Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.comdoi: 10.21276/jamdsr

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805 SJIF (Impact factor) 2017= 6.261; Index Copernicus value 2016 = 76.77

Original Article

Assessment of Efficiency of APACHE II Scoring to Predict the Prognosis of Patients with Bacterial Peritonitis

Arshad Jamal

Associate Professor, Department of Surgery, F H Medical College, Tundala, U.P., India

***ABSTRACT*:**
Background: The scoring systems used widely in the field of intensive care are generic prognostic models that estimate the in-hospital mortality rate. They are designed to express a patient's physical status numerically. Many clinicians utilize these systems to measure the severity of illness, predict patient prognosis, and gather information for clinical research. **Aim:** To assess the efficiency of APACHE II scoring system for bacterial peritonitis patients. **Materials and method:** The present study was conducted in the Department of General Surgery of the Medical institute. A total of 45 patients admitted to the ICU of surgery ward with diagnosis of secondary peritonitis with hollow viscus perforation were included in the study. The diagnosis was confirmed by radiological investigations, clinical and laboratory findings. For the APACHE II scoring, we assessed and recorded various parameters at the time of admission of patients. **Results:** The maximum number of patients were seen in the group with APACHE II score (0-4)(n=16), followed by group with APACHE II score (5-9). No patient was seen in the APACHE II score group 30-34 and >34 the group with APACHE II score 20-24 and 25-29 had 2 patients each. In the present study, we scored all relevant values according to the APACHE II chart scoring for abnormally high or low range. 37 patients were alive and were discharged from the hospital whereas 8 patients died during the treatment period. The correlation of APACHE II score and mortality rate was highly significant. **Conclusion:** APACHE II scoring is highly reliable for predicting the prognosis of bacterial peritonitis patients.
Key words: Bacterial peritonitis, APACHE scoring, critical care.

Received: 18 January 2018 Revised: 16 February 2018 Accepted: 28 February 2018

Corresponding Author: Dr. Arshad Jamal , Associate Professor, Department of Surgery, F H Medical College, Tundala, U.P., India

This article may be cited as: Jamal A. Assessment of Efficiency of APACHE II Scoring to Predict the Prognosis of Patients with Bacterial Peritonitis. J Adv Med Dent Scie Res 2018;6(4):73-76.

INTRODUCTION:

Peritonitis is defined as an inflammatory process of the peritoneum caused by any irritant/agent such as bacteria, fungi, virus, talc, drugs, granulomas, and foreign bodies.[1] Intra-abdominal infection is defined as the local manifestations that occur as a consequence of peritonitis. Intra-abdominal sepsis entails a systemic manifestation of a severe peritoneal inflammation.[2] The main clinical indicators that point to a critical state of the patient are: hypotension, tachycardia, tachypnea, a reduced level of urine output, and altered consciousness. The sensitivity and specificity of these findings for critical illness are greatly improved if they are considered together.[3] In addition to required clinical observation of acutely or potentially critically ill patients, scoring systems are used at different stages of their in-hospital treatment. Scoring systems quantify the severity of critically ill and/or injured on the basis of anatomical, physiological, and biochemical variables and classify the patient in a specific risk group.[4] The scoring systems used widely in the field of intensive care are generic prognostic models that estimate the in-hospital mortality rate.[5] They are designed to express a patient's physical status numerically. Many clinicians utilize these systems to measure the severity of illness, predict patient prognosis, and gather information for clinical research. Since the development of the APACHE scoring system in 1981, many scoring systems, such as the Simplified Acute Physiology Score (SAPS) in 1984 and Mortality Probability Model in 1985.[6,7] Hence the present

study was planned to assess the efficiency of APACHE II scoring system for bacterial peritonitis patients.

MATERIALS AND METHOD:

The present study was conducted in the Department of General Surgery of the Medical institute. The ethical clearance for the protocol of study was obtained from the ethical committee of the institute. The present study was conducted in the department of general surgery of the medical institute. The ethical clearance for the protocol of study was obtained from the ethical committee of the institute. A total of 45 patients admitted to the ICU of surgery ward with diagnosis of secondary peritonitis with hollow viscusperforation were included in the study. An informed written consent was obtained from each patient after explaining them the protocol and procedure of the study. The diagnosis was confirmed by radiological investigations, clinical and laboratory findings. The data was recorded.

