narra j

Short Communication

Role of pediatric risk of mortality (PRISM IV) score at 24 and 72 hours of hospitalization in predicting mortality among critically ill pediatric patients treated in PICU

Aridamuriany D. Lubis[1*], Badai B. Nasution[1], Andriamuri P. Lubis[2] and Kelvin Supriami[3]

[1]Department of Pediatrics, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia; [2]Department of Anesthesiology and Intensive Care, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia; [3]Harvard Medical School, Massachusetts General Hospital, Boston, USA

*Corresponding author: aridamuriany@gmail.com

Abstract

Pediatric patients with multiple organ failures in the pediatric intensive care unit (PICU) are at a higher risk of mortality. Assessing the mortality risk when patients are admitted to PICU is important to allocate treatment and care properly. The aim of this study was to compare the performance of the PRISM IV score within the first 24 and 72 hours to predict mortality in the PICU. Demographic, clinical, and laboratory data were collected to compute the PRISM IV in the first 24 and 72 hours among critically ill pediatric patients in the PICU at H. Adam Malik General Hospital, Medan, Indonesia, from April 2021 to February 2022. The comparison of the PRISM IV scores and its components within the first 24 and 72 hours was analyzed using the Wilcoxon test, Student's independent t-test or McNemar test. The role of PRISM IV score in predicting mortality was assessed using the receiver operating characteristic (ROC) curve. Out of 35 pediatric patients, 17 (48.6%) of them died. Platelet count (p=0.022), pCO_2 (p=0.026), HCO_3 (p=0.009), total CO_2 (p=0.015), and base excess (p=0.001) were statistically different between 24 and 72 hours groups. The area under curve (AUC) for the first 24 hours using PRISM IV scores was 47.4% with p=0.792 (95%CI, 27.7%–67.1%). Meanwhile, the AUC of 72 hours group was 65.4%, p=0.121 (95%CI, 47.1%–83.6%). This study suggested that PRISM IV scores in the first 24 and 72 hours may not be a reliable screening tool for predicting mortality. However, further studies are suggested to validate these findings.

Keywords: PRISM, pediatric, PICU, mortality, sepsis

Introduction

Predicting the severity of diseases and the risk of mortality of critically ill children, especially those in the pediatric intensive care unit (PICU), is essential for determining patient prognoses. In intensive care settings, organ system failures and the extent of organ system dysfunctions are associated with mortality. Approximately 25% of pediatric patients in the PICU experiencing multiple organ system failure face a heightened mortality risk of up to 50% [1]. A study conducted in the United States demonstrated that the overall mortality rate of pediatric patients treated in PICU ranged from 1.85% to 3.38%, with a median rate of 2.39% [2]. The primary objective of care in PICU revolves around preventing mortality through vigilant monitoring and intensive treatment of critically ill pediatric patients who face an increased risk of death. Rapid technological development in patient care in PICU has led to significantly high treatment costs in

https://narraj.org/

Received: April 3, 2024 - Accepted: June 29, 2024 - Published online: July 12, 2024

the intensive care unit. However, these technological strides do not consistently enhance the quality of patient care or lengthen life expectancy [3]. Assessing disease severity upon PICU admission is crucial for determining mortality risk using a scoring system that objectively quantifies and predicts based on clinical condition. This score is vital for anticipating mortality, disease severity, and organ failure likelihood for doctors [4,5].

PRISM III is a validated scoring system used in PICUs in the United States and other countries among the available indicators for assessing pediatric risk of mortality [6,7]. It incorporates risk factors, refines age correction for certain variables, and assesses physiological variables and their ranges, resulting in a precise and discriminating mortality risk model [8]. A previous study that compared the PRISM III scores in the first 12 and 72–84 hours of PICU hospitalization found a significant correlation between the scores in the first 72–84 hours and mortality [9]. As the scoring system evolves, the PRISM III score has progressed to PRISM IV through the incorporation of additional variables for assessment [10]. The primary modification from PRISM III was the timing of data collection.

