

## IMPLEMENTATION OF THE PEDIATRIC EARLY WARNING SYSTEM IN CHILDREN WITH CHRONIC DISEASES: SYSTEMATIC REVIEW

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### ABSTRACT

Pediatric early warning system (PEWS) can be an early detection of worsening in pediatric patients with chronic diseases, quantitative studies related to the implementation of PEWS in children with chronic diseases have been carried out in various countries including the USA, Guatemala and China. The purpose of this review is to determine the implementation of PEWS in children with chronic diseases. This literature study uses a review method approach, data sources through Proquest, Science Key, Pubmed, JStore and CHINIL. Search articles using Indonesian and English keywords. Inclusion criteria and articles analyzed: research on the topic of PEWS in children with cancer. Articles obtained A total of 1,260 journals were taken. However, only 22 journals met the criteria for the last 10 years. In the end, only 6 journals that met the inclusion criteria were analyzed. The results of the analysis show that PEWS is also suitable for use in low-income countries, or in developing countries. The currently developed PEWS is in accordance with the criteria for pediatric patients treated in hemato-oncology wards, and can reduce hospital costs in the country in addition to optimizing existing resource.

**Keywords:** Implementation, Pediatric Early Warning System, Children With Cancer, Chronic Disease

### INTRODUCTION

The accurate and reliable identification of critically ill or deteriorating children has been a challenge and a weakness in pediatric practice for some time. Pediatric patients who require intensive care often show signs of physiological and behavioral disturbances prior to cardiopulmonary arrest. It is reported that between 0.7% and 3% of children hospitalized are threatened with pulmonary cardiac arrest and require immediate medical assistance. Although it is

rare in children, discontinuation of cardiopulmonary results in poor outcomes and only 15%-36% survive. In adult patients, preventive measures can reduce unrelenting events and improve mortality rates, but are highly dependent on the timely observation and referral of at-risk patients and the rapid response of the reaction team (Dewi, 2016).

Early detection of this clinical worsening, if followed by appropriate actions, can reduce the risk of unexpected clinical conditions. Early recognition of the

right client in the right clinical setting, followed by appropriate nursing care is critical and important in providing safe and effective acute care for the first time to clients (Capan et al., 2015).

An early warning system can improve communication between nursing staff and doctors and can help identify populations at high risk (Skaletzky et al., 2012). Several studies have developed and validated a scoring system with the same purpose used for infant and pediatric patients, namely the pediatric early warning score/PEWS (Monaghan, 2005). Based on the foregoing, researchers are interested in conducting a systematic review study related to the implementation of PEWS.

## **RESEARCH METHODS**

This literature review was carried out using a systematic review approach, this approach was considered appropriate to achieve the objectives of the needs of this study, taken from several sources which were integrated into the findings in the latest report. There are five steps carried out starting from the study of literature, finding and searching for sources, selecting the most relevant sources, organizing and analyzing, and finally making a summary. This literature review focuses on information related to the implementation of the Pediatric Early Warning System (PEWS) in pediatric cancer patients. Articles searched based on the following databases: Proquest, Science Key,

Pubmed, JStore and CHINIL. The keywords used are the following: PEWS, Children, Cancer and Quality of life. The research design includes quantitative and qualitative research, RCTs, and systematic reviews published in the last ten to

five years. A total of 1,260 journals were taken. However, only 22 journals met the criteria for the last 10 years. In the end, only 6 journals that met the inclusion criteria could be analyzed. Table 1.1 describes the selection of journals found. The next step is to conduct a content analysis including methods, samples and settings, inclusion criteria and findings. The results are presented in a table that is presented by grouping similar findings. The last step is to make a summary of the findings.

## **RESEARCH RESULTS**

Of the 6 selected studies, there are 5 articles of quantitative studies and 1 article of qualitative studies. The approach used is retrospective (n=4), descriptive (n=1) and another with a qualitative approach (n=1). All research obtained came from outside (Guatemala, USA and China). It was carried out in the period from 2005 to 2020. While the search with an index in Indonesian was not found by the author. All study samples were pediatric patients with chronic diseases using the Pediatric Early Warning System (PEWS) monitoring. The details of the articles obtained will be explained in the following table 1.1.

