



## SCIENTIFIC LETTERS

### Should intensive care admission be restricted to the most severely ill patients?☆



### ¿Se debe restringir el ingreso en cuidados intensivos solo a los pacientes más graves?

Dear Editor:

The clinical practice guidelines on the management of intensive care unit (ICU) admissions recommend that the selection of patients should be based on a potential benefit,<sup>1</sup> assigning the lowest priority to those patients who are “too well” or “too serious” to be able to benefit from the health-care provided at the ICU.<sup>1</sup> However, Chen et al.<sup>2</sup> showed that the percentages of high and low risk of patients admitted to ICUs varied among different hospitals showing a lack of consensus on what patients benefit the most from their ICU admission.

The lack of beds at the ICU is another factor that justifies the refusal to hospitalize low-risk patients. Partly it is because of this that intermediate care units have been created to provide healthcare to low-risk patients in a more cost-effective scenario. However, a recent study suggests that critically ill patients may fare worse at low-intensity ICUs compared to high-intensity ICUs.<sup>3</sup>

During an ICU admission, the risk of a patient is usually defined by his severity scores.<sup>4</sup> These severity scores are updated on a regular basis in order to achieve a better calibration of his response to therapy. However, even in the most recent models, the relation between predicted mortality and observed mortality are evenly distributed along the degree of severity.<sup>5</sup>

A study of 150,000 patients with medical diagnoses of low risk associated the ICU admission of these patients to more invasive procedures and higher costs with no significant differences of mortality.<sup>6</sup>

Given the tendency towards lower ICU-acquired complication rates, basically catheter-related infections and pneumonia, our hypothesis is that low-risk patients can benefit from ICU admissions similar to high-risk patients.

We retrospectively reviewed the 2009–2015 clinical database from the 14-bed mixed medical–surgical ICU at our university hospital. Our ICU accepts patients who require complete ICU therapies, but it also accepts intermediate-level patients. Also, our ICU is a coronary unit and stroke unit. However, our hospital is not accredited to do neurosurgery, cardiac surgery, or transplants.

The ICU clinical database includes data collected at admission (administrative data, comorbidities and severity score [SAPS3]), during the ICU stay (procedures, complications and limitation of life support treatment – LLST) and at ICU discharge (length of the ICU the stay and patient’s state at discharge). The length of the hospital stay, and the patient’s state at hospital discharge were obtained from the hospital database.

For statistical analysis purposes, the categorical variables were expressed as frequencies and percentages and compared using the  $\chi^2$  test. Continuous variables were expressed as mean and standard deviation and compared using the Student’s *t* test. We stratified the population into deciles of mortality risk at admission and then compared it to the actual hospital mortality rate.

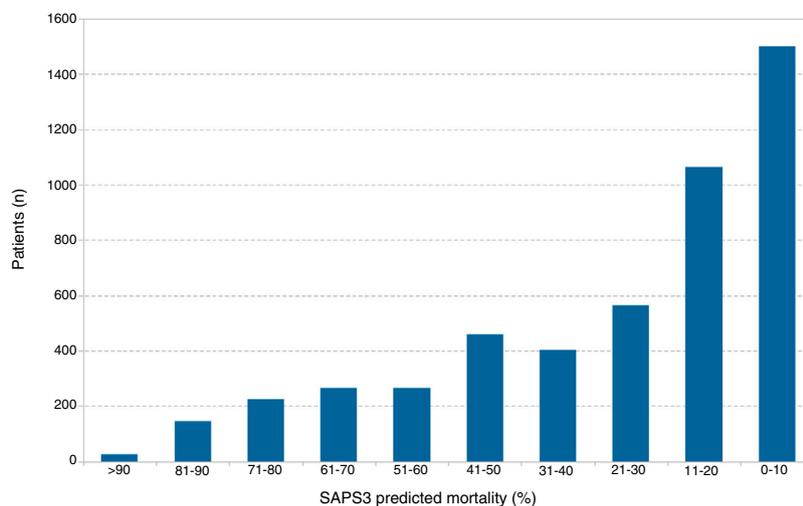
The study spans through a period of seven years and is characterized by a homogeneous case-mix in hospital admissions where the ICU admission criteria remained invariable. Four thousand nine hundred and seventeen (4917) patients were admitted (average age  $65.2 \pm 16.5$  years; 64% males). The average length of the ICU stay was  $4.6 \pm 7.1$  days and the average length of the hospital stay was  $14.1 \pm 18.8$  days. Mortality risk (SAPS3) at admission was  $27.8 \pm 23.9\%$  and 810 (16.5%) patients died at the ICU or at the ward after being discharged from the ICU which led to a standardized mortality ratio of  $0.59 \pm 0.04$ .

When patients were stratified into deciles of SAPS3 risk, a biased population was seen with a higher percentage of low-risk patients (risk < 10%) compared to high-risk patients (risk > 50%) (1499 [30.5%] vs 929 [18.9%]) (Fig. 1). The length of the ICU stay was not homogeneous either (low risk:  $2.9 \pm 4.2$  days vs high risk:  $6.6 \pm 9.7$  days,  $P < .001$ ).