PRISM IV, the latest scoring system, incorporates new variables, such as age, admission source, cardiopulmonary resuscitation status within 24 hours before PICU admission, presence of cancer and or other chronic conditions, organ system dysfunctions in the primary system that include endocrine, hematological, musculoskeletal, and renal systems [11]. These variables are combined with scores obtained from PRISM III's neurological and non-neurological subscores [12]. In Indonesia, there is a limited number of studies available employing the PRISM IV scoring systems to predict mortality in critically ill pediatric patients. The aim of this study was to assess the performance of PRISM IV and to compare the scores in the first 24 and 72 hours of PICU admission as a predictor for mortality among pediatric patients treated in PICU.

Methods

Study design, setting and sampling

This prospective cohort study was a diagnostic accuracy study conducted at the PICU of H. Adam Malik General Hospital, Medan, Indonesia, from April 2021 to February 2022. The sample size for the prevalence study [13] was used to calculate the adequate sample size for this study. Non-probability consecutive sampling was applied to recruit the patients.

Patients and criteria

This study included pediatric patients aged between one month and 18 years old who had been in the PICU for at least 24 hours. Patients admitted to the PICU due to postsurgery, those with malignancies, and/or specific conditions potentially confounding the PRISM IV score, such as fulminant hepatic failure, acute kidney injury, immunodeficiency disorders, and post-transplantation cases, were excluded from the study.

Study variables

The independent variable of this study was PRISM IV scores measured at two different time points: 24 and 72 hours post-PICU admission. Assessments to PRISM IV included several organ systems. Physical examinations were performed to collect neurology (pupillary reactivity and mental status) and cardiovascular variables (heart rate, systolic blood pressure, and temperature). Blood sample tests were tested to measure respiratory (arterial PO_2, pH, PCO_2, and total bicarbonate), chemical (glucose, potassium, blood urea nitrogen, and creatinine), and hematologic components (white blood cell (WBC) count, platelet count, prothrombin, and partial thromboplastin time). The PRISM-IV scores were subsequently calculated for each patient by a pediatrician. The detailed scores of PRISM IV scoring system have been published in a previous study [10]. The dependent variable measured in this study was the outcome of patients defined as in-hospital mortality.

Data collection

Upon PICU admission, the patient's demographic, such as age and sex, initial diagnosis, underlying illnesses, and baseline clinical and laboratory variables, were first documented. At 24 and 72 hours post PICU admission, the patient was re-assessed to collect all clinical parameters

needed for the PRISM IV scores. In addition, a total of ten mL of blood was collected for laboratory tests of parameters related to PRISM IV at both time points. Patients were then followed until endpoints were reached (death or discharge).

Statistical analysis

Dependent variables (PRISM IV scores in the first 24 and 72 hours) were presented in nominal data. The normality of the data was first tested using Kolmogorov–Smirnov test. Comparison of the PRISM IV scores and its components between the first 24 and 72 hours were analyzed using the Wilcoxon test, Student independent t-test or McNemar test as appropriate. The associations between PRISM IV scores and mortality were conducted using a Student's t-test. A *p*-value of <0.05 was considered statistically significant. The role of PRISM IV score in the first 24 and 72 hours to predict mortality was assessed using the receiver operating characteristic curve (ROC) curve. All data analysis was performed using a computerized software system of SPSS version 26.0 (SPSS Inc., Chicago, USA).

Results

Characteristic of patients

A total of 35 pediatric patients were included in the study, as presented in **Table 1**. The proportion of gender is relatively balanced between males and females (48.6% vs 51.4%). There were ten (28.6%) patients below 12 months old, nine (25.7%) patients between 5 and 12 years old, and nine (25.7%) patients above 12 years old. Almost half of the patients (42.9%) received treatment in the PICU due to respiratory problems, and approximately 28.6% were treated for pediatric shock. There were 21 (60%) patients who required a ventilator. The mean length of PICU stay was ten days. Death was recorded in 51.4% of the patients.

