ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 08, Issue, 08, pp. 22177-22179, August, 2018

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

PREDICTIVE VALUE OF SNAPPE II FOR NEONATAL MORTALITY

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ARTICLE INFO

Article History:
Received 18th May, 2018
Received in revised form
16th June, 2018
Accepted 22nd July, 2018
Published online 30th August, 2018

Key Words:
Neonatal mortality, Birth weight, Inpatients, Risk assessment, Intensive care units, Neonate, Scores.

ABSTRACT

The objective of the study was to analyze the Score for Neonatal Acute Physiology Perinatal Extension IIscore as a predictor of neonatal mortality, describing the clinical and epidemiological profile of neonates hospitalized in the neonatal intensive care unit at a cardiology reference institution in the Northern Regionin Brazil. Nine clinical variables were investigated by analyzing each patient's chart and were duly scored. The study score ranged from 0 to 162, and the higher the score, the higher was the severity of the newborn's condition, considering the duration of hospital stay. The results showed that the death rate was proportionately related to the increase in the SNAPPE II score. The results of this study showedthat the nursing team could modify the interventions proposed in the Systematization of Nursing Assistance (SNA) for the most serious conditions in newborns, according to the SNAPPE II evaluation score.

Citation: Adriana O. L. Veríssimo, Elaine Figueiredo, Ana Regina R. Monteiro, Lucas F. Lima, Nívea L. B. Lourinho and Milene A. G. Tyll. 2018. "Predictive value of snappe ii for neonatal mortality", *International Journal of Development Research*, 8, (08), 22177-22179.

INTRODUCTION

The development of severity scores for patients admitted to a neonatal intensive care unit (NICU) aims to systematize the follow-up and provide comparisons between different hospitals, clinics, and ICUs regarding the population characteristics inherent to each location, thus, seeking to improve the efficiency of prospective studies or randomized trials of treatment and to adequately assess treatment costs (Silveira *et al*., 2001).

Score for Neonatal Acute Physiology Perinatal Extension II: (SNAPPE II), which is used internationally, is a simple gravity score with fewer and more accurate variables in the neonatal mortality prognostic area. Data should be collected in the first 24 hours of life, which reduces the interference of the treatment offered to the newborn in the score recorded.

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The SNAPPE II score ranges from 0 to 162; the higher the score, the greater is the severity of the newborn (Genu, 2012). A study by Ramirez at al. (2014) confirmed that the SNAPPE II scoring system is a good predictor of mortality and severity of disease in the NICU, as newborns who died received higher scores. In this context, it is fundamental that the assessment of the SNAPPE II score be the most reliable because it exerts a significant influence on the systematization of specific nursing care for each patient.

MATERIALS AND METHODS

The study was conducted on all newborns admitted to the NICU at a cardiology reference institution in the Northern Region, in the state of Pará, from January 2012 to December 2014. The SNAPPE II score was applied to all newborns born at the institution as soon as they completed 24 h of admission to the NICU during the study period. Exclusion criteria included death during the initial 24 h of admission to the NICU, discharge from the NICU for intermediate care before

completion of 24 h of admission, and admissions transferred from other hospitals. The SNAPPE II score predicts the prognosis of a neonate through clinical variables. These compiled variables are the mean arterial pressure, the temperature at admission, birth weight, birth to gestational age, partial pressure and inspired fraction of oxygen, blood pH, occurrence of multiple convulsions, urinary volume, and the 5-minute Apgar score. The classification is determined according to the score, as shown in Table 1. For the analysis of the data, the SNAPPE II score was initially described through the median and interquartile range (25%–75%) among the groups studied. The median values were compared by the Mann-Whitney U test. The mortality rate for different scores was calculated, and the progressive odds ratios (OR) and the respective 95% confidence intervals (CI) between the baseline level and the different SNAPPE II scores were determined. We used the chi-square test analyzing the for trend. Additionally, the sensitivity, specificity, and predictive values were obtained; the receiver operating characteristics (ROC) curve was obtained by plotting the sensitivity on the Y-axis and the false positive (1-specificity) rate on the X-axis for all possible values of the cutoff point, thus, determining the point with the best combination of sensitivity and specificity for the SNAPPE II score. The accepted statistical significance level was 5%, and the statistical software used were GraphPad Prism 5 and EPI Info 3.5.2.

RESULTS

The sample size consisted of 490 newborns, including425 survivors received subsequent hospital discharge and 65 deaths. The SNAPPE II scores were applied to all the patients. The median and interquartile range of SNAPPE II of the non-surviving newborns were significantly higher (Table 2). To better evaluate the survival, the newborns were divided into five groups of increasing severity of SNAPPE II, in which the proportions of deaths between the ranges were compared.

