Predictive_Value_of_ORPS_Score_in_Outcome_of_Pediatric_Patient_in_Emergency_Instalation-dikompresi-min

by Idham Jaya Ganda

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Predictive Value of Toprs Score in Outcome of Pediatric Patient in Emergency Installation

Idham Jaya Ganda[1], Fitriya Idrus[1], Dasril Daud[1]

[1]Departement of Pediatrics, Faculty of Medicine, Hasanuddin University, Makassar, South Sulawesi, Indonesia

Abstract

Background: Scoring of severity of illness in pediatric emergency is rarely found. The aim of this study was to evaluate TOPRS Scores of children admitted to pediatric emergency.

Method: It was a prospective cohort study on severity illness score on pediatric patient in emergency instalation of Wahidin Sudirohusodo Hospital during October until November 2016. The study population was all children admitted to pediatric emergency unit Wahidin Sudirohusodo Hospital. TOPRS scores were assessed since admission. Subjects were followed up two classified the outcome into two groups, improved group and died group Predictive ability of this scorring system was analyzed using ROC curve.

Results: Among 218 subjects, 46 were died, and 172 were recovered. TOPRS scores were higher in non survivor group, with the optimal cut off value ≥2 to distinguish survivor and died group. P=0.000, sensitivity=100%, specificity=89.5%, PPV=100%, and NPV=74%. Multivariate analysis showed that TOPRS scoring system was independent variable and can be used as a parameter to evaluate the aoutcome of the patients, with p value 0.000 (95% CI 0.00-).

Conclusion: TOPRS scoring system has a predictive value on children admitted to pediatric emergency instalation. Optimal cut off value to distinguish mortality is ≥2.

Keywords: *TOPRS score, pediatric emergency, outcome.*

Introduction

Systemic inflammatory response syndrome (SIRS) is a complex and unspecified inflammatory response to a body which is harmful to the body.[1,2] A study conducted in 2007 - 2010 at the National Hospital Ambulatory Medical Care Survey (NHAMCS) United States got the incidence of SIRS in children by 21.7%. Based on that research, 53% SIRS cases was caused by infection.[3]

TOPRS Score (Temperature, Oxygen Saturation, Pulse Rate, Respiratory Rate, Sensorium and Seizurer) is a relatively new scoring in illness severity degree. This score uses the physical symptoms (symptomatic) parameters in Systemic Inflammatory Response Syndrome (SIRS) and the criteria mentioned in Advanced Pediatric Life Support (APLS).[4] The TOPRS score was developed in a study as a tool that can be applied in emergency rooms especially in places with limited facilities.[5]

SIRS is non-specific and may be caused by ischemia, inflammation, trauma, infection, or some combination of damage. SIRS is not always associated with infection. Infection is defined as a microbiological phenomenon with characteristics as an inflammatory response to microorganisms or the normal invasion of

Corresponding Author:
Idham Jaya Ganda
Departement of Pediatrics, Faculty of Medicine, Hasanuddin, University, Makassar, South Sulawesi, Indonesia, Perintis Kemerdekaan Km. 10 Tamalanrea, Makassar, 90245, Indonesia
e-mail: pediarics.uh@gmail.com
dhamjaya_spa@yahoo.co.id

sterile tissue by the organism.[6] A prior study by Daniela[7] during 2006-2009 in Craiova was obtained prevalence of pediatric patients with SIRS and having sepsis was 78%. Another study in Latvia found the prevalence of SIRS in treated children with febrile clinical symptoms was 72%.[8]

The presence of predisposing factors such as infectious diseases (respiratory tract, urogenitalia, skin and soft tissue), immune disorders (malignancy, radiation therapy, hormonal therapy), and invasive procedures may trigger the release of cytokines and vasodilator substances which will subsequently trigger the response systemic inflammation characterized by symptoms of tachycardia, tachypnea, hypotension, hypoperfusion, pyrexia or hypothermia, leukocytosis or leukopenia. Continuous inflammation will cause tissue damage, cellular metabolic changes, hemodynamic changes that will eventually lead to organ dysfunction and failure. Therefore, scoring system using clinical symptom variables is important to test the ability of predicting output.

