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General Surgery

# EVALUATION OF APACHE II SCORE IN PATIENTS WITH PERFORATIVE PERITONITIS AS A PREDICTOR OF OUTCOME.

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**ABSTRACT** Patients with perforative peritonitis are commonly encountered in hospitals and frequently require ICU support. A scoring system that can accurately stratify the patients into various risk groups is very helpful to predict the outcome. The APACHE II score has been used previously in patients of various diseases for the same purpose. This prospective study has been undertaken to evaluate the usefulness of APACHE II score for risk stratification and prediction of mortality in patients suffering from perforative peritonitis. The study involved 72 patients admitted with perforative peritonitis over two years. The APACHE II score was calculated and assigned to each patient on admission and the clinical outcome was observed. The scoring system predicted mortality fairly well especially in the score range of 11-20. So it may be concluded that this scoring system can be used in patients with perforative peritonitis as a predictor of outcome.

**KEYWORDS :** APACHE II score, peritonitis, emergency surgery, critical care

## INTRODUCTION:

Perforative peritonitis is a type of peritoneal inflammation caused by perforation of hollow viscus and subsequent bacterial proliferation inside the peritoneal cavity. Patients with perforative peritonitis are commonly presented as surgical emergency. Though the advances in supportive care including higher generation of antimicrobial agents has resulted in improved outcome but mortality still ranges from 5% to 50 percent. Hence patients should be categorized according to their mortality risk which is very important to institute proper management and utilization of valuable Intensive Care Unit (ICU) resources and supportive care. Mortality again depends upon disease severity, age, nutrition, preexisting organ dysfunction etc[1].

The APACHE II scoring system was devised by Knaus and colleagues in 1985. The primary purpose of the system was to predict mortality and categorize patients according to their mortality risks in Intensive Care Unit (ICU) setup[2]. Later the system was evaluated all over the world in different patient populations including surgical patients and the system was proved to be useful. The APACHE II score has three parts; APS (Acute Physiology Score), Chronic Health points and age points which is usually calculated on admission of the patient to the hospital. The total of the three scores makes the final APACHE II score. The score ranges from 0 to 71. A good number of studies have been carried out to evaluate and utilize the APACHE II scoring system in different patient populations in different countries since it's development. But there are few studies which evaluated this system involving surgical patients and almost all of the studies were done in developed countries where the patient profile, presentation and available resources differ from the patients we treat in our setup. The present study was carried out in the emergency surgical ward of Medical College, Kolkata, a government teaching hospital over a period of 21 months to evaluate the usefulness of APACHE II score in categorizing the patients into different risk groups and predicting outcome in patients with perforative peritonitis.

In 1989 Moshe Schein and colleagues conducted a study including 162 patients of perforated peptic ulcer to evaluate the usefulness of APACHE II score and observed 0% mortality in the group 0-10, 30.5% in the group 11-20 and 75% mortality in the group >20. They concluded that When measured preoperatively, it stratified accurately these patients into various risk groups[3]. Naved and associates showed that APACHE-II scoring system was found useful for classifying

ICU patients according to their disease severity[4]. Van Le and colleagues showed a significant correlation between APACHE II scores and mortality among the gynaecologic oncology patients[5]. Gupta and associates showed that predicted mortality did not correlate with observed mortality for critically ill patients admitted to an Indian respiratory ICU[6]. Several studies have been conducted till date on different patient populations including surgical, medical, gynecology, respiratory patients etc[7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18]. Not all group of patients are comparable to each other because of differences in patient profile, nature of the disease, affection of different organ systems etc. So the present study could not be compared to many such studies.

This prospective study was undertaken to justify the usefulness of the APACHE II scoring system in categorizing the patients with perforative peritonitis into various risk groups and predicting the outcome.

## MATERIALS AND METHODS:

The study was conducted in the Emergency surgical ward and emergency operating room, Medical College &Hospital, Kolkata, West Bengal over a period from January, 2013 to September, 2014 including 72 patients with a diagnosis of peritonitis due to perforation of hollow viscus who gave consent to be included in the study.