Table 1. Characteristics of the pediatric patients treated at the PICU included in the study (n=35)

Demographic characteristic	Frequency (%)
Gender	
Male	17 (48.6)
Female	18 (51.4)
Age	
<12 months old	10 (28.6)
12–23 months old	6 (17.1)
24–59 months old	1 (2.9)
60–143 months old	9 (25.7)
≥144 months old	9 (25.7)
Causing disease	
Respiratory problem	15 (42.9)
Cardiovascular disease	5 (14.3)
Central nervous system	10 (28.6)
Pediatric shock	1 (2.9)
Renal failure	4 (11.4)
Ventilator use	
Yes	21 (60)
No	14 (40)
Length of stay (days), mean±SD	10±7.42
Outcome >72 hours	
Death	18 (51.4)
Lived	17 (48.6)

Clinical and laboratory data at 24 and 72 hours of PICU admission

From the clinical examinations, there were no significant differences between the examinations in the first 24 and 72 hours of admission. Meanwhile, from the laboratory examinations, several parameters showed significant differences between the first 24 and 72 hours, such as thrombocyte counts (p=0.022), pCO_2 (p=0.026), HCO_3 (p=0.009), total CO_2 (p=0.015), and base excess (p=0.001) (**Table 2**). However, there was no significant difference in PRISM IV scores between the first 24 and 72 hours of assessment (**Table 2**).

Table 2. Clinical, laboratory examinations and PRISM IV scores of patients (n=35)

Variables	24 hours	72 hours	*p*-value
Clinical examinations			
Temperature, mean (SD), °C	37.22 (0.48)	37.15 (0.42)	0.592[a]
Heart rate, mean (SD), ×/min	110.2 (17.82)	107.97 (12.5)	0.778[a]
Systolic blood pressure, mean (SD), mmHg	99.6 (15.76)	101.63 (15.01)	0.383[b]
Diastolic blood pressure, mean (SD), mmHg	60 (16.63)	63.14 (16.4)	0.191[a]
Mean arterial pressure, mean (SD), mmHg	73.76 (13.5)	76.74 (13.39)	0.127[b]
Pupil, n (%)			
Reactive	33 (94.3)	31 (88.6)	0.500[c]
Non-reactive	2 (5.7)	4 (11.4)	
Laboratory Examinations			
Hemoglobin, mean (SD), mg/dL	10.19 (3.04)	9.73 (2.62)	0.189[a]
Leukocyte, mean (SD), $\times 10^3/\mu L$	16.09 (9.32)	14.56 (9.26)	0.489[a]
Hematocrit, mean (SD)	30.96 (9.62)	29.87 (8.59)	0.394[b]
Thrombocyte, mean (SD), $\times 10^3/\mu L$	274.42 (163.91)	218.27 (153.3)	0.022[b*]
Lactate, mean (SD)	1.73 (1)	1.96 (1.05)	0.101[a]
Random blood glucose, mean (SD), ng/mL	120.74 (95.4)	120.46 (71.29)	0.878[a]
Potassium, mean (SD)	4.07 (1.12)	7.73 (23.55)	0.321[a]
Blood urea nitrogen, mean (SD)	39.74 (55.29)	35.24 (42.31)	0.757[a]
Prothrombin time, mean (SD)	18.85 (12.14)	19.66 (15.77)	0.164[a]
aPTT, mean (SD)	37.85 (23.72)	34.65 (19.72)	0.163[a]
Creatinine, mean (SD)	2.24 (3.79)	2.22 (3.67)	0.797[a]
pH, mean (SD)	7.33 (0.2)	7.35 (0.13)	0.499[a]
pCO_2, mean (SD), mmHg	29.11 (14.92)	35.11 (13.36)	0.026[a*]
pO_2, mean (SD), mmHg	168.09 (33.35)	165.69 (33.6)	0.499[a]
HCO_3, mean (SD), mEq/L	15.99 (8.16)	19.56 (7.66)	0.009[b*]
Total CO_2, mean (SD), mmHg	16.92 (8.7)	20.41 (8.25)	0.015[b*]
Base excess, mean (SD)	-9.1 (9.04)	-3.84 (8.98)	0.001[b*]
SaO_2, mean (SD), %	99.29 (1.07)	99.06 (1.41)	0.433[a]
PRISM IV score, mean (SD)	8.43 (5.17)	7.03 (3.91)	0.102[b]

[a] Analyzed using Wilcoxon
[b] Analyzed using Student t-test
[c] Analyzed using McNemar
[*] Significant at p=0.05

Role of PRISM IV score in the first 24 and 72 hours to predict mortality

There were no significant differences of PRISM IV scores between pediatric patients who survived and died in the first 24 hours of admission in PICU (p=0.763). Similarly, PRISM IV scores at 72 hours of admission in PICU also had no difference between both groups (p=0.076). The comparison of PRISM IV scores between groups in predicting mortality is presented in **Table 3**.