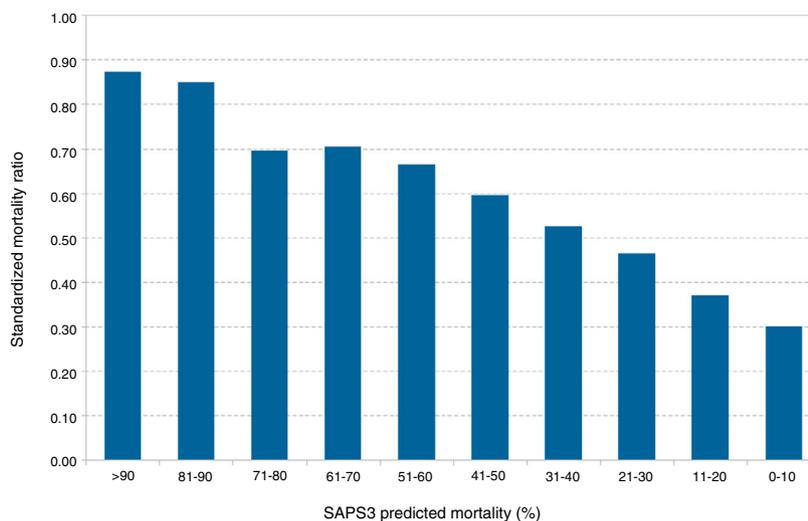
Fig. 2 shows that the standardized mortality ratio was also distributed non-homogeneously dropping gradually with respect to lower deciles of the SAPS3, from 0.87 for SAPS3 > 90% to 0.30 for SAPS3 < 10%.

This study found that low-risk patients not only were not hurt by their ICU admission, but that the survival benefit of low-risk patients was proportionally greater compared to high-risk patients.

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**Figure 1** Stratification of patients into risk deciles at SAPS3 admission.



**Figure 2** Stratification of the standardized mortality ratio into SAPS3 mortality risk deciles.

Our analyses are based on the predictive value of SAPS3 at admission. The original SAPS3 was adapted to predict mortality in every level of risk while taking into consideration the geographical and developing area of the world where the patient received healthcare.<sup>5</sup> For this reason, part of our population's survival advantage compared to the predicted mortality rate may be due to the cumulative effects of not calibrating this tool across the years as it has already been proven.<sup>7</sup> However, none of the studies that evaluated this problem found that this error in the calibration affects differently based on the level of predicted risk.<sup>4,7</sup>

Our period of observation was not long enough to be able to show time-dependent effects over the standardized mortality ratio. On the other hand, some patients spent one or more days at the ICU waiting to be hospitalized, meaning that the survival benefit may be associated with the improvement reported and with admissions at semi-intensive care units,<sup>8</sup> yet former studies do not suggest a greater benefit for low-risk patients.

Another problem here is the economic burden involved when admitting low-risk patients to an ICU. We do not

have direct data on costs, but most studies suggest that the key factor here is the much shorter length of the ICU stay<sup>9,10</sup> of low-risk patients. We can only speculate whether there would be an equivalent survival advantage for low-risk patients in less expensive ICUs, such as semi-intensive or "low intensity" units.<sup>3</sup>

Our study suggests that ICU admissions involve survival benefits for low-risk patients as well, which makes them eligible for admission too.

## Authors

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## Kidney transplantation in the Intensive Care Unit: Graft evaluation using imaging tests<sup>☆</sup>



## Postoperatorio de trasplante renal en la unidad de cuidados intensivos: evaluación del injerto mediante técnicas de imagen

Dear Sir,

Kidney transplantation is the management of choice in patients with end-stage chronic kidney disease. For decades it has been shown to offer improved quality of life and a lesser mortality risk compared with hemodialysis.<sup>1</sup> However, transplantation remains a complex process and involves patients with important comorbidities. It is therefore essential to optimize the postoperative care of these individuals in the Intensive Care Unit (ICU). Imaging techniques play a very important role in this respect. Both renal doppler ultrasound (RDU) and radioisotopic studies (renal scintigraphy) are of great help in the identification of early complications, and afford very useful basal information for adequate graft assessment.<sup>2,3</sup>

Renal doppler ultrasound performed at the patient bedside by the intensivist makes it possible to discard acute complications such as bleeding, hydronephrosis,

vascular dehiscence, arterial stenosis, venous thrombosis or renal infarction.<sup>2</sup> The technique is moreover inexpensive, noninvasive and avoids the need for patient transfer. Furthermore, the renal resistance index (RI) (RI = peak systolic flow – end-diastolic flow/peak systolic flow) allows the quantification of graft flow alterations. It was originally used to diagnose acute rejection,<sup>4</sup> though recently it has also been regarded as a chronic rejection marker.<sup>5</sup> On the other hand, RI > 0.8 has been shown to be a strong predictor of graft loss, being related to donor death.<sup>5</sup> However, despite its prognostic value in transplant patients, RI is more closely related to recipient age and certain hemodynamic factors than to renal anomalies.<sup>6,7</sup> Radioisotopic studies in turn allow evolutive monitoring of the graft. Although a single or point evaluation is unable to distinguish between acute tubular necrosis and acute rejection, serial radioisotopic studies evidencing a progressive decrease in function and perfusion could be indicative of acute rejection.<sup>8</sup>

In our ICU, renal doppler ultrasound is performed by the intensivist in the immediate postoperative period, while renal scintigraphy is routinely performed on the morning after the operation. In the event of an interval of more than 12 h between both explorations, a new ultrasound study is made before patient transfer. Since our Unit provides support for a large number of kidney transplants, we decided to conduct a retrospective observational study, analyzing the explorations made between January 2013 and December 2015 in all patients admitted to the ICU in the immediate postoperative period of kidney transplantation. In this context, on performing RDU, adequate flow was defined as RI ≤ 0.7 in the principal renal artery and in the segmental renal arteries. In relation to scintigraphy, mercaptoacetylglycine (MAG-3) is the radionuclide of choice in our center. The three phases of renal function were evaluated. The first phase shows graft perfusion based on images obtained during

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