For the APACHE II scoring, we assessed and recorded following parameters at the time of admission of patients: Temperature(C), Mean arterial pressure(mm Hg), Heart rate, Respiratory rate (non ventilated), Oxygena¬tion (PaO2 in mmHg withFiO2<0.5 record PaO2), Ar¬terial pH, Serum Sodium (mmol/L), Serum Potassium (mmol/L), Serum creatinine(mg/dl), Hematocrit (%), White blood count. These values were scored in ac¬cordance with the APACHE II chart scoring for abnor-mally high or low range. The score ranged from 0 to 4 on each side of the normal value. Zero score represents a normal value. An increase to 4 represents an extreme end of high or low abnormal levels. These parameters represents the Acute Physiological scores (APS II). Age points for adults in the scoring system were included in the study as follows: <44 = 0, 45-54 = 2, 55- 64=3, 56-74= 5, >75=6. The data was compiled and evaluated.

The statistical analysis of the data was done using SPSS software for windows. The significance of the data was checked using Chi-square test and Student's t-test. A p-value<0.05 was predetermined to be statistically significant.

RESULTS:

In the present study, we scored all relevant values according to the APACHE II chart scoring for abnormally high or low range. The score ranged from 0 to 4 on each side of the normal value; an increase to 4 indicates the extreme end of high to low abnormal levels. Table 1 shows the frequency of patients in each APACHE II score group. The maximum number of patients were seen in the group with APACHE II score (0-4)(n=16), followed by group with APACHE II score (5-9). No patient was seen in the APACHE II score group 30-34 and >34 the group with APACHE II score 20-24 and 25-29 had 2 patients each.Table 2 shows the final outcome of the patients. We observed that 37 patients were alive and were discharged from the hospital whereas 8 patients died during the treatment period. The correlation of APACHE II score and mortality rate was highly significant. On comparing the results of study we observed statistically significant results (p value <0.05) [Fig 1].

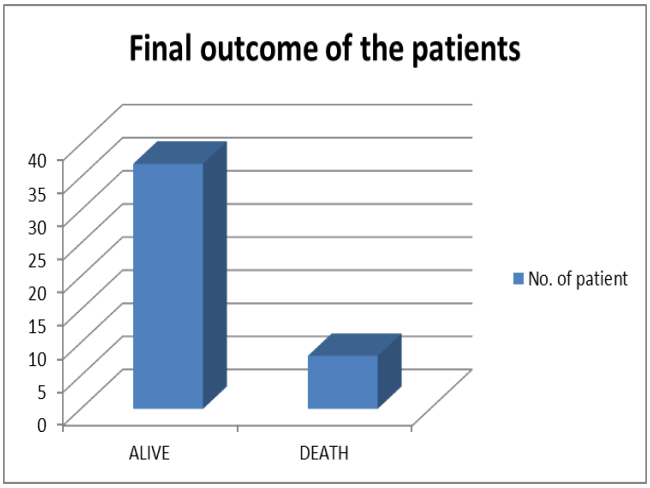
Table 1: Frequency of patients in each APACHE II score group

APACHE II score	No. of patients
0-4	16
5-9	13
10-14	5
15-19	7
20-24	2
25-29	2
30-34	0
>34	0
Total	**45**

Table 2: Final outcome of patients

Final outcome of the patients	No. of patient	p-value
ALIVE	37	0.001
DEATH	8	

Figure 1: No. of patients ALIVE AND DEAD



DISCUSSION:

The APACHE II score , introduced in 1985, is an old version of the APACHE system but still widely used because of its simplicity and capability of classifying severity of illness and predicting hospital mortality.[4] In this study 45 patients of secondary peritonitis weretaken and APACHE IIscore calculated and mortality assessed. The association between these 2 variables was found highly significant. APACHE SCORE < 10 contains 29 patients and no patients died i.e. 0 % mortality. APACHE score

