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Review Article

Effects of Early Warning Score (EWS) on outcomes of inpatient services

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Abstract

The decrease in patient morbidity and mortality is influenced by quality inpatient services. Hospitalized patients can be in stable or unstable conditions. There is a phenomenon of patients whose condition is not stable being placed in inpatient, due to the limitations of the intensive care unit. These patients are at risk for worsening clinical conditions that increase morbidity and mortality. One of the efforts to improve quality related to patient safety in hospitals is the application of the Early Warning Score (EWS) including in inpatient installations. An early warning score is one of the assessment parameters in hospital accreditation and quality of care. The aim of this literature review is to explain effects of early warning score (EWS) on outcomes of inpatient services. This study uses a literature study approach with a descriptive review type. The articles used are international with a range of years from 2011-2021. The databases used are Proquest, PubMed, and the Google Scholar search engine. Implementation of EWS has resulted in higher utilization of the rapid response system but a lower incidence of cardiopulmonary arrest; it is associated with lower mortality rates, and improved patient safety and clinical outcomes. The results obtained that there is a correlation between the EWS value with mortality but not with the length of stay. Research results related to the correlation of EWS with referrals to ICU/HCU and activation of code blue cannot be analyzed so that in the future a larger number of samples and case variations are needed. A clinical flow can be created in advance so that good patient management can be carried out if the EWS score is higher. An early Warning Score (EWS) can be used to predict the patient outcome which is an indicator of inpatient services.

INTRODUCTION

The decrease in patient morbidity and mortality is influenced by quality inpatient services. Hospitalized patients can be in stable or unstable conditions. There is a phenomenon of patients whose condition is not stable being placed in inpatient, due to the limitations of the intensive care unit. These patients are at risk for worsening clinical conditions that increase morbidity and mortality. One of the efforts to improve quality related to patient safety in hospitals is the application of the Early Warning Score (EWS) including in inpatient installations.[1] An early warning score is one of the assessment parameters in hospital accreditation and quality of care.[2] An early

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warning score (EWS) is a parameter used to assess the deterioration of the patient's physiological condition, namely identifying and responding to patients who come with acute disease conditions. The EWS assessment was carried out based on seven parameters for assessing the patient's physiological response consisting of respiration, systolic blood pressure, temperature, pulse, oxygen saturation, supplemental oxygen, and the patient's level of consciousness. Adult Early Warning Score (AEWS) is a score monitoring tool that is specifically used to identify and assess changes in the condition of adult patients (over 15 years of age) using physiological parameters, such as respiration, peripheral oxygen saturation, oxygen use, systolic blood pressure, pulse/ heart rate, consciousness, and temperature.[3]

The early warning score (EWS) can be used to predict the short-term and long-term probability of death. This is associated with abnormality in the patient's high vital signs, regardless of the intervention or timeliness of medical personnel. The early warning score (EWS) can be used as a predictor of patient outcomes including Length of Stay (LOS), mortality within 28 days or Net Death Rate (NDR), and HCU/ICU admission and activation of a code blue.[4] Based on the results of existing research, the impact of the application of EWS on patient clinical outcomes is still varied so an overall conclusion cannot be drawn. The results of previous studies found that there was a significant difference between the NDR and LOS of patients in the hospital after the application of EWS. Significant differences were found in the increase in code blue activation and admission to HCU. The implementation of the EWS has resulted in higher utilization of the rapid response system, resulting in a lower incidence of cardiopulmonary arrest. The aim of this literature review is to explain effects of early warning score (EWS) on outcomes of inpatient services.[6]

METHODS

This study uses a literature study approach with a descriptive review type. The articles used are international with a range of years from 2011-2021. The databases used are Proquest, PubMed, and the Google Scholar search engine. The strategy used to search the literature is by using the keywords "early warning score" AND "healthcare quality". The inclusion criteria in this study were full text, randomized control trial, quasi-experimental and English. While the exclusion criteria are articles with systematic reviews, literature reviews, and case reports. It was found that 2,136 articles came from the PubMed database, 38,760 articles came from the Proquest database, and 19,400 articles came from the Google Scholar search engine, so the total articles found were 60,260 articles. After re-screening the 60,260 articles based on the exclusion criteria, it was found that 31,252 had the search exclusion criteria. A total of 3,439 articles were screened again and resulted in 5 articles that met the researcher's inclusion criteria.