Some research on scoring systems as predictors of outcomes has been done. One of the earliest physiological scoring systems in children is the PSI (Physiology Stability Index), in which the system assesses 34 variables. Furthermore, a simpler scoring system that is PRISM, which assesses 14 variables, in which the variable consists of physical and laboratory assessment. On the other hand, there is also a PIM (Pediatric Index Mortality) scoring system assessed at the time of admission to pediatric intensive care. Those kind of scoring systems cannot be used in emergency department, but it need a longer time to wait for laboratory results. It is also less suitable for use in developing countries such as Indonesia. Therefore, it is necessary to examine the scoring system as a simpler external predictor that combines vital signs,so this study is aimed to determine the TOPRS score of pediatric patients in pediatric emergency care.

Materials and Method

Design and Variable Study: This study was an observational with a prospective cohort approach at the emergency instalation of Wahidin Sudirohusodo Hospital, Makassar which conducted during October until November 2016. It has been approved by the ethical committee of Faculty of Medicine, Hasanuddin University.

The study variables consist of: independent variables (infectious and non-infectious diseases), dependent variables (TOPRS score and outcome), confounding varia bles (biological processes occurring in patients during treatment), random variables (sex, nutrition, and genetic), and control variables (age, basic disease treatment).

Population and Sample: Population of the study were patients who entered in the IRD of children aged 1 month to 18 years who underwent treatment at DR Wahidin Sudirohusodo Hospital, Makassar. The study sample was the entire affordable population that met the inclusion and exclusion criteria which obtained by using consecutive sampling method based on the order of admission in the hospital.

Method of Collecting Data: Anamnesis and physicals examination in patients aged 1 month -18 years was conducted at the first admission to the hospital. The result was confirmed by TOPRS score check. Age, sex, nutritional status, vital signs (awareness, blood pressure, respiration, pulse, temperature), oxygen saturation, presence or absence of seizures were checked. During the treatment, study subjects were observed until the effect (outcome) of the patient improved or died. The end result observed is the outcome (improved or died).

Data Analysis: All the data obtained are recorded in the study data form and then grouped by the destination and type of data. Appropriate statistical method was used analyse the data, namely: 1) the univariate analysis; and 2) the bivariate analysis which includes: test Student's t, Mann Whitney Test, X2 (Chi square) or Fisher's Exact test, to assess the accuracy limit levels as a predictor, calculating the sensitivity, specificity, positive predictive value and predictive value negative (with CI 95%).

Results

Out of 218 patients, there were 172 patients improved and 46 patients died. Based on the sex category, male group consists of 31 patients (24.21%) who were died and, 97 (75.78%) were improved, while female group consists of 15 patients (16.66%) who were died and 75 patients (83.33%) were improved. Statistical analysis showed no significant difference between the two groups with $p = 0.17$ (Table 1).

Table 2 showed the correlation between nutritional status and the patients' outcome. In well nourish group, 13 patients (11.92%) were died and 96 patients (88.07%)

were improved. In the under nourished group, 17 patients (34%) were died and 33 patients (66%) were improved, while malnutrition group consists of 16 patients (27.11%) who were died and 43 patients were improved (72.88%). Statistical analysis showed that there were significant differences in terms of improved outcome or death based on nutritional status with p = 0.003.

Based on the data analysis, it was found that the mean age of patients did not different significantly between the two groups that compared with p = 0.26. (Table 3). It means that age was not a prognostic factor in the outcome of patients in emergency installation, while nutritional status was a prognostic factor.

The average score of TOPRS score of study subjects showed that the average score of TOPRS score of patients who improved was lower than the score of the patient who died. Mann-Whitney test results show that there was a very significant difference between these two groups with p = 0.000 (Table 4).