>10(10-24) contains 16 patients and all 8 patient who died belonged to this group i.e. 100%mortality. The results were statistically significant. The results were compared to other studies from the literature and were found to be consistent. Duseja A et al assessed the performance of various prognostic scores including the acute physiology and chronic health evaluation (APACHE II), sequential organ failure assessment (SOFA), Child-Turcotte-Pugh (CTP) and model for end-stage liver disease (MELD) scores in predicting short-term mortality in patients with acute-on-chronic liver failure (ACLF). Altogether 100 consecutive patients with ACLF were evaluated prospectively. The diagnosis of ACLF was based on the Asian-Pacific Association for the Study of the Liver criteria except for the inclusion of non-hepatic insults as acute events. Sensitivity, specificity, positive and negative predictive values, and diagnostic accuracy for predicting short-term mortality was calculated for APACHE II, SOFA, CTP and MELD in all patients and Maddrey's discriminant function (DF) and Glasgow alcoholic hepatitis scores (GAHS) for patients with alcoholic hepatitis only. Most patients had alcohol-related cirrhosis and alcoholic hepatitis as acute insults for ACLF. A total of 53 patients either died or left hospital in very sick status and were confirmed to have died the same day after leaving hospital. Overall, the area under the receiver operating characteristic curve of APACHE II was higher than those of MELD, SOFA and CTP scores for predicting short-term mortality. Even for patients with alcoholic hepatitis, APACHE II performed better than DF and GAHS. It was concluded that short-term mortality is high in patients with ACLF. APACHE II scoring system is superior to other prognostic scores in predicting its short-term mortality.Lee H et al compared the ability of the APACHE IV with those of APACHE II, Simplified Acute Physiology Score (SAPS) 3, and Korean SAPS 3 in predicting hospital mortality in a surgical intensive care unit (SICU) population. They retrospectively reviewed electronic medical records for patients admitted to the SICU from March 2011 to February 2012 in a university hospital. Measurements of discrimination and calibration were performed using the area under the receiver operating characteristic curve (AUC) and the Hosmer-Lemeshow test, respectively. They calculated the standardized mortality ratio (SMR, actual mortality predicted mortality) for the four models. The study included 1,314 patients. The hospital mortality rate was 3.3%. The discriminative powers of all models were similar and very reliable. The AUCs were 0.80 for APACHE IV, 0.85 for APACHE II, 0.86 for SAPS 3, and 0.86 for Korean SAPS 3. Hosmer and Lemeshow C and H statistics showed poor calibration for all of the models. The SMRs of APACHE IV, APACHE II, SAPS 3, and Korean SAPS 3 were 0.21, 0.11 0.23, 0.34, and 0.25, respectively. They concluded that the APACHE IV revealed good discrimination but poor calibration. The overall discrimination and calibration of APACHE IV were similar to those of APACHE II, SAPS 3, and Korean SAPS 3 in this study. A high level of customization is required to improve calibration in this study setting.[8, 9]