Table 3. Comparison of PRISM IV scores between survived and death pediatric patients (n=35)

Variable	Outcome		*p*-value
	Survived (n=17)	Death (n=18)	
PRISM IV 24 hour, mean (SD)	8.71 (5.85)	8.17 (4.59)	0.763[a]
PRISM IV 72 hour, mean (SD)	5.82 (3.70)	8.17 (3.87)	0.076[a]

[a]Analyzed using Student t-test

The analysis using the receiver operating characteristic (ROC) curve for PRISM IV scores in the first 24 and 72 hours to predict mortality are presented in **Figure 1**. The area under the cover (AUC) for PRISM IV in the first 24 hours to predict mortality was only 47.4%, with 95% confidence interval (95%CI) ranged from 27.7%–67.1% (p=0.792). This result showed that the PRISM IV scores in the first 24 hours had a poor performance to predict mortality in this study. In comparison, PRISM IV in the first 72 hours to predict mortality had AUC of 65.4% with 95%CI ranged from 47.1%–83.6% (p=0.121) suggesting that the PRISM IV scores in the first 72 hours also had a poor performance to predict mortality in this study.

As PRISM IV scores at 24 and 72 hours were not statistically significant, the cut-off value was not examined further in this study. Therefore, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of the PRISM IV score for predicting mortality were not assessed.

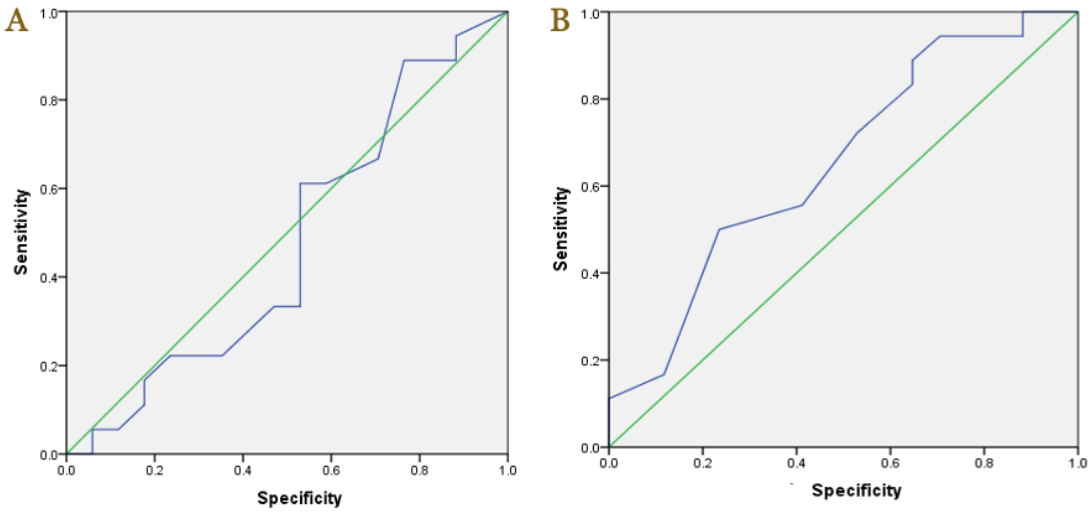

Figure 1. Receiver operating characteristic curve (ROC) of PRISM IV scores in the first 24 hours (A) and 72 hours (B) to predict mortality of pediatric patients treated in the ICU. The area under the cover (AUC) of PRISM IV in the first 24 hours (A) and 72 hours (B) are 47.4% and 65.4%.