The majority of studies assessed only single factors and did not provide a comprehensive view of the instruments used in PEWS. The analysis found that the PEWS instrument had been applied in the realm of pediatric inpatient care and the benefits were felt, especially in improving the quality of service and effectiveness of use for hospitals with limited resources.

PEWS is also suitable for use in low-income countries, or in developing countries. The article (Demmel et al., 2010) mentions that the parameters used in PEWS include

scores in the assessment of the results of observations on the eight PEWS parameters (PEWS score Key), where the decrease and increase in the normal value of the observations are 2-1-0-1-2, a value of 0 in the middle is a normal value, 2 and 1 is a value below normal, while 1-2 is a value above normal. The score obtained for each parameter is

calculated and gets the result value of the entire score.

The division into 5 age categories, namely, 0-3 months, 4-11 months, 1-4 years, 5-12 years, and 12 years and over because each age category of children has different normal values for physiological changes in their bodies, the division of groups age for accurate results.

**Tabel 1.1 Summary of articles on the implementation of a pediatric early warning system in pediatric patients with cancer**

No	Researcher	Title	Published Year	Location	Design	Method	Respondent	Sampling Technique	Inclusion Criteria	Findings
1	Anguinik. A, Arango. R, Moran. E, Kussman. AH, dkk	Cost-benefit Analysis of Implementing a Pediatric Early Warning System at a Pediatric Oncology Hospital in a Low-middle Income Country	2019	Pediatric oncology hospital in Guatemala	Quantitative	Retropective Cohort	2280	Total Sampling	Cost evaluation PEWS benefit	Implementation of PEWS in pediatric oncology hospitals in low-income countries can reduce hospital costs, improve quality of care and optimize resources.
2	Zou.PL, Liu. YL, Li. Hu	Establishment and Utility Assessment of Posterior Reversible Encephalopathy Syndrome Early Warning Scoring (PEWS) Scale Establishment and Utility Assessment	2019	PLA Army General Hospital, Peking Union Medical College Hospital, Xin Hua Hospital, and Yu Ying Children's Hospital of Wenzhou Medical University	Quantitative: Literature Review	Retropective Analysis	31	Total Sampling	PEWS Syndrome Encephalopathy	The PEWS scale can detect Posterior Reversible Encephalopathy Syndrome early on so that prophylactic interventions can be given so as to improve the prognosis.

									ent of PEWS Scale	
3	Demmel. MK, Williams. L, dan Flesch. L	Implementation of The Pediatric Early Warning Scoring System on a Pediatric Hematology/Oncology Unit	2010	Royal Alexandra Children's Hospital and Sussex University Hospitals NHS	Qualitative	Descriptive	299	Simple Sampling	PEWS parameter PICU transfer Fast reaction team activation/ Code Blue.	The application of PEWS in the pediatric Hematology Oncology unit was successfully implemented in increasing the activation of the code blue system's rapid reaction team, thereby reducing the number of patients requiring PICU nurses.
4	Angulnik. A, Robies. NML, Forbes. WP, Vasquez. JSD, Mack. R, dkk	Improved Outcomes After Successful Implementation of a Pediatric Early Warning Systems (PEWS) in a Resource-limited Pediatric Oncology Hospital	2015	Pediatric oncology hospital in Guatemala	Quantitative	Retrospective Cohort	5157-5130	Total Sampling	PEWS parameter PICU transfer Resource limitation	Describe the successful implementation of PEWS, reduce clinical damage, transfer effectiveness to the PICU and improve the quality of hospital services with limited resources
5	Angulnik. A, Naskarni. A, Robies. NML	PEWS Aid in Triage to Intermediate Versus Intensive Care for Pediatric Oncology Patients in Resource-limited Hospitals	2018	Pediatric oncology hospital in Guatemala	Quantitative	Retrospective	39	Total Sampling	PEWS parameter	The Intermediate Room can assist in the monitoring and care of pediatric patients in hospitals with limited resources.