Kim EK et al evaluated the predictive validity of three scoring systems; the acute physiology and chronic health evaluation(APACHE) III, simplified acute physiology score(SAPS) II, and mortality probability model (MPM) II systems in critically ill patients. A concurrent and retrospective study conducted by collecting data on consecutive patients admitted to the intensive care unit (ICU) including surgical, medical and coronary care unit between January 1, 2004, and March 31, 2004. Data were collected on 348 patients consecutively admitted to the ICU (aged 16 years or older, no transfer, ICU stay at least 8 hours). Three models were analyzed using logistic regression. Discrimination was assessed using receiver operating characteristic (ROC) curves, sensitivity, specificity, and correct classification rate. Calibration was assessed using the Lemeshow-Hosmer goodness of fit H-statistic. For the APACHE III, SAPS II and MPM II systems, the area under the receiver operating characteristic(ROC) curves were 0.981, 0.978, and 0.941 respectively. With a predicted risk of 0.5, the sensitivities for the APACHE III, SAPS II, and MPM II systems were 81.1, 79.2 and 71.7%, the specificities 98.3, 98.6, and 98.3%, and the correct classification rates 95.7, 95.7, and 94.3%, respectively. The SAPS II and APACHE III systems showed good calibrations. The authors concluded that the APACHE III and SAPS II systems have excellent powers of mortality prediction, and calibration, and can be useful tools for the quality assessment of intensive care units (ICUs).Lee H et al compared the performance of APACHE IV-liver transplantation (LT) specific predicted mortality, SAPS 3, APACHE II, Model for End-stage Liver Disease (MELD)-Na, MELD, and CTP scores in predicting in-hospital and 1 year mortality in liver transplant patients was using 590 liver transplantations in a single university hospital. In-hospital mortality and 1 year mortality were 2.9% and 4.2%, respectively. The APACHE IV-LT specific predicted mortality showed better performance in predicting in-hospital mortality compared to SAPS 3, MELD-Na, and CTP. The APACHE IV-LT specific predicted mortality showed better performance in predicting 1 year mortality compared to MELD-Na and CTP, and also in all MELD groups and in both living and deceased donor transplantation. The APACHE IV-LT specific predicted mortality showed better performance in predicting in-hospital and 1 year mortality after liver transplantation.[10, 11]

CONCLUSION:

Within the limitations of present study we conclude that APACHE II scoring is highly reliable for predicting the prognosis of bacterial peritonitis patients.

REFERENCES:

1. Wittmann DH, Walker AP, Condon RE. Peritonitis, intra-abdominal infection, and intra-abdominal abscess. In: Schwartz SI, Shires GT, Spencer FC, editors. Principles of surgery. 6th. New York: McGraw-Hill; 1994. pp. 1449–84.
2. Wittmann DH, Shein M, Condon RE, et al. Management of secondary peritonitis. Ann Surg. 1996;224(1):10–8.
3. Harrison DA, Parry GJ, Carpenter JR, et al. A new risk prediction model for critical care: the Intensive Care National Audit & Research Centre (ICNARC) model. Crit Care Med. 2007;35(4):1091–98.
4. Gunning K, Rowan K. ABC of intensive care: outcome data and scoring systems. BMJ. 1999;319:241–244.
5. Knaus WA, Zimmerman JE, Wagner DP, Draper EA, Lawrence DE. APACHE-acute physiology and chronic health evaluation: a physiologically based classification system. Crit Care Med. 1981;9:591–597.
6. Le Gall JR, Loirat P, Alperovitch A, Glaser P, Granthil C, Mathieu D, et al. A simplified acute physiology score for ICU patients. Crit Care Med. 1984;12:975–977.
7. Lemeshow S, Teres D, Pastides H, Avrunin JS, Steingrub JS. A method for predicting survival and mortality of ICU patients using objectively derived weights. Crit Care Med. 1985;13:519–525.
8. Duseja A, Choudhary NS, Gupta S, Dhiman RK, Chawla Y. APACHE II score is superior to SOFA, CTP and MELD in predicting the short-term mortality in patients with acute-on-chronic liver failure (ACLF). J Dig Dis. 2013 Sep;14(9):484-90. doi: 10.1111/1751-2980.12074.
9. Lee H, Shon YJ, Kim H, Paik H, Park HP. Validation of the APACHE IV model and its comparison with the APACHE II, SAPS 3, and Korean SAPS 3 models for the prediction of hospital mortality in a Korean surgical intensive care unit. Korean J Anesthesiol. 2014 Aug;67(2):115-22. doi: 10.4097/kjae.2014.67.2.115. Epub 2014 Aug 26.
10. Kim EK, Kwon YD, Hwang JH. Comparing the performance of three severity scoring systems for ICU patients: APACHE III, SAPS II, and MPM II. J Prev Med Public Health. 2005 Aug;38(3):276-82.
11. Lee H, Yoon S, Oh S-Y, et al. Comparison of APACHE IV with APACHE II, SAPS 3, MELD, MELD-Na, and CTP scores in predicting mortality after liver transplantation. Scientific Reports. 2017;7:10884. doi:10.1038/s41598-017-07797-2.

Source of support: Nil **Conflict of interest:** None declared