

EDITORIAL

Are we ready for an ICU Scoring System? The APACHE IV score

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General ICU scoring systems are used to assess severity of illness at admission and use it to predict outcomes. They are useful in determining allocation of resources, characterization of disease severity and organ dysfunction, for comparing units and in ICU research.

The Acute Physiology and Chronic Health Evaluation (APACHE) IV scoring system uses the worst physiological measurements on day 1 of ICU admission; pulse rate, respiratory rate, mean blood pressure, temperature, PaO₂/ FiO₂ ratio or PA-aO₂ for intubated patients with an FiO₂ ≥ 0.5, sodium, bilirubin, blood urea nitrogen, creatinine, albumin, glucose, hematocrit, white blood cells, urine output, acid base abnormalities and neurologic assessment by the Glasgow Coma scale, to calculate an Acute Physiology Score. Other variables used in the prediction model are , source of ICU admission, chronic health status, reason for ICU admission, length of hospitalization prior to ICU admission, whether the patient received mechanical ventilation or required emergency surgery or thrombolysis. The calculated APACHE IV score is then used to estimate a risk of mortality and length of ICU stay for the individual patient.

APACHE IV predictive equations are a modification of a general scoring system, the APACHE I, developed by Knaus et al in 1981¹. In 2006, the APACHE IV scoring system was modeled and then validated in 110,558 patients from 104 ICUs in 45 American hospitals. Data was entered into a scoring calculator that predicted mortality rates for a specific score. Mortality predicted by the model was compared with mortality observed. Performance of the scoring system is assessed by area under the receiver operating characteristic curve. This showed good discrimination (AUC 0.88) and calibration (Hosmer-Lemeshow C statistic 16.9, p 0.08). For 90% of the 116 admission diagnoses the ratio of observed to predicted mortality was not significantly different from 1². Closer to home validation of the APACHE IV score in India³ and Saudi Arabia⁴ has also been consistent with good predictive performance.

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However prediction models validated in American or American-style ICUs are not necessarily generalizable to all settings. Differences in availability of ICU beds, End-of-Life decision making, Pre and Post- ICU care, ICU protocols and available resources make management of critically ill patients very different in resource-strapped countries like Pakistan. Most ICUs in Pakistan are understaffed and run by physicians with little or no training in critical care. Basic physiological measurements, such as arterial blood gases, are not always available and compliance with guidelines or protocols of critical care management almost nonexistent⁵. Clearly we will have to validate these predicted expectations of survival and lengths of ICU admission against our own actual rates, considering our limitations, before we adopt scoring systems.

In study published in this edition⁶ the investigators have attempted to validate the APACHE IV scoring system in a tertiary care ICU in Karachi. They enrolled 162 patients, of which on 119 they had complete data. The case mix included randomly selected patients from the Surgical, Medical and Neuro ICUs. Data obtained within the first 24 hours of admission was used to calculate a score using an online APACHE IV calculator. Predicted mortality and lengths of stay were compared against actual observed rates for the whole group and stratified by ICU type. This study has a number of methodological problems and was unable to conclusively validate the score.

But the story should not end here. There is great value in using prognostic scoring systems such as the APACHE IV. Critical care in Pakistan is a precious resource. Unduly prolonged lengths of ICU stay, and life sustaining therapy for either terminal disease or severe associated organ failure, are strains on an already scarce resource. It is the ICU physician who is increasingly becoming both a provider/prescriber and the rationer of the critical care product. Predictive models such as the APACHE IV may provide objective data for resource allocation, can identify patients with anticipated favorable outcomes and can be used to provide benchmarks making it possible to estimate ICU lengths of stay⁷, duration of mechanical ventilation⁸ and use of ICU therapy^{9,10}.

So what is the bottom line for us in Pakistan? Simple, low cost measures of infection control, nursing protocols and early aggressive, pre-ICU care will go a long way to reducing the burden of care in a country where we cannot afford this form of intense, expensive and in many instances, futile treatment. Using scoring systems judiciously can assist clinicians and administrators in resource allocation and health systems development.

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