6	Graetz. D, Kaye. CE, Garza. M, Rodrigu ez. M, Vasquez . JS.D, et. al.	Qualitative Study of PEWS on Interdisciplinary Communication in Two Pediatric Oncology Hospitals with Varying Resources	2020	RS Pusat Kanker di USA dan Guatemala	Qualitative	Semi-structured	83	Purposive Sampling	Hierarchy of Empowerment, quality and method of communication, "Triggers"	PEWS improves interdisciplinary communication in managing resource constraints.
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## DISCUSSION

### Current Evidence of PEWS Implementation

Implementation of PEWS in the tertiary area of the hospital reduces the possibility of dying conditions during the PICU admission process, reduces the need for PICU intervention and reduces the length of stay in the PICU (Sefton et al., 2014). According to Roland (Roland, 2017), the implementation of PEWS has increased since 2005. This implementation has become less consistent with the many variations in the scale of the PEWS used, the response activation criteria, availability of the Rapid Response Medical Team (TMRC) and membership of the TMRC. There should be national coordination for evaluation of PEWS implementation, impact and effectiveness of standardized PEWS programs in various environments where sick children are cared for. It is supported with the research revealed by Anguilnik, et al., (Agulnik et al., 2017, 2018, 2019). The application of PEWS in the pediatric hemato-oncology unit is strengthened by research conducted by Demmel et al., which is used as a measurement parameter (Demmel et al., 2010)

### PEWS in children with cancer

Children with Cancer, Cancer is a neoplasm characterized by uncontrolled growth of anaplastic

cells that invade surrounding tissues and tend to spread to distant sites in the body. This uncontrolled growth is caused by damage to Deoxyribose Nucleic Acid (DNA) which causes mutations in vital genes that control cell division (Hanahan & Weinberg, 2011). Data from the Indonesian Children's Oncology Foundation shows that 2-3% of the number of cancer cases in Indonesia occur in children, which is around 150 out of 1 million children. Therefore, it is estimated that every year there are 4,100 new cases of cancer in children in Indonesia (Umiati et al., 2010). The currently developed PEWS is in accordance with the criteria for pediatric patients treated in hemato-oncology wards, the article on the cost-benefit analysis of PEWS at an Oncology Hospital in Guatemala, 2019 states that PEWS can reduce hospital costs in the country in addition to optimizing existing resources (Agulnik et al., 2019).

### Definition of Cost

Costs are resources used to produce a product or service, so that these resources can no longer be used to produce other products or services. Based on economic theory, the "real" cost is the "opportunity cost". Furthermore, "opportunity cost" is the amount of lost value that can be generated if the resource is used for production or to produce the best service. This happens

because these resources cannot be used to produce the best products or services (Liu, 2009).

The main factors in managed care that must be carried out are: managing payments and delivery of health services, using cost control techniques, dividing financial risk between providers and insurance, regulating and managing the utilization of health services (Hosizah, 2017).

Cost containment which has the meaning as an effort to suppress or control financing on various aspects of the hospital, ranging from personnel, infrastructure, equipment, medicines, consumables and so on, is one of the most important things to be implemented in the managed care system. (Sinuraya, 2012).

#### **Service improvements**

PEWS can improve the quality of nursing care for pediatric patients because patient assessments can be faster, easier and reduce nurse errors, and optimize resource limitations. An early warning system can improve communication between nursing staff and doctors and can help identify client populations who are at high risk (Skaletzky et al., 2012). Several studies have developed and validated a scoring system with the same purpose used for infant and pediatric patients, namely the pediatric early warning score (PEWS) (Monaghan, 2005).

#### **Limitation**

This literature review provides information related to the implementation of the Pediatric Early Warning System in pediatric patients with cancer with reviews from abroad, this is due to the lack of information related to PEWS in the country, especially its use in

hospitals treating patients with cancer.

#### **CONCLUSION**

This literature review highlights PEWS which is implemented in the hemato-oncology treatment room through a systematic review approach that is very beneficial for pediatric cancer patients.

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