

Correlation between APACHE II Score and Mortality Rate in PKU Gamping Hospital ICU patients

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KEYWORDS

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ABSTRACT

The intensive care system have a duty to help patients in healing process and not to delay patient's death. Therefore many scoring methods was developed to predict the outcome of care and mortality rate in the ICU. One of those methods is APACHE II that scores 12 physiological variables and pre-existing conditions in the patients. This research was done to find the correlation between APACHE II score and mortality rate of PKU Gamping hospital ICU patients. The data used medical records for 61 non-operative patients from June-December 2019. This research found that 37 (60.6%) died and 24 (39.4%) lived after treatment. The average APACHE II score was 21.28 with the lowest score of 3 and the highest score of 43, after the data gathering a correlation test was conducted using Spearman-correlation test. In the data analysis p value of 0.000 ($p < 0.05$) and correlation coefficient of .698 was found. there was a significant correlation between the APACHE II score and the mortality rate of the PKU Gamping hospital ICU patients, where with higher number of score there was higher number of patient's death.

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Introduction

Modern Intensive Care Unit (ICU) evolved from the 1950s where polio patients needed one-on-one nursing care in a separate hospital department. This intensive care aims to assist patients in the healing process and not to delay the death of patients who have low survival abilities. A method is needed to assist practitioners in predicting the outcome of treatment to be given in the ICU, therefore various scoring methods have been developed to assist practitioners in predicting treatment outcomes and mortality in the ICU (Mitchell & Peake, 2005).

Of the various scoring methods developed for intensive care, APACHE II, SAPS II and MPM II are the most commonly used in ICUs worldwide. This has attracted a lot of attention where several studies were conducted to find the most accurate scoring system among the scoring systems above (Knaus et al., 1985). In a 2016, it was found that the APACHE II scoring method showed a more accurate prediction ability than the SOFA and SAPS II scoring methods (Naqvi et al., 2016).

In the APACHE II scoring system, there are 12 physiological variables that are assessed along with the accompanying canonical assessment of the patient and the patient's age, these 12 physiological variables include: Body temperature, Mean Arterial Pressure, pulse rate, respiratory rate, oxygenation, arterial pH, serum sodium, serum potassium, creatinine, hematocrit, leukocytes, and the Glasgow Coma Scale (GCS). All scores will be graded as a score from 0 to 71 where a high score indicates a high risk of death. (Rapsang & Shyam, 2014) (Wibowo P, Sugiman T, n.d.)

Therefore, this study was conducted to find a relationship between the APACHE II score and the mortality rate of ICU patients at the PKU Gamping Hospital.

Research Methods

This study is a retrospective cross-sectional study using secondary data in the form of patient medical records at the PKU Gamping Hospital from June to December 2019, with a sample of 61 patients. The criteria taken were patients who had passed the inclusion process in the form of non-operative patients and had all APACHE II parameters met at 24 hours of ICU admission. And the exclusion criteria were patients under the age of 16 years and being discharged from the ICU not on medical indications. This study has an independent variable in the form of APACHE II and the dependent variable in the form of patient mortality. This study uses Spearman-correlation test data analysis.

Results and Discussions

Table 1. APACHE II Score Distribution

Score APACHE II	Frequency n (%)	Mean	Min	Max
0-4	2 (3.2%)			
5-9	8 (13.1%)			
10-14	7 (11.4%)			
15-19	7 (11.4%)	21,28	3	43
20-24	15 (24.5%)			
25-29	9 (14.7%)			
30-34	7 (11.4%)			
>34	6 (9.8%)			
Total	61(100%)			

According to the APACHE II score distribution table above, the highest number of patients in an APACHE II score range is in the range of 20 points to 24 points, and the least number of patients is in the range of 0 points to 4 points. Patients with an APACHE II score of 0 to 4 were 2 (3.2%), then patients with a score of 5 to 9 were 8 (13.1%), then at a score of 10 to 14 and 15 to 19 had a same number of 7 (11.4 %) for each score, at a score of 20 to 24 the number of patients is 15 (24.5%), a score of 25 to 29 has 9 (11.4%), a score of 30 to 34 has 7 (11.4%), and on a score above 34 has as many as 6 (9.8%) patients.

