

# Would the Evaluation of the Standardized Mortality Ratio be the Real Best Predictor for Patients with a Lesser Mortality Probability?

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## Abstract

Evaluating the performance of the Intensive Care Unit and its quality of care is very much based on clinical indicators. One of the most relevant indicators is mortality adjusted by the Standardized Mortality Ratio. The most widely used mortality predictor score for patients admitted to the Intensive Care Unit is SAPS 3. Through the expected average mortality, a relationship is made with the mortality found; in this way, the adjusted mortality is found. The results of this study, with a large number of patients, show that adjusted mortality presents excellent results, even when compared to another Brazilian hospital of high-quality standard. Nevertheless, this study questions whether the variables of SAPS 3 should not be updated (the last update was in 2005), since it is observed that in patients with lower expected mortality, the relationship with that found is low and this increases progressively according to the expected mortality.

**Keywords:** simplified acute physiology score iii; standardized mortality ratio; intensive care unit; death probability

## Introduction

It is essential that any Intensive Care Unit (ICU) service has statistical and care data for the management of the unit, to draw up improvement plans and to compare itself with data and goals of national health regulatory agencies, as well as with other ICU services.

An indicator of extreme relevance is adjusted mortality. This causes higher mean mortality results in a given ICU when compared to other services with lower mortality, not to verify that its result is necessarily worse, because ICU with less complexity is expected to be really lower.

For there to be an adequate adjusted mortality, two premises are fundamental: the ideal score for the unit profile is applied and that these are calculated correctly.

The Simplified Acute Physiology Score III (SAPS 3) is considered one of the best scores to predict mortality at that hospitalization in patients with clinical pathologies and patients undergoing non-cardiac surgeries [1-4].

Through the mean mortality predicted by the score, the adjusted mortality is evaluated through the Standardized Mortality Ratio (SMR), performing the ratio between the observed mortality (numerator) and the mortality expected by the denominator. This will generate a value that is used to arrive at the adjusted mortality [5-8].

## Aim

To evaluate the SMR in ICU patients and to verify if there are statistically significant variations of this indicator according to the probability of death at ICU admission.

## Material and method

Through the ICU database composed of 37 beds, the average SAPS 3 of all clinical admissions and of patients undergoing non-cardiac surgery in the period from 2015 to 2019 was evaluated. After that, the SMR of these 8612 patients was evaluated and divided into three groups: patients with expected mean mortality lower than 20%, between 20% and 50% and

greater than 50%. After obtaining these data, the statistical relevance of mortality was evaluated.

## Conclusions

The SMR in this ICU always had a relationship lower than 1, that is, by the score applied, there were fewer deaths than predicted. It is also observed that the SMR was increasing according to the expected mortality and this causes some hypotheses to be raised:

This ICU presents high multidisciplinary performance in the management of critically ill patients, regardless of the expected mortality and this sustains the SMR always lower than 1 in this period evaluated?

Does SAPS 3 contemplate the best variables that make it score in populations with lower expected mortality? Could this overestimate mortality in the groups with lower expected mortality and thus generate low results in mortality adjusted by the SMR?

Are the SAPS 3 more assertive to generate the SMR in populations with higher mortality expected by its variables that score higher in this

subgroup or does the mortality found really cause the SMR to be higher, purely and simply because this population (SAPS 3 mean greater than 50%) with a smaller number of patients in this sample, does it naturally have higher mortality?

Therefore, this is a provocation for more ICU services to divide into groups, based on the mortality expected to emerge new data in studies, with different populations and teams to evaluate their results for effective management and compare with the data of this publication.

## Limitations of the study

Ideally all parameters should be compared with multiple other hospitals and have always the information of the confidence interval.

## Results

The SMR in this period in all groups was, respectively, 0.49 in male patients, composed of 3,756 patients admitted and 0.43 in female patients in 4,856 patients admitted (Table 1).

	FEMALE	MALE
Admission	4,856	3,756
SAPS 3	12,98	14,23
Expected mortality	630.31	534.48
Mortality found	269	263
Standardized Mortality Ratio	0.43	0.49

**Table 1:** Mortality rate according to sex.

When evaluated by the mean mortality predicted by SAPS 3 with expected mortality in patients with expected death at that hospitalization lower than 20% (n=6896), the following data regarding RMS were found, respectively: 0.3 in males and 0.32 in females (Table 2).

	FEMALE			MALE		
	< 20%	20%-50%	> 50%	< 20%	20%-50%	> 50%
Admissions	2,931	723	102	3,965	767	124
Death	107	109	47	96	120	53
SAPS 3	11,55	29,11	61,67	8,13	29,62	65,09
Expected mortality	338.53	210.47	62.9	322.4	227.2	80.71
Standardized Mortality Ratio	0.32	0.52	0.75	0.30	0.53	0.66

**Table 2:** Mortality rate scores.

In the group with expected death between 20% and 50% (n=1,490), the following data related to SMR were found, respectively: 0.53 in males and 0.52 in females (Table 2). When the expected mortality was greater than 50% (n=226), the SMR in males was 0.66 and in females 0.75 (Table 2).

Another result that draws attention is that when the expected mortality was greater than 50%, the SMR in women obtained a much more significant relationship in relation to men (0.75 x 0.66) when compared to the other two groups evaluated (Table 2).

## Abbreviations:

ICU: Intensive Care Unit

SAPS 3: Simplified Acute Physiology Score III

SMR: Standardized Mortality Ratio

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## Conflicts of interest

No conflict of interest.

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