condition has been important to ensure continuity of care and patient safety. However, very limited research has been done to look at nurses’ handover practices. Thus, it is an important clinical practice to be researched [28].

A retrospective qualitative design and phenomenology methodology were used in the study which was conducted in Sweden. The purpose of the study was to investigate the differences in critical care nurses’ experiences with patient handovers during transfers to a critical care ward. The researchers have shown that the clinical handover involves the transfer of accountability and responsibility for patient care, it is a crucial and high-risk communication act. The ability of nurses to transfer clinical care is inextricably influenced by their perspectives and communication skills [29].

4.8. Nurse Staffing Levels, Missed Vital Signs

The study tried to look at whether the differences in nurse staffing levels in general hospital wards are related to missed opportunities to provide nursing care or delays in doing so by monitoring vital signs and taking action on them were given special attention, as well as determining whether or not variations in staffing. This study provided evidence that higher RN staffing levels are associated with lower mortality [30]. Allen (2020) reported that deficiencies in nurses’ identification and response to early signs of clinical deterioration in acute care facilities lead to an unsafe state in hospitalized patients. Factors contributing to nurses’ failure to recognize and respond to early warning signs noted were inadequate monitoring, lack of clinical knowledge, lack of experienced nurses, lack of nurses’ confidence, workload, and poor communication [31]. On the contrary Dall’Ora *et al.* (2021) reported that measuring and recording vital signs is a time-consuming activity and nurses believe that several assessments are unnecessary for patients at low risk. Therefore, nurses give more priority to tasks other than to vital signs. This results in poor patients’ outcomes [32].

4.9. Long Shift Hours

A retrospective observational study was conducted in a large acute hospital in London to determine the relationship between nurses who worked shifts of at least 12 hours and the timely monitoring of vital signs. The study indicated that on the days when nurses worked for long hours, the risk of delaying vital signs observations is higher, signifying lower job performance. While longer shifts are thought to require fewer staff resources to maintain nurse-to-patient ratios, staff become less productive [32]. O Neill *et al.* (2021) in their qualitative study explored why nurses fail to escalate the care according to EWS protocol. The authors report that frequently feeling a lack of confidence and increased workload nurses delay in recognizing and responding to the EWS. This leads them to a failure to rescue patients [5].

4.10. Communication

According to Allen (2020), the teamwork of healthcare professionals (nurses and doctors) is core to meeting common goals. Factors that impair effective communication among the care team include nurses feeling anxious, uncomfortable, or feared being ridiculed. Consequently, patient care gets delayed [31]. A structured communication SBAR (Situation, Background, Assessment, Recommendation) tool is developed which is widely used in the USA and adopted by the UK. This tool helps healthcare professionals to have clear and effective communication between nurses and physicians, particularly when patients shift from one area to another. Their study demonstrated that nurses often forget important information when reporting to a doctor after hours. To ensure accurate communication incorporating EWS into an SBAR tool is suggested for reporting early signs of deterioration, and it is expected that nurses will be able to respond to early intervention. This structured communication model in combination with EWS will enhance early reporting of physiological changes and decrease the failure to rescue [33].

5. Conclusion

Most of the studies had reviewed literature in a qualitative retrospective observational study, content analysis, mixed method, and quasi-experimental study. However, there is a need to identify the impact of compliances in early recognition and response to deteriorating patients. The patients may respond differently to treatment according to their condition and may show a few warnings like physiological changes which may be missed and lead to unplanned ICU admission or death. The literature review identified that long hours of shift, nurse staffing levels, missed vital signs, lack of nursing training and education, and communication impact nurses' ability to recognize and respond to early warning signs.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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