RESULT

Based on the search results obtained from Google Scholar, Proquest, and Pubmed using the keywords used in this literature review using Indonesian and English. The mortality rate of inpatients after the use of AEWS is included in the low category with a gross death rate of 3.2 per 1000 visits or the number of deaths of inpatients aged over 15 years as many as 12 people.[7] An early Warning Score (EWS) can be used to predict the patient outcome which is an indicator of inpatient services. The results obtained that there is a correlation between the EWS value with mortality but not with the length of stay.[8] Research results related to the correlation of EWS with referrals to ICU/HCU and activation of code blue cannot be analyzed so that in the future a larger number of samples and case variations are needed. A clinical flow can be created in advance so that good patient management

can be carried out if the EWS score is higher.[9]

Table 1
Data Extraction Table

No.	Title, Author and Year	Design	Sample	Results
1.	Title : Impact of Early Warning Score Model Implementation on Inpatient Service Quality Author : Sri Wulan Megawati, Septy Dian Sondari, Irisanna Tambunan Year : 2020	Randommized Controller Trial	Samples obtained for one month amounted to 278. with the criteria the patient is an adult (≥16 Years) but not included in the emergency room, intensive care unit, children's room (i.e.<16 Years old), pregnant women, and patients with chronic obstructive pulmonary disease (COPD).	The results obtained indicate that there is no correlation between the EWS value and length of stay, while for mortality there is a correlation. Referrals to the ICU/HCU and activation of code blue cannot be analyzed because of the homogeneity of the data so a larger number of samples and case variations are required. EWS can be used as a predictor of inpatient service quality by looking at patient outcomes.
2.	Title : The Effect of Using Adult Early Warning Scoring (AEWS) on Mortality Rates at Bali Mandara Hospital. Author : Budi Ayu Mira Dewi, I Made Dwie Pradnya Susila,A.A. Kompiang Ngurah Darmawan Year : 2020	One Groups Pre test-Post test	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. The tools used in data collection are observation sheets and medical record data.	The mortality rate before the use of AEWS was included in the low category with a crude death of 8.8 per 1000 inpatient visits or as many as 21 people, while the mortality rate after the use of AEWS was included in the low category with a crude death of 3.2 per 1000 inpatient visits or as many as 12 people.
3.	Title : Evaluasi Penerapan Early Warning Score Di Ruang Rawat Inap Dewasa Author : Sri Wulan Megawati , R.Siti Jundiah , Nur Intan HHK , Rizki Muliani Year : 2021	Quasi Experimental	The sample in this study was 245 patients. Data collection was carried out during the period (1 month) between 6 August – 6 September 2020.	The implementation of EWS in hospitals has not been carried out properly, it can be seen from the results that all documented patient EWS sheets are incomplete.
4.	Title : Adjusting Early Warning Score by clinical assessment: a study protocol for a Danish cluster- randomised, multicentre study of an Individual Early Warning Score (I-EWS)	Quasi Experimental	The main hypothesis is that I-EWS will be non-inferior to the existing NEWS algorithm regarding 30- day mortality but the addition of clinical assessment in the I-EWS results in lower scores, fewer escalations, and consequently that	The I-EWS study investigates the effect of integrating a clinical assessment on mortality in a head to head compar- ison with the internationally used NEWS, which includes the opportunity to use CROS. Caring for the right patient at the right time could possibly allow for reallocation of resources. If our hypothesis is confirmed, considerations should

No.	Title, Author and Year	Design	Sample	Results
	Author : Pernille B Nielsen , Martin Schultz, Caroline Sophie Langkjaer, Anne Marie Kodal, Niels Egholm Pedersen,John Asger Petersen, Theis Lange, Michael Dan Arvig,Christian Sahlholt Meyhoff, Morten Bestle Year : 2020		patients on average are scored fewer times per day when I-EWS is used rather than NEWS.	be given towards allowing nursing staff to include their clinical assessment in TTS.
5.	Title : Evaluation of the Initial General Ward Early Warning Score and ICU Admission, Hospital Length of Stay and Mortality. Author : Anneke Gielen, MD Kristine Koekkoek, MD Marijke van der Steen, MD Martijn-Looijen, BSc, Arthur R.H. van Zanten, MD, PhD Year : 2021	Quasi Experimental	We performed a retrospective cohort study of adult patients admitted to a general hospital ward between July 1, 2014–December 31, 2017. Data were obtained from electronic health records (EHR). The primary outcome was in-hospital mortality. Secondary outcomes were ICU admission and hospital LOS. We categorized patients into three risk groups (low, medium or high risk of clinical deterioration) based on EWS.	Our findings suggest that an initial high-risk EWS in patients admitted to a general hospital ward was associated with an increased risk of in-hospital mortality, ICU admission, and prolonged hospital LOS. Close monitoring and precise documentation of the EWS in the EHR may facilitate predicting poor outcomes in individual hospitalized patients and help to identify patients for whom timely and adequate management may improve outcomes.

