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Original Research Article

A Comparative Study of APACHE II and SOFA Scores for Predicting ICU Mortality in a Tertiary Care Hospital

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Conflict of interest: Nil

Abstract:

Background: Accurate early prediction of mortality in critically ill patients is essential for clinical decision-making and optimal resource utilization in intensive care units (ICUs). The APACHE II (Acute Physiology and Chronic Health Evaluation II) and SOFA scores (Sequential Organ Failure Assessment) are widely used severity scoring systems for this purpose.

Aim: To compare the predictive accuracy of APACHE II and SOFA scores in estimating ICU mortality.

Methods: This retrospective observational study included 150 critically ill patients admitted to a tertiary care ICU over six months. APACHE II and SOFA scores were calculated within 24 hours of admission. Patients were categorized into high- and low-risk groups using predefined cut-offs (APACHE II ≥20; SOFA ≥8). Mortality outcomes were analysed using the chi-square test, with $p < 0.05$ considered statistically significant.

Results: Patients with APACHE II scores ≥20 had significantly higher mortality compared to those with scores <20 (45% vs 14.3%, $p < 0.001$). Similarly, patients with SOFA scores ≥8 had higher mortality than those with scores <8 (53.3% vs 8%, $p < 0.001$). SOFA demonstrated a stronger association with mortality compared to APACHE II.

Conclusion: Both APACHE II and SOFA scores are effective predictors of ICU mortality. However, SOFA showed superior predictive ability and may be more useful for ongoing assessment in critically ill patients.

Keywords: ICU, mortality, APACHE II, SOFA, severity scoring systems.

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Introduction

Critically ill patients admitted to intensive care units (ICUs) often present with complex and life-threatening conditions requiring prompt evaluation and management. Accurate risk stratification at admission is crucial for guiding clinical decisions, optimizing resource allocation, and improving patient outcomes. [1]

Severity scoring systems play an essential role in predicting prognosis and monitoring disease progression. Among these, the Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores are widely used.

APACHE II incorporates acute physiological parameters, age, and chronic health conditions to estimate mortality risk. [2] In contrast, the SOFA score evaluates the extent of organ dysfunction across six systems and is particularly useful in patients with sepsis and multi-organ failure. [3]

Despite widespread use, comparative evaluation of these scoring systems remains clinically relevant, especially in resource-limited settings. This study aims to assess and compare the predictive accuracy of APACHE II and SOFA scores in ICU patients. [4]

Materials and Methods

Study Design: Retrospective observational comparative study.

Study Duration: March 2025 to August 2025 (6 months).

Study Setting: ICU of a tertiary care hospital in Patna, Bihar.

Sample Size: 150 critically ill adult patients.

Inclusion Criteria

- Age ≥18 years
- ICU admission
- Availability of complete data for APACHE II and SOFA calculation within 24 hours

Exclusion Criteria

- ICU stay <24 hours
- Incomplete clinical records

Score Categorization

- APACHE II:
  - Low risk: <20
  - High risk: ≥20
- SOFA:
  - Low risk: <8
  - High risk: ≥8

Outcome Measure

Primary outcome: ICU mortality.

Statistical Analysis: Data were analysed using appropriate statistical software (IBM SPSS V29). Categorical variables were compared using the chi-square test.

A p-value <0.05 was considered statistically significant.

Results

Table 1: Baseline Distribution

Variable	Number (n=150)	Percentage (%)
High APACHE II (≥20)	80	53.3%
Low APACHE II (<20)	70	46.7%
High SOFA (≥8)	75	50%
Low SOFA (<8)	75	50%

Out of 150 patients:

- 80 (53.3%) had APACHE II ≥20
- 75 (50%) had SOFA ≥8

Table 2: Mortality Based on APACHE II

APACHE II Group	Total	Deaths	Mortality (%)	p-value
High (≥20)	80	36	45%	<0.001
Low (<20)	70	10	14.3%	

- High APACHE II (≥20): 36/80 deaths (45%)
- Low APACHE II (<20): 10/70 deaths (14.3%)
- **Statistically significant (p < 0.001)**

Table 3: Mortality Based on SOFA

SOFA Group	Total	Deaths	Mortality (%)	p-value
High (≥8)	75	40	53.3%	<0.001
Low (<8)	75	6	8%	

- High SOFA (≥8): 40/75 deaths (53.3%)
- Low SOFA (<8): 6/75 deaths (8%)
- **Statistically significant (p < 0.001)**

Both scoring systems demonstrated clear discrimination between high- and low-risk groups, with SOFA showing a stronger association with mortality.

