

Correlation between the APACHE IV score and predicted mortality rate in obstetrics and gynaecology admissions in ICU

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Abstract

Background: The use of scoring system to predict risk of mortality and evaluating outcome in critically ill patients is important in modern evidence-based medicine. Prognostication of critically ill patients, in a systematic way, based on definite objective data is an integral part of the quality of care in ICU.¹ Acute physiology and chronic health evaluation (APACHE) scoring systems provide an objective means of mortality prediction in ICU. Hence the study was taken to correlate between APACHE IV score and mortality rate in obstetrics and Gynecology patients admitted in ICU. **Methods:** All Obstetrics and Gynecology admissions in ICU at Sri Ramchandra Medical Centre, Chennai from July 2007 to July 2009 were studied. Patients less than 18 years of age, ICU stay less than 4 hours were excluded. **Results:** All the patients who had a score between 0-40 survived. Out of 27 patients who had a score of 41-60, 25 patients survived and 2 died. Inpatients with a score of 61-80, 9 survived and 3 died. Inpatients with a score of 81-100 almost 54.5% of patients died. Patients who had score above 100 only 16.6% survived. In Patients with APACHE IV score > 100-83.4% died. In patients with APACHE IV score <40-100% survived. Total number of deaths was 14. Correlation between APACHE IV score and the patient outcome is statistically significant with a P-value < 0.001. **Conclusion:** When compared to all other studies which were done to determine whether APACHE IV scores for patients in ICU correlate with outcomes this study shows that there is no statistical significance for its deviation from a perfect fit in obstetrics and Gynaecology patients. **Key Words:** APACHE-IV, Mortality rate, Intensive care unit, Obstetrics, Gynaecology.

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INTRODUCTION

The use of scoring system to predict risk of mortality and evaluating outcome in critically ill patients is important in

modern evidence-based medicine. Prognostication of critically ill patients, in a systematic way, based on definite objective data is an integral part of the quality of care in ICU.¹ Acute physiology and chronic health evaluation (APACHE) scoring systems provide an objective means of mortality prediction in ICU. An adequate scoring system should be able to define critically ill-patients, estimate prognosis, and set a benchmark for the maintenance of standards of care in the ICU. A number of physiological based scoring systems have been developed over the years to achieve these goals. However, among many severity scoring systems, APACHE scores are the most commonly used and deserve some understanding. The basic premise of these scores is that worst physiological derangement noted during first 24 hours after admission in an ICU

determines the chance of hospital survival as these define organ insufficiency. APACHE IV scoring system was introduced in 2006 as an improved and updated model for predicting hospital mortality among critically ill patients and is the most recent version of the APACHE scoring system. This model included the new predictor variables like- mechanical ventilation, thrombolysis, Pao2/fio2 ratio, impact of sedation on Glasgow Coma Scale, pre-ICU hospital length of stay, location prior to ICU admission and 116 disease specific subgroups in addition to the modifications introduced in the APACHE III.² Hence the study was taken to correlate between APACHE IV score

and predicted mortality rate in obstetrics and Gynecology patients admitted in ICU.

MATERIAL AND METHODS

All Obstetrics and Gynecology admissions in ICU at Sri Ramchandra Medical Centre, Chennai from July 2007 to July 2009 were studied. Patients less than 18 years of age, ICU stay less than 4 hours were excluded. Data collected in all eligible patients on pre designed proforma. APACHE IV calculator is used to derive APACHE IV scores. Data on mortality is collected as outcome measure. Statistical analysis using t-test, chi square test for correlation coefficient are used to analyze the results.

RESULTS

Total number of 82 patients were included in the study. The age group of the patients varied from 19 to 90 years of age. The mean age was 27.96 years with standard deviation of 10.72. There were 30(36.58) patients in the age group between 18-25 years, 25 (30.5%) patients in the age group 26-30(19.5%) patients between 30-45 years and 11 (13.4%) patients between > 40 years of age group.

Table 1: Cause of admission and no. of cases

Cause	cases	Cause	cases
Post-Partum Haemorrhage	10	Sepsis	06
Pre-Eclampsia / Eclampsia	16	Jaundice	01
Ectopic Pregnancy	01	HELLP	04
Intra uterine foetal death	08	Pulmonary Edema	07
Abruptio Placenta	05	Diabetic Ketoacidosis – 2	02
Cardiac Illness	12	Transfusion Reaction	04
Seizures	03	Dysfunctional Uterine Bleeding	02
Pulmonary Embolism	07	Anaesthetic Complication	02
Peripartum Cardiomyopathy	01	Hypertension	01
Intestinal Obstruction	01	Chronic Renal Failure	01
Metabolic Acidosis	01	Carcinoma	05
Von Willebrand’s Disease	01		

There were a total of 82 patients. Out of which 64(78%) were admitted to intensive care unit for obstetric reasons and 18(22%) of them were for Gynecological reasons. The causes have been enumerated earlier. There were 64 obstetric patients in this study population. Out of which 36 were primigravida and 28 were multigravida. Out of the 82 patients 43 had some chronic disease and 39 did not have chronic disease. The presence or absence of the chronic disease has a statistical significance on the APACHE IV scoring and hence on the outcome. Out of the total of 82 patients 39 patients needed mechanical ventilation. It was observed in my study that the ventilated patients had a poor outcome.

Table 2: Correlation between APACHE score, Predicted Mortality Rate (PMR).