Discussion

The PICU in hospitals is defined as the unit that provides care to children with a wide range of life-threatening conditions, including very unstable conditions and patients requiring complex and advanced medical and surgical care [14]. Critical illness in children can significantly impact children's health and development, as well as negatively impact the functioning and well-being of the family [15-17]. The child mortality rate is still relatively high globally at around 3.1 million neonates, 2.3 million toddlers, and 2.3 million child deaths occur every year. Globally, the distribution of deaths among children aged less than five years is around 33% in South Asia, 50% in Africa, and less than 1% in developed countries [18]. In Australia and New Zealand, sepsis and septic shock are causes of death in children hospitalized in pediatric intensive care [19]. In undeveloped countries, pneumonia, and diarrhea cause 20% of deaths in children under five years of age [20]. In developing countries, 10–20% of critically ill children are hospitalized every year. The hospital mortality rate is around 10.3% and is higher in children with several comorbid diseases [21].

A study in 2014 reported more female (65.4%) patients than male patients (34.6%) admitted to the PICU [9]. Another study reported that the mean age of children admitted to the PICU was eight months old [22]. As mentioned, these age and gender characteristics align with this study, where there was a slightly higher number of female than male patients, and most were below 12 months old. Several previous studies reported that children requiring PICU were mostly due to respiratory problems [10,14]. This study found almost half of the patients treated in the PICU had respiratory problems. The length of stay in the PICU could be prolonged with the use of ventilators. Studies have suggested an increased mortality risk in children who require ventilator support compared to those who do not [22,23]. A mechanical ventilator is a common requirement in intensive care for neonates, children, and adults. Despite the underlying diseases, the supporting treatment is associated with several complications that may prolong the length of stay, involving ventilator-related injury and pneumonia [24]. As a result of patients requiring prolonged mechanical ventilation, healthcare expenses are expected to rise, particularly for intensive care [23].

PRISM, a simplification of the physiologic stability index (PSI) score, relies on clinical assessment translated into statistical outcomes. It consists of 14 variables assessing six human body systems. From several study results that have been carried out, it was found that the range of PRISM value has a level of objectivity that demonstrated the abnormalities of the body system in relation to death [7,25,26]. The PRISM total value provides a relative value of the severity of the disease. PRISM values also allow the expansion of several clinical principles in assessing the severity of disease [27].

Changes in the scores from PRISM IV reflect the patient's condition. An increase in the score indicates a worsening condition, while a decrease in the score indicates an improvement [28]. Although the validity of the PRISM score itself has been well tested in the United States, development is still being carried out on existing variables and assessment ranges, including age development, namely its application to neonates [29]. The current iteration of PRISM development, known as PRISM IV, reflects the input of experts in intensive care. They recognize that the relationship between physiological status and the risk of death can evolve with the discovery of new protocols, therapeutic interventions, and monitoring strategies [30].

In this study, no significant differences were observed in the clinical characteristics during the initial 24 and 72 hours of admission among patients admitted to the PICU. Certain laboratory test parameters differed significantly, such as thrombocyte, pCO_2, HCO_3, total CO_2, and BE between 24 and 72 hours. There was also no significant difference in the PRISM IV scores between 24 and 72 hours of assessment. The ROC analysis showed that PRISM IV scores, both in 24 and 72 hours, were not significant in predicting mortality in the research population. These results may indicate that the PRISM IV score could be used either 24 or 72 hours to assess the severity of disease in patients treated in the PICU [11,31]. A study conducted in Brazil revealed that PRISM IV exhibited a predicted mortality rate closely aligned with observed mortality, demonstrating strong discrimination and calibration in an independent group of children. Notably, only the initial PICU admission during hospitalization was considered, with measurements taken from 2 hours before admission to 4 hours after this [26]. Another study showed that the optimum assessment time to predict mortality is after 24 hours. Any delay in the prediction score from PRISM IV may result in the risk of death even before the score is established [32].

There are some limitations to this study, making the findings in this study should be cautiously interpreted. First, this study was conducted at a single center with a small sample size. Second, the non-probability sampling method was used in this study due to several factors, including limited resources. Therefore, future studies with a bigger sample size with a probability sampling method to reduce sampling bias are warranted to validate the reported findings in this study.