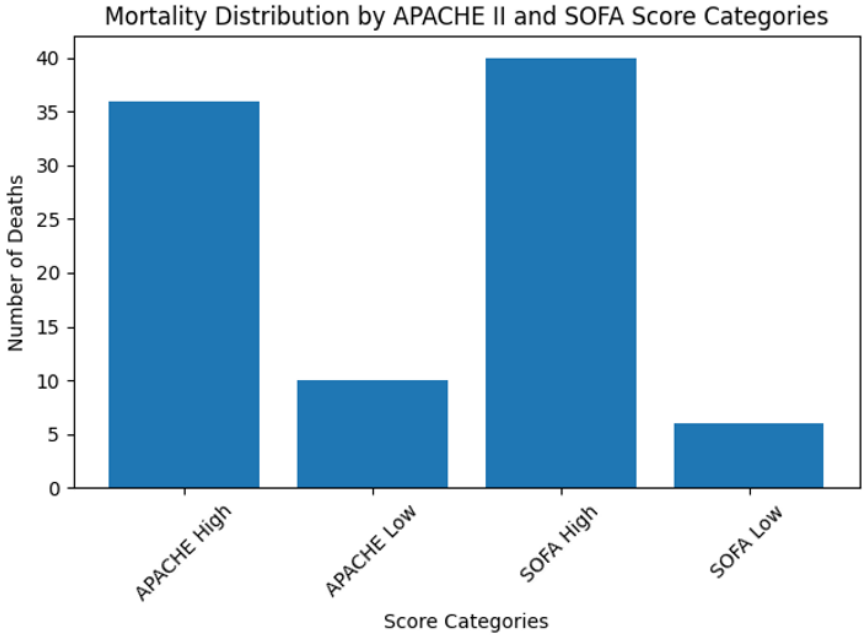

Figure 1: Mortality distribution by APACHE II and SOFA score categories

Discussion

This study demonstrates that both APACHE II and SOFA scores are reliable predictors of ICU mortality. Higher scores in both systems were significantly associated with increased mortality.

APACHE II scores of ≥20 were substantially linked to higher mortality, demonstrating its usefulness in early risk assessment. Nonetheless, a SOFA score of ≥8 shown a higher discriminatory ability in identifying high-risk individuals and an even larger correlation with mortality. These results imply that, although both scoring systems have therapeutic utility,

However, SOFA showed superior discriminatory ability compared to APACHE II. This may be attributed to its dynamic nature and its focus on organ dysfunction, which reflects real-time physiological deterioration more accurately. [3]

The fact that SOFA focuses on the degree and course of organ dysfunction could be one reason for its superior efficacy. SOFA more directly and dynamically reflects acute physiological impairment by evaluating the six primary organ systems. [5] Because SOFA can be repeated every day, it is very useful for continuing to monitor critically ill patients, unlike APACHE II, which is mostly measured after admission. [6]

Clinically speaking, both scores are helpful for early risk stratification at the time of intensive care unit admission. On the other hand, SOFA might be better suited for daily evaluation, directing assertive management tactics, efficient resource distribution, and knowledgeable family therapy. Early high-risk patient identification enables prompt actions that could enhance results. [7]

Mortality was higher in the high-score APACHE II and SOFA groups than in the corresponding low-score groups. Significantly, the group with the greatest SOFA score had the highest overall mortality, suggesting better predictive ability. Both scoring systems' clear distinction between high and low groups demonstrates how well they stratify risks and bolsters their therapeutic usefulness in forecasting intensive care unit outcomes. [8]

These findings are in accordance with other research showing that SOFA works better in patients with sepsis and multi-organ failure, while APACHE II is useful for baseline mortality estimate. Additionally, it has been demonstrated that there is a high correlation between patient outcomes and dynamic changes in SOFA levels. Overall, the results are consistent with ICU data from around the world that favour SOFA for predicting death. [9]

APACHE II remains valuable for initial risk stratification at ICU admission. In contrast, SOFA is more suitable for ongoing monitoring and prognostication, particularly in patients with sepsis and multi-organ dysfunction.

Clinical Implications

- Early identification of high-risk patients
- Improved resource allocation
- Better prognostic counselling for families

Limitations

- Single-centre study
- Retrospective design

- Relatively small sample size
- Lack of ROC curve and AUC comparison

Future studies with larger populations and advanced statistical analysis are recommended.

Conclusion

Both APACHE II and SOFA scores are effective tools for predicting ICU mortality. However, the SOFA score demonstrated superior predictive performance in this study and may be preferred for ongoing patient assessment in the ICU.

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