The logistic regressi on analysis of the independent variables in predicting the outcome showed that the nutritional group B had p = 0.283 with confidence interval 95% (0.60-5.62). While the TOPRS variable ≥2 has p = 0.000 with confidence interval 0.00-, which shows the score of TOPRS is independent variable which is not influenced by nutritional status. Thus TOPRS can be used as parameters to generate output (Table 5).

Table 1: Relationship between Sex category and the patients outcome

Sex	Study subject		Total n (%)
	Died n (%)	Improved n (%)	
Male	31 (24.21%)	97 (75.78%)	128(100%)
Female	15 (16.66%)	75 (83.33%)	90 (100%)
Total	46 (21.10%)	172 (78.89%)	218 (100%)

Chi-Square = 1.81 df = 1 p =0.17(p >0.05)

Table 2: Relationship between nutritional status and the outcome of the patients

Nutritional Status	Study subject		Total
	Died n (%)	Improved n (%)	
Well nourished	13 (11.92%)	96 (88.07%)	109 (100%)
Under nourished	17 (34%)	33 (66%)	50 (100%)
Malnourished	16 (27.11%)	43 (72.88%)	59 (100%)
Total	46 (21.10%)	172 (78.89%)	218 (100%)

Chi-Square = 11.79 df = 2 p =0.003(p <0.05)

Table 3: Mean age of study subjects

Age (Years)	Study subject	
	Died n = 46	Improved n = 172
Mean	3.86	4.12
Median	0.91	2
Deviation Standard	5.43	4.84
Minimum-maximum	0.10 – 17.90	0.10 – 17.40

Mann-Whitney U, p = 0.26 (p >0.05)

Table 4: TOPRS Score average of Study Subjects

TOPRS score	Study subject	
	Died n = 46	Improved n = 172
Mean	3.29	0.58
Median	3.0	0
Standard intersection	0.73	0.74
Minimum-maximum	2-5	0-3

Mann-Whitney U, p=0.000 (p<0.01)

Table 5. Results of independent logistic variable regression analysis in predicting the patients outcomes

Variabel	B	S.E	Df	p	Exp (B)	95% CI
Group nutritional status B	0.61	0.56	1	0.283	1.84	0.60-5.62
TOPRS ≥2	21.98	3231.80	1	0.000	3530274583	0.00-

B : Regression Coefficience, S.E : Standar Error

Discussion

This study shows that the TOPRS score is higher in the deceased group. The TOPRS score is an independent variable, which can be used as a parameter to determine the output with p = 0.000 with (95% CI 0.00-). The TOPRS score has a predicted outcome score in the admitted patient to emergency care. The best cutting point for distinguishing two outcomes (improved or dead) is ≥ 2.

The sex correlation with the outcome of the treated patient did not differ significantly, which means that sex is not a prognostic factor. Overall, there was no significant difference by sex, but death was found more in girls. Similar with the results obtained by Faisal[9], there is no significant difference in sex with outcome of patients in Wahidin Sudirohusodo Hospital based on SICK score.

In relation to nutritional status, the incidence of SIRS and sepsis leading to death more frequently affects malnourished children. This is associated with a decrease in the antibody immune response to the presence of a worse antigen (infection) to allow for severe SIRS/ sepsis.[10]

Generally, the value of TOPRS score in patients who died is much higher than the value of the improved patients. The mean value of TOPRS score of patients in improved group was lower compared to the patients who died. It means that the role of SIRS/sepsis parameters is particularly prominent in patients who die and correlates with the weight and outcome of the disease. It occurs because of the increase of SIRS signs, the appearance of proinflammatory status characterized by tachycardia, tachypnea or hyperpnea, hypotension, hypoperfusion, oliguria, leukocytosis or leukopenia, pyrexia or hypothermia. Several molecules that signal from cell to cell are thought to be involved in proinflammatory status events include interleukin (IL) -1, IL-5, IL-6, IL-8, IL-11, IL-15, and multiple colony stimulating factors, and chemokacin (monocyte chemotactic protein-1, growth-related oncogene alpha protein). Similar findings have been made for tumor necrosis factor (TNF) -alpha and other related molecules derived from pathogenic microbes, eg lipopolysaccharides, staphylococcal enterotoxins A-E. it showed that there is no single trigger for SIRS. In other words, SIRS is a common organism response to various types of immune system challenges. SIRS can affect all organ systems and lead to MODS.[5]

