INTRODUCTION

The patients admitted in surgical intensive care unit (ICU) need intensive monitoring and aggressive management for advanced support of life. Patients may be admitted to an intensive care from the emergency department, the ward, or from the operation theatre. They have the most severe and life-threatening illnesses like severe trauma, major surgery, multiple organ failure, pancreatitis, sepsis etc. Some scoring systems have been developed for the constant monitoring and support from specialised equipment and medications. Moreover, there has been interest in measuring the outcome of ICU patients, in terms of survival, morbidity, mortality and resource utilization. Various scoring systems for these critically ill patients include Acute Physiology and Chronic Health Evaluation (APACHE), Simplified Acute Physiology Score (SAPS), Ranson criteria, Sequential Organ Failure Assessment (SOFA) score, Glasgow Coma Scale, etc. These scoring systems are used for grading the severity of illness, planning the treatment, predicting outcome and communicating with others. These systems are moderately accurate in predicting the survival. The variables used in them can be incorporated into risk adjustment systems for ICU. The type of surgical intervention is also important in determining the outcome.

In comparison with the other scoring systems, APACHE IV is generalisable and can be applied to a wide variety of critically ill patients. Some of the other scoring systems in practice, such as Glasgow Coma Scale for head injury, and Ranson criteria for pancreatitis etc., are specific and have limited application. APACHE IV score is used in the patients, who are admitted in surgical ICU for various diseases, to monitor and evaluate the results of treatment. Moreover, the survival and mortality could be assessed by applying this score to these surgical patients. It can also be used for counselling and resource utilisation. Little has been done or mentioned in the local literature about the usefulness of APACHE IV in the integrated surgical ICUs.

The objective of this study was to predict the mortality by the mean Acute Physiology and Chronic Health Evaluation (APACHE) IV score of all the patients admitted in a Surgical Intensive Care Unit (ICU). The scores of the survivors and the non-survivors were compared for prediction of survival and mortality.

METHODOLOGY

This was a descriptive study conducted in the Surgical Intensive Care Unit, Mayo Hospital, Lahore, from June 2013 to November 2014. All adult patients of either gender admitted to the Surgical ICU patients were included.

OBJECTIVE

To predict the mortality by the mean Acute Physiology and Chronic Health Evaluation (APACHE) IV score of all the patients admitted in a Surgical Intensive Care Unit (ICU) and comparing the score of the survivors and non-survivors.

Study Design: Descriptive study.

Place and Duration of Study: Surgical Intensive Care Unit, Mayo Hospital, Lahore, from June 2013 to November 2014.

Methodology: All adult patients admitted in the Surgical ICU were included in this study. The demographics and other data of the patients were recorded. The APACHE IV scores of all patients were calculated at the time of admission. The scores of the survivors and the non-survivors were compared for prediction of survival and mortality.

Results: The age of these patients ranged from 13 to 70 (mean 38.39) years with 86 (55.48%) males and 69 (44.52%) females. The mean APACHE IV score of these patients was 34.96 ±14.93 ranging from 11 to 63 years. Eighty-three (53.55%) patients survived and 72 (46.45%) died. With respect to gender, 41 (47.67%) males out of 86 and 31 (44.92%) females out of 69 did not survive. The mortality increased with an increase in APACHE IV score and all the patients with score more than 39 did not survive.

Conclusion: The predicted mortality can be assessed by APACHE IV score, so it is good for application among the surgical ICU patients.

Key Words: APACHE IV. Intensive Care Unit (ICU). Mortality prediction.

ABSTRACT

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Patients up to 12 years were excluded as they are treated in the pediatric surgery department of the study centre.

The patients fulfilling inclusion criteria were enrolled after consent from the surgical ICU team of the Hospital. Their demographic variables like name, age, gender, and address were noted. During the first 24 hours of ICU admission, the highest and the lowest values of parameters like pulse, blood pressure, temperature, respiratory rate, serum sodium, glucose, creatinine, BUN, hematocrit, and white cell count were recorded. A single reading of parameters including blood pH, pCO2, pO2, FiO2, albumin, bilirubin and Glasgow coma scale was noted at the same time. Also 24-hour urine output during the first 24-hour after admission was recorded. Data, including source of admission, pre-ICU stay, admitting diagnosis and whether patient was ventilated during first 24-hour, were also recorded as well as any chronic health condition, like chronic liver disease. All the data were recorded and APACHE IV score calculated. Then the survival and actual mortality was calculated by applying t-test. The quantitative data was presented in the form of mean and standard deviation of qualitative variables in the form of frequency and percentages. Data was entered and analysed using SPSS version 18. P-value < 0.05 was considered as significant.