The results obtained indicate that there is no correlation between the EWS value and length of stay, while for mortality there is a correlation. Referrals to the ICU/HCU and activation of code blue cannot be analyzed because of the homogeneity of the data so a larger number of samples and case variations are required. EWS can be used as a predictor of inpatient service quality by looking at patient outcomes. The mortality rate before the use of AEWS was included in the low category with a crude death of 8.8 per 1000 inpatient visits or as many as 21 people, while the mortality rate after the use of AEWS was included in the low category with a crude death of 3.2 per 1000 inpatient visits or as many as 12 people. The I-EWS study investigates the effect of integrating a clinical assessment on mortality in a head to head compar- ison with the internationally used NEWS, which includes the opportunity to use CROS. Caring for the right patient at the right time could possibly allow for reallocation of resources. Initial high-risk EWS in patients admitted to a general hospital ward was associated with an increased risk of in-hospital mortality, ICU admission, and prolonged hospital LOS. Close monitoring and precise documentation of the EWS in the EHR may facilitate predicting poor outcomes in individual hospitalized patients and help to identify patients for whom timely and adequate management may improve outcomes.

DISCUSSION

Hospital service standards are grouped based on patient safety goals, patient-focused service standards, national programs, and the integration of health education in hospital services. One of the hospital accreditation assessments contains the application of early detection of changes in patient conditions using the Early warning score.[2] An early warning score is a parameter used to assess the deterioration of the patient's physiological condition, namely identifying and responding to patients who come with or are in acute disease conditions. The early warning score assesses the patient's 6 physiological components, namely consciousness, systolic blood pressure, pulse, oxygen saturation, respiratory rate, and temperature.[1,3]

In Indonesia, there is no definite data regarding the mortality rate in all hospitals. In one Indonesian hospital, it was found that the 2016 GDR showed 14.73 while the NDR value was 7.73, which means it is still high beyond the minimum standard for hospital services.[4] The EWS assessment was carried out based on seven parameters for assessing the patient's physiological response consisting of respiration, systolic blood pressure, temperature, pulse, oxygen saturation, supplemental oxygen, and the patient's level of consciousness.[5] The EWS can be used to predict the short-term and long-term probability of death.[10] It is associated with abnormalities in the patient's vital signs, regardless of the intervention or timeliness of medical personnel. The early warning score (EWS) can be used as a predictor of patient outcomes including Length of Stay (LOS), mortality within 28 days or Net Death Rate (NDR), and HCU/ICU admission and activation of a code blue.[9]

Based on the results of existing research, the impact of the application of EWS on patient clinical outcomes is still varied so an overall conclusion cannot be drawn. The results of previous studies found that there was a significant difference between the NDR and LOS of patients in the hospital after the application of EWS.[11] Significant differences were found in the increase in code blue activation and admission to HCU. Implementation of EWS has resulted in higher utilization of the rapid response system but a lower incidence of cardiopulmonary arrest; it is associated with lower mortality rates, and improved patient safety and clinical outcomes.[12] The EWS assessment was carried out based on seven parameters for assessing the patient's physiological response consisting of respiration, systolic blood pressure, temperature, pulse, oxygen saturation, supplemental oxygen, and the patient's level of consciousness.[13] The EWS can be used to predict the short-term and long-term probability of death. This is associated with abnormalities in the vital signs of patients who are at high risk of death, regardless of intervention or timeliness of medical personnel.[14]

CONCLUSION

An early Warning Score (EWS) can be used to predict the patient outcome which is an indicator of inpatient services. The results obtained that there is a correlation between the EWS value with mortality but not with the length of stay. The results of the study related to the correlation of EWS with referrals to the ICU/HCU and activation of code blue could not be analyzed so that in the future a larger number of samples and case variations are needed. A clinical flow can be made in advance so that good patient management can be carried out if the EWS score is higher. The ability of nurses to identify the patient's condition and fill out the Early Warning Scoring observation sheet, the initial condition of the new patient arriving at the hospital and the history of initial treatment when the patient was found (primary survey), the existence of a Code Blue system or an adequate intensive care room in the hospital as a step when a high EWS score is found.

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CONFLICT OF INTEREST

Neither of the authors has a conflict of interest that would bias the findings presented here.

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