TOPRS score can be used as a differentiator between groups of patients who have a good and bad prognosis. From this study it was found that the lowest cutoff point of the TOPRS score lies in the 97.5 percentile of the improved group, with the TOPRS score of 2 and the highest cutoff point lying in the 2.5 percentile of the deceased group, with the TOPRS score 3. In between the two cut off point, there are 2 cut off points, for each cut point then assessed sensitivity, specificity, positive predictive value and negative predictive value. It aims to find the best TOPRS score value in determining outpatient outcomes admitted to emergency room.

These values are then analyzed and described into the ROC curve, and it is found that the furthest point from the diagonal line and the upper left corner is the green line ie the cutoff point of the TOPRS score ≥3, which has the same under-curve (AUC) value with the cutoff point of TOPRS score score ≥2 is 0.945 or in other words from two points of this cut has the same AUC. Since both are the same, in order to establish the prognosis we choose the earlier value, TOPRS ≥2.

This cutting point has a sensitivity value of 100%, specificity 89.5%. In which, this TOPRS score has the ability to identify patients treated with a good prognosis of 100% and states have a poor prognosis of 89.5% if the score of TOPRS patients ≥2.

This point has a positive predictive value of 100%, and a negative predictive value of 74%. Positive and negative predictive values are also quite good. When applied clinically, the patients have a good prognosis if the TOPRS score is less than <2 of 100%. Patients' outcome depends on many factors, such as the type of illness, the speed of the diagnosis, and the treatment. Accumulation of these factors will lead the patient to a good or bad prognosis.

The TOPRS <2 score score limit shows very significant differences in terms of output. The odds ratio can not be calculated because there is one table cell that is zero value. The TOPRS score value (<2) has a better predictive prognosis for an earlier assessment in emergency room with the best treatment (as per clinical pathway). In contrast, patients with a TOPRS score (≥2), which means there are 2 or more abnormal (SIRS) parameters, should be wisely translated in their clinical application. The specificity of 89.5% is quite high (optimal), so that the patient with the TOPRS score ≥ 2 needs more rigorous monitoring, but does not necessarily

direct the bad outcome (death). The results of this study expose the same value, with previous studies conducted by Harmesh bain in India who found the cutoff point of TOPRS ≥2 score. In a study conducted by Gupta et al.[5], the severity of the disease assessed by the SICK score found a score of 2.5. It is also similar to Faisal's[9] result, by using a SICK score to find a cutoff point ≥2. 3.

Based on bivariate analysis, there were two variables, TOPRS score and the identified nutritional status, which had significant relationship with the outcome of the infected patient in pediatric emergency instalation. Therefore, multivariate analysis is done. From multivariate analysis showed that TOPRS score is independent variable which is not influenced by nutritional status. Thus, the TOPRS score can be used as a parameter to determine the output.

The TOPRS score can be said to reflect the severity of a disease, because every disease, has some or all of the vital signs/symptoms present in the TOPRS score. In this study, there are 4 patients who died with the score of TOPRS 2, it can be explained that the possibility due to the basic disease of each patient, which at the beginning of hospital admission is relatively mild but the history of disease/treatment experience worsening.

In conclusion, TOPRS score had a prognostic value on patient outcome in pediatric emergency instalation. The best cutting point to determine the outcome of the patient is the TOPRS score ≥2, where the result below this score is a good prognosis, after an optimum management according to the protocol.

Conflict of Interest: There is no conflict of interest that can be reported in this study.

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