Conclusion

This study found no significant changes in PRISM IV's ability to predict mortality at 24 or 72 hours. Furthermore, according to ROC curve analysis, PRISM IV was not found to be a reliable predictor of mortality in this study sample. Given these findings, further investigation into alternative predictive models or additional variables may enhance mortality prediction in similar pediatric intensive care settings.

Ethics approval

This research was approved by the Health Ethics Committee, Universitas Sumatera Utara, Medan, Indonesia (ethics code: 598/KEP/USU/2021).

Acknowledgments

This research was funded by TALENTA USU for Young Lecturer Research Scheme with contract No. 108/UN5.2.3.1/PPM/SPP-TALENTAUSU/2021 on 18 June 2021.

Competing interests

The authors declare that there is no conflict of interest.

Funding

This research was funded by TALENTA USU for Young Lecturer Research Scheme with contract No. 108/UN5.2.3.1/PPM/SPP-TALENTAUSU/2021 on 18 June 2021.

Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

How to cite

Lubis AD, Nasution BB, Lubis AP, Supriami K. Role of pediatric risk of mortality (PRISM IV) score at 24 and 72 hours of hospitalization in predicting mortality among critically ill pediatric patients treated in PICU. Narra J 2024; 4 (2): e780 - http://doi.org/10.52225/narra.v4i2.780.

References

1. Kafle R, Sanjeev S, Kumar G. Utility of sequential organ failure assessment score in prognosticating sick children in paediatric intensive care unit. J Nepal Paediatr Soc 2022;42:134-139.
2. Burns JP, Sellers DE, Meyer EC, *et al*. Epidemiology of death in the PICU at five U.S. teaching hospitals. Crit Care Med 2014;42(9):2101-2108.
3. Latief A, Chairulfatah A, Alam A. Diagnosis dan tatalaksana sepsis pada anak. Unit Kerja Koordinasi Pediatri Gawat Darurat Ikatan Dokter Anak Indonesia. Jakarta: Ikatan Dokter Anak Indonesia; 2009.
4. Vincent JL, Ferreira F, Moreno R. Scoring systems for assessing organ dysfunction and survival. Crit Care Clin 2000;16(2):353-366.
5. Bramantyo TB, Martuti S, Salimo H. Perbandingan prediktor mortalitas skor PRISM III dan PELOD 2 pada anak sakit kritis non bedah. Sari Pediatri 2018;19(5):284-289.
6. Rahmatinejad Z, Rahmatinejad F, Sezavar M, *et al*. Internal validation and evaluation of the predictive performance of models based on the PRISM-3 (Pediatric Risk of Mortality) and PIM-3 (Pediatric Index of Mortality) scoring systems for predicting mortality in Pediatric Intensive Care Units (PICUs). BMC Pediatr 2022;22(1):199.
7. Anjali MM, Unnikrishnan DT. Effectiveness of PRISM III score in predicting the severity of illness and mortality of children admitted to pediatric intensive care unit: A cross-sectional study. Egypt Pediatr Assoc Gaz 2023;71(1):25.
8. Ruttimann UE, Pollack MM. Objective assessment of changing mortality risks in pediatric intensive care unit patients. Crit Care Med 1991;19(4):474-483.
9. Soniwal S. Prediction of outcome of paediatric patients by validating PRISM III scoring within 12 Hours and PRISM III at 72-84 hours after initiation of the treatment. J Evol Med Dent Sci 2014;3:11533-11555.
10. Pollack MM, Holubkov R, Funai T, *et al*. The pediatric risk of mortality score: Update 2015. Pediatr Crit Care Med. 2016;17(1):2-9.
11. Leal P de B, de Araujo OR, Petrilli AS, *et al*. PRISM 4-C: An adapted PRISM IV algorithm for children with cancer. J Pediatr Hematol Oncol 2020;42(7):e563-e568.
12. Lacroix J, Cotting J. Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network. Severity of illness and organ dysfunction scoring in children. Pediatr Crit Care Med. 2005;6 Suppl 3:S126-S134.
13. Daniel WW, Cross CL. Biostatistics: A foundation for analysis in the health sciences. Hoboken: John Wiley and Sons; 2018.
14. Susianawati V, Suryantoro P, Naning R. Prognostic predictor at Pediatrics Intensive Care Unit (PICU) with Pediatric Risk of Mortality III (PRISM III) scores. J Thee Med Sci Berk Ilmu Kedokt 2014;46:71-77.
15. Bae W, Kim K, Yoon JS. Mortality of children treated in a pediatric intensive care unit versus other intensive care units. Iran J Pediatr 2020;30(2):1-6.
16. Crow SS, Undavalli C, Warner DO, et al. Epidemiology of pediatric critical illness in a population-based birth cohort in Olmsted County, MN. Pediatr Crit Care Med. 2017;18(3):e137-e145.
17. Frost P, Wise MP. Recognition and early management of the critically ill ward patient. Br J Hosp Med (Lond). 2007;68(10):M180-M183.
18. Jofiro G, Jemal K, Beza L, et al. Prevalence and associated factors of pediatric emergency mortality at Tikur Anbessa specialized tertiary hospital: A 5 year retrospective case review study. BMC Pediatr 2018;18(1):316.
19. Schlapbach LJ, Straney L, Alexander J, et al. Mortality related to invasive infections, sepsis, and septic shock in critically ill children in Australia and New Zealand, 2002-13: A multicentre retrospective cohort study. Lancet Infect Dis 2015;15(1):46-54.
20. Watson RS, Hartman ME. Epidemiology of critical illness. In: Wheeler D, Wong H, Shanley T, editors. Science and practice of pediatric critical care medicine. London: Springer; 2008.