### Inclusion criteria:

Patients admitted to the emergency surgical ward with a diagnosis of perforative peritonitis due to various etiologies who gave consent to be included in the study.

### Exclusion criteria:

Patients with blunt injury abdomen who had other associated solid organ, vascular, neurological injury and fracture were excluded from the study.

### Diagnosis was established with the following:

a. History
b. Physical examination
c. Free gas under diaphragm found in plain radiograph of abdomen in erect posture.
d. Intraoperative confirmation.

All biochemical investigations needed for the scoring system were done immediately after admission and the proforma was filled. Then the APACHE II score was calculated based on the single reading taken on admission according to the method of

Knaus et al [1]. The surgical procedure followed was to perform closure of perforation in duodenal and gastric ulcer perforation with omental (Graham's) patch, Appendicectomy in perforation due to appendicitis and limited resection and end-to-end anastomosis in perforation of gangrenous bowel. Then the patients were divided in three groups according to their APACHE II score; 0- 10, 11- 20 and >20 for the convenience of analyzing results. Predicted risk of mortality was calculated according to APACHE II death equation for each group. Mortality was defined as any death occurring during the hospital stay. The term 'morbidity' included local and systemic complication and length of hospital and ICU stay. Observed death rate was compared with predicted death rate for each study group. The accuracy of outcome prediction by the APACHE-II system was assessed by using receiver operating characteristics (ROC) curve and Pearson correlation coefficient and its significance test[19]. A ROC curve was constructed from the patients predicted and observed hospital outcomes. Area under the curve was computed using the trapezoidal rule to find the predictive value of APACHE-II score in prediction of mortality and survival. Pearson correlation co-efficient and its significance test were used to investigate whether the difference between the sample correlation coefficient and zero is statistically significant. The statistical software SPSS 22.0 was used for the analysis of the data and Microsoft word and Excel was used to generate graphs, tables etc.

## RESULTS AND DISCUSSION
### Table 1: Etiology

| Etiology | Total Patients | % | Non survivors (%) |
|---|---|---|---|
| Appendicitis | 25 | 35 | 0 |
| Peptic Ulcer Disease | 20 | 28 | 4(5.55%) |
| Typhoid | 4 | 5 | 1(1.39%) |
| Tuberculosis | 7 | 10 | 3 (4.17%) |
| Blunt Trauma Abdomen | 6 | 8 | 2 (2.78%) |
| Bowel Strangulation | 6 | 8 | 3 (4.17%) |
| Malignancy | 4 | 6 | 1 (1.39%) |
| Total | 72 | 100 | 14(19.44%) |

### Table 2: Co- Morbid conditions

| Co-morbidities | No. of cases |
|---|---|
| Ischemic heart disease | 5 |
| Chronic Obstructive Pulmonary Disease (COPD) | 8 |
| Pulmonary Tuberculosis | 4 |
| Chronic Liver Disease | 2 |
| HIV infection | 1 |

### Table 3: Local Complications

| | |
|---|---|
| Wound infection only | 14 |
| Wound dehiscence with wound infection | 12 |
| Anastomotic Leak with wound infection | 6 |
| Fecal fistula with wound infection | 3 |
| Total | 35 |

### Table 4: Systemic Complications

| Complication | Number of patients |
|---|---|
| Adult Respiratory Distress Syndrome (ARDS) | 23 |
| Sepsis | 12 |
| Acute Renal Failure (ARF) | 4 |
| Total | 39 |

### Table 5: Hospital stay and ICU stay

| APACHE II Score | Mean Hospital Stay | Mean ICU Stay |
|---|---|---|
| 0 - 10 | 10.31 | 1.31 |
| 11-20 | 16.73 | 3.65 |
| >20 | 15.62 | 6.62 |