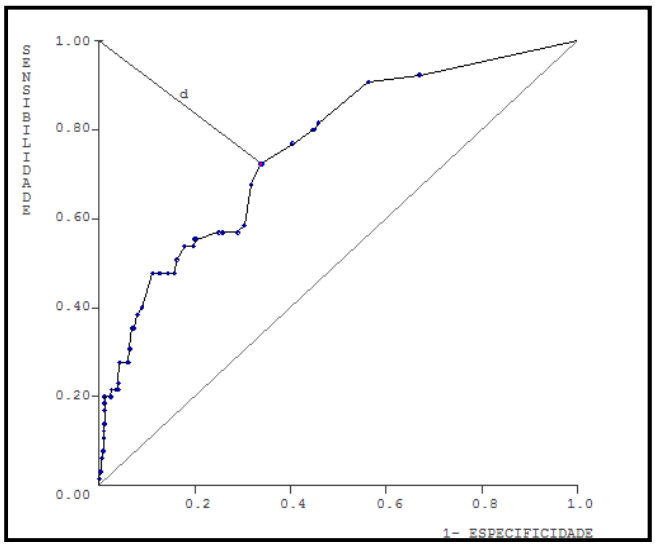

Figure 1. SNAPPE II descriptive ROC curve

A mortality rate of 5.3% was established as a basic risk or no risk of death, which corresponded to the first score value. There was a trend towards a linear increase in OR for death, where we observed that all newborns who died had received higher scores, and those who survived received a lower score. Therefore, the risk of death could be directly associated with the increase in the SNAPPE II score, and a statistically significant association was found (Table 3). To determine the function of the score with respect to the neonatal mortality and survival rates, a ROC curve was used, based on the sensitivity (correct prediction of death) and the specificity (correct survival prediction). With showed that the area under the curve using SNAPPE II scores was 0.67 (CI 95% 0.63 – 0.71), and 15.000 was determined as the cutoff point (Figure1).

Table 1. SNAPPE II Score

Variables	Score
Mean blood pressure	
Not evaluated	0
≥ 30 mmHg	0
20 to 29 mmHg	9
< 20 mmHg	19
Temperature at the inlet	
> 35,6°C	0
35 a 35,6°C	8
< 35°C	15
Relationship PaO_2 / FiO_2	
Nonexistent	0
> 2,49	0
1 a 2,49	5
0,30 a 0,99	16
< 0,30	28
Blood pH	
Unrealized	0
≥ 7,20	0
7,10 a 7,19	7
< 7,10	16
Multiple seizures	
No	0
Yes	19
Urinary volume	
Not measured (RN well)	0
≥ 1 mL / Kg / h	0
0,1 a 0,9 mL / Kg / h (oliguria)	5
< 0,1 mL / Kg / h	18
Birth weight	
≥ 1000 g	0
750 a 999 g	10
< 750 g	17
Small for gestational age (according to Alexander)	
≥ Percentil 3	0
< Percentil 3	12
APGAR of 5 minutes	
≥ 7	0
< 7	18
TOTAL:	

Source:Genu (2012).

Table 2. Comparison of the SNAPPE II scores and survival

	Death	Survivors	*P*
N	65 (13.3%)	425 (86.7%)	
SNAPPE II	25 (13-86)	8 (0-19)	<0,0001*

*Mann-Whitney test

Table 3. SNAP-PE II levels and survival of newborns

Snap-PE II	N	Death	Or	IC95%	*p*
Levels		n (%)			
Until 11[1]	247	13 (5,3%)	1	-	-
12 to 23	132	17 (12,9%)	2,66	1,24 - 5,66	0,0111*
24 to 32	52	10 (19,2%)	4,29	1,76-10,41	0,0013*
33 to 50	43	14 (32,6%)	8,69	3,72 - 20,28	<0,0001*
51 or more	16	11 (68,8%)	39,60	11,98-130,88	<0,0001*
				Trend	<0,0001**

* Pearson's Chi-square test.
** Statistically significant trend (Trend Chi-square test, p <0.05).
OR = Odds Ratio (Chance Ratio).
95% CI = 95% OR confidence interval.

DISCUSSION

The choice of SNAPPE II as a predictor of death allowed us to establish a relative risk for neonatal mortality, which could be estimated from neonatal conditions in the first 24 h of admission to the NICU. Ramirez *et al*. (2014) evaluated SNAPPE II scores of232neonates, and the newborns were divided into 3 groups, according to the postnatal age at the time of admission: Group 1 (G1) was newborns with postnatal ages of from a few hours to 6 days, Group 2 (G2) newborns were aged 7–14 days, and Group 3 (G3) comprised newborns aged 15–28 days. The ROC curve showed a cutoff point G1 (n = 153) it was 0.75 (CI 95% 0.67–0.84), For G2 (n = 36), it was 0.60 (CI 95% 0.30–0.90) and for G3(n = 43) it was 0.74 (0.52–0.95).In two of these groups, it was observed that the SNAPPE II score was higher in the neonates who died. However, the conclusion of the same study confirms that the observed results were not sufficient to relate the score to the risk of mortality. Dammann *et al*. (2010) reported that SNAPPE II could be considered as an important predictor of severe prognosis, reflecting fetal immaturity and impaired development, which would require intensive multi-professional care. They concluded that SNAPPE II is a marker for the vulnerability of development. The same trend was found by Zardo and Procianoy (2003) in a study conducted on newborns, where it was shown that all 44 deaths were related to a high SNAPPE II score. The cutoff point assessed by the ROC curve of this study was 0.91. The SNAPPE II score was considered potentially capable of predicting the newborns who will be more likely to survive and those who will succumb to death.

Conclusion

Based on this study, we conclude that newborns admitted to the NICU of the institution involved in the study, whose SNAPPE II scores were higher than 15, were more likely to succumb to deaththan those who had a lower score. Moreover, the SNAPPE II score is shown to be related to the risk of mortality, by the ability to predict death within a NICU.

Thus, this score contributes to the improvement of the care processes administered by the multi-professional team within the NICU and optimizes the allocation of resources to the treatment of high-risk newborns.

Acknowledgments

The team of the Neonatal Intensive Care Unit of the Gaspar Vianna Clinic Hospital Foundation.

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