21. Chavez H, Garcia CT, Sakers C, et al. Epidemiology of the critically ill child in the resuscitation bay. Pediatr Emerg Care 2018;34(1):6-9.
22. Nupen TL, Argent AC, Morrow B. Characteristics and outcome of long-stay patients in a paediatric intensive care unit in Cape Town, South Africa. S Afr Med J. 2016;107(1):70-75.
23. Demirkiran H, Kilic M, Tomak Y, *et al*. Evaluation of the incidence, characteristics, and outcomes of pediatric chronic critical illness. PLoS One 2021;16(5):e0248883.
24. Wu D, Wu C, Zhang S, *et al*. Risk factors of ventilator-associated pneumonia in critically iii patients. Front Pharmacol 2019;10:482.
25. Costa G de A, Delgado AF, Ferraro A, *et al*. Application of the Pediatric Risk of Mortality Score (PRISM) score and determination of mortality risk factors in a tertiary pediatric intensive care unit. Clinics 2010;65(11):1087-1092.
26. Garcia PC, Ronchetti MR, Da Costa CA, *et al*. The pediatric risk of mortality IV (PRISM IV) validation in an independent sample in Southern of Brazil. Pediatr Crit Care Med 2018;19 Suppl 6:150.
27. Pollack MM, Capron C. The pediatric risk of mortality and therapeutic intervension scoring system. In: Levin DL, Morriss FC, editors. Essential of pediatric intensive care. St. Louis: Quality Medical Publishing; 1990.
28. Pollack MM, Ruttimann UE, Getson PR. Pediatric risk of mortality (PRISM) score. Crit Care Med 1988;16(11):1110-1116.
29. Wells M, Riera-Fanego JF, Luyt DK, *et al*. Poor discriminatory performance of the Pediatric Risk of Mortality (PRISM) score in a South African intensive care unit. Crit Care Med 1996;24(9):1507-1513.
30. Iskandar H, Mulyo D, Agnes P, *et al*. Comparison of pediatric logistic organ dysfunction (PELOD) score and pediatric risk of mortality (PRISM) III as a mortality predictor in patients with dengue shock syndrome. Pediatrics 2008;121.
31. Namachivayam SP, Alexander J, Slater A, *et al*. Five-year survival of children with chronic critical illness in Australia and New Zealand. Crit Care Med 2015;43(9):1978-1985.
32. Shen Y, Jiang J. Meta-analysis for the prediction of mortality rates in a pediatric intensive care unit using different scores: PRISM-III/IV, PIM-3, and PELOD-2. Front Pediatr 2021;9:712276.