		APACHE IV	ALS (Days)	PLS (Days)	PMR
APACHE IV	Pearson Correlation	1	.304	.635	.859
	Sig. (2- tailed)		.006	.000	.000
	N	82	82	82	82
ALS (Days)	Pearson Correlation	.304	1	.469	.180
	Sig. (2- tailed)	.006		.000	.106
	N	82	82	82	82
PLS (Days)	Pearson Correlation	.635	.469	1	.378
	Sig. (2- tailed)	.000	.000		.000
	N	82	82	82	82
PMR	Pearson Correlation	.859	.180	.378	1
	Sig. (2- tailed)	.000	.106	.000	
	N	82	82	82	82

Correlation is significant at the 0.01 level (2- tailed).

Table 3: Independent sample test

	Levene's Test for quality of Variance		t- test for Equality of means						
	F	Sig.	t	df	sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
PMR	33.307	0.000	-6.774	80	.000	25.42840	3.75397	2.89903	7.95777
Equal variance assumed									
Equal variance not assumed			-3.917	13.796	.002	25.42840	6.49261	9.37297	1.48383

The P-value is <0.001 for predicted mortality rate and the outcome which is statistically significant. This study shows that APACHE IV is a reliable tool to predict out come in Obstetrics and Gynaecology patients in ICU.

Table 4: APACHE score Vs outcome survival

APACHE score Vs outcome survival					
APACHE IV SCORE	0-40	41-60	61-80	81-100	>100
Survived	20	25	9	5	1
Died	0	2	3	4	5

All the patients who had a score between 0-40 survived. Out of 27 patients who had a score of 41-60, 25 patients survived and 2 died. Inpatients with a score of 61-80, 9 survived and 3 died. Inpatients with a score of 81-100 almost 54.5% of patients died. Patients who had score above 100 only 16.6% survived. In Patients with APACHE IV score > 100-83.4% died. In patients with APACHE IV score <40-100% survived. Total number of deaths was 14. This study shows that the correlation is statistically significant with P-value < than 0.001.

DISCUSSION

This study shows that the correlation between APACHE IV score and the patient outcome is statistically with a P-value < 0.001. This signifies that APACHE IV is a reliable in Obstetrics and Gynaecology patients admitted in intensive care as for any other intensive care patient. P-Value< 0.001 for the APACHE IV score and predicted mortality rate which is statistically significant as observed in the patients who died. In a study by Mohammad Ghorbani *et al.*, out of the studied patients, 157 died and 682 were discharged (non-survivors and survivors, respectively). The overall observed mortality was 17.8%, while the predicted mortality by APACHE-IV model was 21%. Therefore, there was an overestimation of predicted mortality by APACHE-IV model, with an absolute difference of 3.2% (p=0.036). It was concluded that APACHE-IV was a poor predictor of mortality rate in emergency ICU. Therefore, specific models based on big sample sizes of Iranian patients are required to improve accuracy of predictions.³ In a study by Jack E Zimmerman *et al.*, on 131,618 consecutive ICU admissions during 2002 and 2003, of which 116,209 met inclusion criteria, it was concluded that the APACHE IV model provides clinically useful predictions for critically ill patient groups, but its accuracy and utility are limited for individual patients. APACHE IV benchmarks for ICU stay are useful for assessing the efficiency of unit throughput and support examination of structural, managerial, and patient factors that affect ICU stay.⁴ In a study by Amit chatopadhyaya *et al.*, on 198 severe sepsis ICU admissions it was concluded that the results provide a preliminary indication that

APACHE-IV model may be a poor predictor of mortality rate in severe sepsis cases.⁵ In a study by Vidya S Nagar *et al.*, APACHE II score of the patients ranged from 1 to 32 and APACHE IV score of the patients ranged from 25 to 142. There was good correlation between APACHE II and APACHE IV scores with the spearman's rho value of 0.776 (P<0.01). Discrimination for APACHE II and APACHE IV models were good with area under ROC curve of 0.805 and 0.832 respectively. APACHE IV was more accurate than APACHE II in this regard. The cut-off point with best Youden index for APACHE II was 17 and for APACHE IV were 72 respectively for predicting mortality. It was concluded that discrimination was better for APACHE IV than APACHE II model however Calibration was better for APACHE II than APACHE IV model in the study. There was good correlation between the two models observed in the study.⁶ In a study by Tim M E Crozier *et al.*, on 6565 ICU admissions it was observed that overall mortality was 28% (predicted, 32.7%; 95% CI, 31.4%–34.5%). Of those aged > 80 years, 37% were discharged home, and 39% died.⁷ In a study by Ramkrishnan *et al.*, total of 498 patients were included in the study. After excluding patients, data from 392 patients with a mean age of 55.61 ± 16.78 was analysed. The OMR of the study population was 30.10%. The mean APACHE II score was 26.49 ± 10.12 while the mean APACHE IV score was 81.32 ± 36.33. The PMR obtained using APACHE II was significantly higher than that obtained using APACHE IV score (51% vs. 36.6%; p < 0.001). The SMR obtained using APACHE II and IV scores were 0.59 and 0.82 respectively. On Bland-Altman plot, the mean

bias in the PMR between the two APACHE scoring systems was -18.6 with 95% limits of agreement between 9 and -46.1. It was concluded that outcome prediction using APACHE IV and APACHE II systems provide different PMR and SMR. This variability can alter the reporting and the perception of the ICU quality and outcomes. Standardizing the scoring systems across ICUs globally will help to better compare quality of ICUs and interpret published data on outcomes.⁸

CONCLUSION

When compared to all other studies which were done to determine whether APACHE IV scores for patients in ICU correlate with outcomes this study shows that there is no statistical significance for its deviation from a perfect fit in obstetrics and Gynaecology patients.

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