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A New Risk-Adjustment System for IC

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Problems with existing risk assessment models for assessing the likelihood of a patient dying following admission to intensive care have recently been addressed by the SAPS 3 study and development of a new model, the SAPS 3 Admission Score.

Risk-adjustment, i.e. the “normalization” of raw mortality rates according to the severity of illness for each patient is a method that has been used for a long time in epidemiology. In intensive care medicine, risk adjustment became popular in the early nineties, shortly after publication of the first systems by Knaus et al. 1981 & 1985, Le Gall et al. 1983 & 1993 and Lemeshow et al. 1993.

Today, severity-of-illness scores have a fixed place in intensive care research: the adjustment for the risk to die within the hospital that a certain patient carries at the time of ICU admission or within the first hours in the ICU. At the end of the nineties, however, some studies unveiled a lack of prognostic performance of the current systems: in most cases an underestimation of mortality in low-risk patients and an overestimation in high-risk patients. This pattern was observed for all the published models (Apolone et al. 1996; Moreno and Morais 1997; Moreno et al. 1983; Metnitz et al. 1999). For this reason, several researchers tried to improve the prognostic performance of various systems through recalibration (also called “customization”), which generally did not solve the various problems inherent to the models.

These problems can be classified as either user-, patient, or model-dependent. User-dependent problems include differences between, or ambiguous definitions, and their non-uniform application. Patient-dependent problems are mainly related to shifts in the baseline characteristics of the populations and the therapeutic options over time: besides differences in the age distribution, several new techniques have been developed (such as advances in minimal invasive surgery or liver replacement therapy etc.). Model-dependent problems often also include the lack of important prognostic variables, such as diagnostic information or the presence of infection. For this reason a group of intensivists (SAPS 3 Outcome Research Group, SORG) have developed a new risk adjustment system for intensive care. After several years of preparation, the SAPS 3 study was completed at the end of 2002. More than 340 ICUs worldwide documented all admitted patients over a period of two months. The subsequent data analysis then took more than one and a half years.

The main model – the SAPS 3 Admission Score – which has been published recently in Intensive Care Medicine (Metcitz et al. 2005; Moreno et al. 2005) uses data from within one hour prior and after ICU admission. The score consists of 20 variables, which can be ordered in three logical boxes (see table 1). The score can thus be used on a variety of levels. First, patients can be compared selectively on one or more levels, such as status before ICU admission (Box I) or the physiological derangement (Box III). Moreover, the sum score (Box I + Box II + Box III) can be used as a measure of the overall severity of illness. In addition, the sum score can be entered into a logistic regression equation and a predicted hospital mortality can be calculated. This “expected” mortality can then be compared with the observed mortality, which gives the so called O/E ratio. The O/E ratio can then be used to statistically compare mortality rates from different groups of patients (or ICUs).

Intensive care medicine is, however, a very heterogeneously plasticized medicine. For this reason, seven different regions were defined and separate mortality prediction equations developed to allow comparisons at both general and regional levels. Additionally, a tool for comparisons by major patient typologies is under development. Comprehensive supporting information for calculations has been published with the study reports (www.springer.com) and additional information is available at www.saps3.org.

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SAPS 3 has successfully addressed some of the problems of currently used prognostic models, providing the most modern and accurate risk-adjustment system available. Whether the SAPS 3 is adopted in ICUs depends on the willingness and motivation of intensivists to integrate a new system into their environment.

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