Table 2. Result of ICU Care

Treatment Result	Frequency n (%)
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Alive	24 (39.4%)
Death	37 (60.6%)
Total	61 (100%)

Based on the distribution table of patient care results, it was found that 61 patients who received ICU care were 24 (39.4%) living patients and 37 (60.6%) dead patients.

Table 3. Result of Data Analysis

Score APACHE II	Lives n (%)	Death n (%)	Sun (%)	<i>p value</i>
0-4	2(8.3%)	0(0%)	2 (3.2%)	
5-9	7(29.1%)	1(2.7%)	8 (13.1%)	
10-14	6(25%)	1(2.7%)	7 (11.4%)	
15-19	4(16.6%)	3(8.1%)	7 (11.4%)	.000
20-24	4(16.6%)	11(29.7%)	15(24.5%)	
25-29	1(4.1%)	8(21.6%)	9 (14.7%)	
30-34	0(0%)	7(18.9%)	7 (11.4%)	
>34	0(0%)	6(16.2%)	6 (9.8%)	
Total	24(39.3%)	37(60.6%)	61 (100%)	
<i>Correlation coefficient</i>				.698

Based on the correlation test table above, it can be seen that the number of patients who died was greater than that of living patients. A change in the number of patients who died and lived could be seen with each change in the APACHE II score. In the results of the Spearman correlation test, the *p* value was 0.000 ($p < 0.05$), thus indicating a significant relationship between APACHE II scores and mortality in ICU patients at PKU Muhammadiyah Gamping Hospital.

Discussion

This study showed that the number of patients who died was more than the number of living patients at the end of treatment with 37 patients dying and 24 living patients. This is different from the research conducted at Dr. Kariadi Semarang in 2016 where the number of living patients was 80 and 55 patients died. This is also different from research conducted at the Al-Madinah Hospital in Saudi Arabia in 2015 where the number of patients died was less than living patients, with 30 patients dying and 80 living patients (Brahmi et al., 2016).

After calculating the APACHE II score in this study, the data distribution showed a mean value of 21.28 and a minimum value of 3 followed by a maximum value of 48. This is different from the results of research conducted in India in 2015 where their research resulted in a mean of 18 and a minimum value of 6 and a maximum of 35 (Parajuli et al., 2015). Like research in India, this result is also consistent with the results of research conducted in Saudi Arabia (Saleh et al., 2015). But this is consistent with a study conducted in Pakistan in 2011 where the mean patient score was obtained at 20.84. This also resembles the figures from the Hong Kong study (Lee & Rainer, n.d.). These differences can be found due to variations in ICU management methods in each country, especially between countries with developed medical systems and countries with developing medical systems.

After analyzing the data on the APACHE II score with the mortality rate for ICU

patients at PKU Muhammadiyah Gamping Hospital, the results obtained were a p value of 0.000 which means ($p < 0.05$) followed by a correlation coefficient of 0.698. This shows a significant relationship between the APACHE II score and the mortality rate in ICU patients at PKU Muhammadiyah Gamping Hospital, where the higher the APACHE II score, the higher the mortality rate. This is in line with research conducted previously at the ICU RSUP dr. Kariadi where the results showed a strong positive relationship between APACHE II scores and mortality in ICU patients (Armiati et al., 2014). This is also consistent with the results of a study in India, where the APACHE II score showed a positive relationship to mortality and length of stay (Naved et al., 2011). Likewise, in a study conducted by Nagar et al, in India, in 2019 where they found a correlation between the APACHE II score and mortality in ICU patients despite the existence of a new APACHE scoring system that was able to more accurately predict patient mortality. (Nagar et al., 2019)

Conclusion

Based on the results, which was then discussed, it was found that there was a significant relationship between the APACHE II score and the mortality rate of ICU patients at PKU Muhammadiyah Gamping Hospital. The higher the APACHE II score obtained, the higher the mortality rate.

Suggestions for the development of science, it is hoped that the results of this research can be used as a basis for further research. Further research should be carried out using other scoring methods to find a more accurate scoring method. For the hospital and the community, especially practitioners, this research are expected to be additional information, knowledge and as material for consideration in policies related to predicting treatment outcomes.

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