**RESULTS**

A total of 155 patients were included in this study. The mean age of the patients was 38.39 ±13.61 years with minimum and maximum ages of 13 and 70 years, respectively (Table I). Eighty-six (55.48%) patients were males, while 69 (44.52%) patients were females. The male to female ratio was 1:2 to 1. The most common indication for admission was surgery for peritonitis due to various reasons (Table I). The mean value of APACHE IV score of the patients was 34.96 ±14.93 with minimum and maximum scores of 11 and 63, respectively (Table I). Low values of APACHE score were found for hepatorraphy and oesophagectomy, thus mortality was low; while high scores were found for pancreatic necrosectomy and thoracolaparotomy, having high mortality. The study results showed that the mortality occurred in 72 (46.45%) patients; whereas, mortality did not occur in 83 (53.55%) patients. Out of 86 male patients, mortality occurred in 41 (47.67%) patients and did not occur in 45 (52.33%) patients, while 69 patients were females in which mortality occurred in 31 (44.92%) and not in 38 (55.08%) patients. There is relatively insignificant difference regarding the gender and mortality of the patients with p-value of 0.035. Figure 1 shows the relationship of APACHE IV score with the mortality.

**DISCUSSION**

For monitoring in the intensive care units, APACHE IV is one of the many scoring systems. The parameters incorporated in it are anatomical, physiological, and pathological. Scores from anatomical parameters, once assessed, remain fixed and do not change; whereas, physiological parameters may change as the response to the disease and treatment varies. These systems are moderately accurate in predicting individual survival. Apart from nature and severity of disease, the surgical intervention is also important in determining the outcome.8,9 The survival and mortality is related to the levels of APACHE IV scores. APACHE IV scores are directly proportional to the mortality. Low scores are associated with better survival and low mortality rate. So the mortality can be predicted from calculating the APACHE IV scores of these patients. APACHE IV is a successful scoring system for assessing severity of illness and predicting the prognosis.10,11 Moreover, it can be used for planning treatment and communicating with others. Another advantage of APACHE IV is that, it is not systemic-specific, and can be applicable to the patients admitted to ICU for various reasons. In some countries, it is being used by intensivists after proving valid.12
Mortality prediction in patients admitted in surgical intensive care unit by using APACHE IV

This study results showed that the mean value of APACHE IV score of the patients was 34.96, with minimum and maximum scores of 11 and 63, respectively. According to the study conducted by Yamin et al. in Civil Hospital Karachi (CHK) to see the applicability of APACHE IV in intensive care unit, the mean APACHE IV score of all patients was 63.78 and mean APACHE IV score of non-survivors was 85.07 with mean predicted mortality of overall patients was found to be 25.7%, while the observed mortality was 28.4% with SD of 0.439. They concluded that the mortality, survival, and length of stay can be predicted acceptably by APACHE IV system in the patients and can be utilised as a performance assessment tool in ICU. Another local study demonstrated that APACHE IV can be used as a valid method of predicting outcome and mortality in acute lung injury among ICU patients. They also showed that APACHE IV had an excellent prediction for duration of stay and death at ICU in the surgical patients.

APACHE IV is a predictor of hospital mortality for discrimination and calibration. It provides useful benchmark for evaluating efficiency in ICUs. Clinicians can use these benchmarks to assess their unit’s efficiency and monitor the impact of treatment protocols for specific patient groups. The mortality rate in this study (45.33%) was comparable to a study conducted in United States for APACHE IV scores of patients admitted in ICU. The mortality rate increased with the increase in the score. The observed mortality of 44.4% was not statistically different from predicted mortality of 42.1. APACHE IV is relatively less reliable tool to predict mortality and length of stay in patients with sepsis and acute pancreatitis, where the predicted and observed length of stay and mortality of patients were found to be different.

The difference in mortality can also be related to the calibration of ICU and use of APACHE IV scores. Some studies report that there can be overestimated hospital mortality in the integrated ICUs. Hu et al. showed that the APACHE IV score had a better calibration when it was applied to specialised ICUs; this scoring system is sensitive to distinguish possible non-survivors from survivors. Comparing with data from integrated ICUs, the APACHE IV score showed better prediction in a specialised ICU, which has also been demonstrated by Knaus. These results suggested that the APACHE IV scoring system is more appropriate for prediction of the prognosis of patients in specialised ICUs than in the integrated ICUs. APACHE IV predictions of hospital mortality have good discrimination and calibration and should be useful for benchmarking performance in ICUs. However, there is need for further research on APACHE IV regarding its application amongst the patients who are seriously ill and admitted in ICU with various diseases.

CONCLUSION

APACHE IV scoring system assesses the severity of the disease and there is close relationship of the survival and mortality to the levels of APACHE score. So, it is good for application among the patients in intensive care unit for mortality prediction.

REFERENCES


