Commentary

Predicting mortality in intensive care unit survivors using a subjective scoring system

Bekele Afessa[1] and Mark T Keegan[2]

[1]Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Mayo Clinic College of Medicine, 200 First St. SW, Rochester, Minnesota 55905, USA
[2]Critical Care, Department of Anesthesia, Mayo Clinic College of Medicine, 200 First St. SW, Rochester, Minnesota, USA

Corresponding author: Bekele Afessa, afessa.bekele@mayo.edu

Published: 15 February 2007
This article is online at http://ccforum.com/content/11/1/109

Critical Care 2007, **11:**109 (doi:10.1186/cc5683)

See related research by Fernandez *et al*., http://ccforum.com/content/10/6/R179

Abstract

Most prognostic models rely on variables recorded within 24 hours of admission to predict the mortality rate of patients in the intensive care unit (ICU). Although a significant number of patients die after discharge from the ICU, there is a paucity of data related to predicting hospital mortality based on information obtained at ICU discharge. It is likely that experienced intensivists may be able to predict the likelihood of hospital death at ICU discharge accurately if they incorporate patients' age, preferences regarding life support, comorbidities, prehospital quality of life, and clinical course in the ICU into their prediction. However, if it is to be generalizable and reproducible and to perform well without bias, then a good prediction model should be based on objectively defined variables.

Prognostic models are used to predict the outcome of patients admitted to the intensive care unit (ICU). Age, comorbidities, physiologic abnormalities, acute diagnoses, and lead-time bias are among the predictor variables entered into these models. These variables are usually selected and scored subjectively by expert consensus or objectively using statistical methods. Some of the ICU prognostic models require cumbersome data collection and employ complex statistical analyses to predict mortality. Most of the ICU prognostic models are based on variables recorded within 24 hours of ICU admission, and there is a paucity of data describing the role of these models in predicting the outcome of patients who survive their initial ICU stay. In an attempt to fill this gap in knowledge, Fernandez and coworkers [1], in a previous issue of *Critical Care*, described a scoring system for predicting patients' hospital mortality after ICU discharge.

The ICU prediction models have the potential to help decision makers, physicians, and patients to select treatment options and allocate resources. Despite their limitations, they have been used as benchmarks to evaluate ICU performance, and they highlight the structure and process of care characteristics associated with the various levels in quality of care [2-4]. Adult ICU prognostic models have recently been updated to their newer versions: Acute Physiology and Chronic Health Evaluation (APACHE) IV, Simplified Acute Physiology Score III and Mortality Probability Model III [5-7]. These new versions perform well in predicting mortality at the population level, but their questionable performance at the individual patient level limits their utilization as decision support tools at the bedside. Currently, most patients and their families rely on prognostic information provided by physicians to support their decisions. However, because of biases in subjective estimates, the ability of physicians to predict mortality correctly is highly variable [8-10]. Overconfident physicians tend to underestimate mortality, whereas those who lack self-confidence tend to overestimate mortality [11]. We need accurate and objective tools to support decision making. Although the Sabadell score is purely subjective, as reported by Fernandez and coworkers [1], the intensivists probably incorporated the patients' clinical data and ICU course in their predictions. The APACHE III investigators developed equations to predict hospital mortality not only for the first day but also for subsequent ICU days [12]. In patients who are at high risk for death at ICU admission, lack of improvement in predicted mortality rate, as measured by APACHE III, has been shown to indicate poor prognosis [13].

The Sabadell score is based on the subjective perception of intensivists and residents working in one ICU [1]. The score includes four options (Table 1). Although the APACHE II severity model was used in the study, the physicians did not utilize any of the severity models in their predictions. Similar

APACHE = Acute Physiology and Chronic Health Evaluation; ICU = intensive care unit.

Table 1

Sabadell score

Sabadell score	Prognosis	ICU readmission
0	Good for >6 months survival	Unrestricted if needed
1	Poor for >6 months survival	Unrestricted if needed
2	Poor for <6 months survival	Debatable
3	Poor for hospital survival	Not recommended

ICU, intensive care unit.

to the McCabe prognostic system [14], the Sabadell score uses simple prognostic stratification. The McCabe prognostic system stratifies patients into three categories based on objectively defined severity of illness: rapidly fatal, ultimately fatal, and nonfatal. However, the Sabadell score is purely subjective. Although both the discrimination and calibration of the Sabadell score in predicting hospital mortality were quite impressive, its reproducibility and external validation cannot be assessed because of its lack of objective criteria as well as the heterogeneity in intensivists' training background and experience and differences in ICU staffing, hospital settings, and patient mix. Moreover, the findings of the study by Fernandez and coworkers [1] are weakened by the 'self-fulfilling prophecy' design. In addition to being the outcome predictors for the study, the intensivists provided care to the patients not only in the ICU but also in the step-down unit and as outreach. As such, they were unlikely to provide aggressive care to patients if they believed that they would not survive.