### Table 6: Survival according to the APACHE II Score

| APACHE II Score | Survivors | Non Survivors | Percentage of mortality |
|---|---|---|---|
| 0-10 | 36 | 2 | 5.26 |
| 11- 20 | 20 | 6 | 23.07 |
| >20 | 2 | 6 | 75 |
| | Mean APACHE II Score =9.89 | Mean APACHE II Score =18.92 | |

### Table 7: Complications and APACHE II Score

| APACHE II Score | No. of Patients | Pts. developing Local Complications | Percentage | Pts. developing Systemic Complications | Percentage |
|---|---|---|---|---|---|
| 0-10 | 38 | 11 | 28.94 | 11 | 28.94 |
| 11-20 | 26 | 18 | 69.23 | 21 | 80.76 |
| >20 | 8 | 6 | 75 | 7 | 87.5 |

### Table 8: Overview

| Variables | APACHE II Score Group | | |
|---|---|---|---|
| | 0-10 | 11-20 | >20 |
| Mean Age | 30.10 | 38.88 | 61.37 |
| Male : Female | 2.8 : 1 | 2.25:1 | 1.66: 1 |
| Mean Hospital Stay (days) | 10.31 | 16.73 | 15.62 |
| Mean ICU Stay (days) | 1.31 | 3.65 | 6.62 |
| Percentage of local complications | 28.94 | 69.23 | 75 |
| Percentage of systemic complications | 28.94 | 80.76 | 87.5 |
| Mortality percentage | 5.26 | 23.07 | 75 |

### Table 9: Prediction of mortality

| A II Score Group | Mean A II score | No. of Cases | Observed Death | Predicted Death | Standard Mortality Ratio |
|---|---|---|---|---|---|
| 0- 10 | 6.76 | 38 | 2 (5.26%) | 2.80 (7.38%) | 0.71 |
| 11- 20 | 15.69 | 26 | 6 (23.07%) | 5.89 (22.68%) | 1.01 |
| > 21 | 21.75 | 8 | 6 (75%) | 3.32 (41.54%) | 1.80 |
| 0- 23 (overall) | 11.65 | 72 | 14(19.44%) | 10.07 (13.99%) | 1.39 |
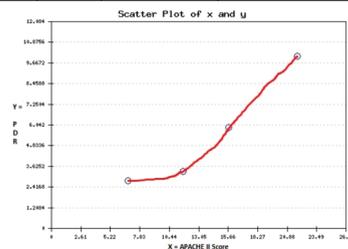


**Graph 1: Correlation Of APACHE II score and Predicted Death Rate (PDR)**

Pearson Correlation coefficient and its significance test were applied to investigate whether the difference between sample correlation coefficient and zero is statistically significant. It showed perfect correlation of APACHE-II score and predicted death rate. [r=0.96]. The second degree polynomial was able to correlate well with predicted death rate with R2 = 0.96084517.
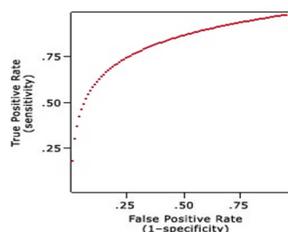


**Graph 2 : Receiver Operating Characteristic Curve**

A receiver-operating characteristic curve was constructed from the predicted and observed outcome of patients and is shown in Graph 11. The area under the curve computed using the trapezoidal rule was 0.824 which indicates good correlation.[19]

## CONCLUSION:

In conclusion the APACHE II score is a reliable scoring system in stratifying patients with perforative peritonitis in various risk groups and predict mortality accurately in the score range of 11-20.

However predicted mortality did not correlate well with the observed mortality in the other two groups. In the group with score 0- 10 the system overestimates the mortality risk whereas in the group with score >20 it underestimates the risk.

Overall the scoring system has shown to be a reliable tool in predicting outcome and categorizing the patients with perforative peritonitis into various risk groups. Moreover the variables required are simple and almost universally available in any standard ICU setup. Also the score is easy to calculate in a very little time.

There is scope for further evaluation of this scoring system in larger patient population and different group of patients. If the score can be standardized it can also be used to evaluate the quality of care provided by an ICU setup. There is also scope for further modification.

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