Although most life-saving interventions are usually available only in the ICU, critical illness knows no boundaries. During the past decade, rapid response and outreach teams were created to improve outcomes of critically ill patients in the non-ICU setting. We need decision support tools to identify those patients who are at risk for deterioration in the non-ICU setting in order to focus the efforts of these teams. The Sabadell score is an excellent contribution. However, if such tools are to be useful, then they must be based on objective criteria. With regard to ICU survivors, these criteria should include age, underlying comorbidities, and trends in end-organ dysfunctions during the ICU stay.

Competing interest

The authors declare that they have no competing interests.

References

1. Fernandez R, Baigorri F, Navarro G, Artigas A: **A modified McCabe score for stratification of patients after intensive care unit discharge: the Sabadell score.** *Crit Care* 2006, **10:**R179.
2. DePorter J: **UHC operations improvement: adult ICU benchmarking project summary. University HealthSystem Consortium.** *Best Pract Benchmarking Healthc* 1997, **2:**147-153.
3. Glance LG, Dick AW, Osler TM, Mukamel D: **Using hierarchical modeling to measure ICU quality.** *Intensive Care Med* 2003, **29:**2223-2229.
4. Zimmerman JE, Alzola C, Von Rueden KT: **The use of benchmarking to identify top performing critical care units: a preliminary assessment of their policies and practices.** *J Crit Care* 2003, **18:**76-86.
5. Higgins TL, Teres D, Copes W, Nathonson B, Stark M, Kramer AA: **Updated mortality probability model (MPM III) [abstract].** *Chest* 2005, **128:**349S.
6. Moreno RP, Metnitz PG, Almeida E, Jordan B, Bauer P, Campos RA, Iapichino G, Edbrooke D, Capuzzo M, Le Gall JR; SAPS 3 Investigators: **SAPS 3 – From evaluation of the patient to evaluation of the intensive care unit. Part 2: Development of a prognostic model for hospital mortality at ICU admission.** *Intensive Care Med* 2005, **31:**1345-1355.
7. Zimmerman JE, Kramer AA, McNair DS, Malila FM: **Acute Physiology and Chronic Health Evaluation (APACHE) IV: hospital mortality assessment for today's critically ill patients.** *Crit Care Med* 2006, **34:**1297-1310.
8. Brannen AL, Godfrey LJ, Goetter WE: **Prediction of outcome from critical illness. A comparison of clinical judgment with a prediction rule.** *Arch Intern Med* 1989, **149:**1083-1086.
9. Kruse JA, Thill-Baharozian MC, Carlson RW: **Comparison of clinical assessment with APACHE II for predicting mortality risk in patients admitted to a medical intensive care unit.** *JAMA* 1988, **260:**1739-1742.
10. Poses RM, Bekes C, Copare FJ, Scott WE: **The answer to 'What are my chances, doctor?' depends on whom is asked: prognostic disagreement and inaccuracy for critically ill patients.** *Crit Care Med* 1989, **17:**827-833.
11. Poses RM, McClish DK, Bekes C, Scott WE, Morley JN: **Ego bias, reverse ego bias, and physicians' prognostic.** *Crit Care Med* 1991, **19:**1533-1539.
12. Wagner DP, Knaus WA, Harrell FE, Zimmerman JE, Watts C: **Daily prognostic estimates for critically ill adults in intensive care units: results from a prospective, multicenter, inception cohort analysis.** *Crit Care Med* 1994, **22:**1359-1372.
13. Afessa B, Keegan MT, Mohammad Z, Finkielman JD, Peters SG: **Identifying potentially ineffective care in the sickest critically ill patients on the third ICU day.** *Chest* 2004, **126:**1905-1909.
14. McCabe WR, Jackson GG: **Gram-negative bacteremia: etiology and ecology.** *Arch Intern Med* 1962, **110:**83-91.