





Clinical Potpourri

Pediatric Index of Mortality 2 as a predictor of death risk in children admitted to pediatric intensive care units in Latin America: A prospective, multicenter study

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Abstract

Purpose

The purpose of this study is to assess the performance of the Pediatric Index of Mortality 2 (PIM2) score in pediatric intensive care units (PICUs) in Latin America.

Materials and methods

This is a prospective, observational, multicenter study. We included patients aged 1 month to 16 years old admitted consecutively during 1 year to 34 PICUs in 9 Latin American countries. Discrimination and calibration tests were performed to validate the performance of PIM2 in the entire sample and in different subgroups.

Results

A total of 7391 patients were analyzed. Pediatric Index of Mortality 2 predicted 573 deaths, whereas the observed deaths were 663 ($P < .001$). The area under the receiver operating characteristic curve for the entire population was 0.817 (95% confidence interval, 0.808-0.825). The score showed good discrimination. Instead, calibration was inadequate. The difference between observed and predicted deaths for the entire population and across different risk intervals was statistically significant ($\chi^2 = 121.87$; $df = 8$; $P < .001$). Pediatric Index of Mortality 2 did not predict mortality correctly in different diagnostic categories (injury,

postoperative, and miscellaneous), in children younger than 12 months, adolescents, and patients with chronic complex conditions.

Conclusions

Pediatric Index of Mortality 2 showed good discrimination, but calibration was inadequate. To use PIM2 for monitoring PICU performance in Latin America, it might be necessary to recalibrate the score locally.

Introduction

Since pediatric intensive care units (PICUs) first appeared, they have contributed significantly in the care of severely ill children. Highly specialized human resources and costly technological equipment are concentrated in this area, aiming to restore children's health and quality of life before hospitalization and prevent or reduce any permanent disability [1]. Continuous improvement in pediatric critical care is a high priority worldwide. To design any possible improvement initiatives, it is essential to assess the quality of care provided objectively.

Avedis Donabedian, the father of health care quality, proposed the assessment of health services by considering 3 dimensions: structure, process, and results [2]. Although structure and processes in the PICU can be measured objectively, the interpretation and measurement of results, especially mortality, are not a simple task. To make comparisons between local, regional, and international mortality and due to the great differences in the characteristics of the patients treated, it is necessary to adjust the risk of death to factors that may influence results other than clinical care. To this end, several prognostic scores have been developed to quantify objectively the status of critically ill patients and estimate their risk of dying [3], [4]. These scores use regression models to obtain an equation that describes the relationship between different predictive variables (physiological, demographic, and clinical) and the probability of death [5].

The specific risk of mortality scores for pediatric patients are the Pediatric Risk of Mortality [6], [7] and the Pediatric Index of Mortality in its different versions [8], [9], [10]. These scores have been generated using large samples of critically ill patients admitted to PICUs in developed countries, with centralized health systems, whose infrastructure and organization differ from Latin American PICUs. Although these scores can be used in other parts of the world, which did not participate in the original study, it is essential to previously assess their performance in representative patient samples to determine whether their predictions are valid in different contexts.

To date, Pediatric Index of Mortality 2 (PIM2) is the score that has shown the best predictive value and fits in different diagnostic and risk groups [11]. It has been evaluated in multicenter studies conducted in developed countries and developing countries [12], [13] as well as in individual units in different continents [14], [15], [16], [17], [18], [19]. The analysis of these studies show mixed results depending on the geographic location.

The present study was designed to assess the capacity of the PIM2 score to predict mortality in a population of children admitted to PICUs in Latin America. Although this score is routinely used in certain PICUs in the region, there are no multicenter studies available currently to assess its performance in a large sample of patients from different Latin American countries. We consider that it is a priority to determine if this model allows assessment of the death risk in critically ill children in our region. Without this certainty, research on the efficacy of intensive care provided as well as the initiatives to improve its quality will be severely limited.

Section snippets

Population and methods

We designed a cross-sectional, observational, and prospective multicenter study. Invitations to participate in the study were made through representatives of member countries of the Latin American Society of Pediatric Intensive Care, as well as other societies, including the pediatric intensivists in Latin American countries [20]. Patient registration began between January 1, 2013, and June 1, 2013, depending on the administrative requirements of each institution. Each PICU recorded the...

Results

Forty-two PICUs from 13 Latin American countries agreed to participate in the study. From this total and after the data collection period was completed, 34 units (located in 9 countries) sent their records. Table 2 describes the characteristics of each PICU and the number of patients included. Seventy-six percent of the units (26/34) belonged to the public setting, and 52.9% (18/34) were located in pediatric hospitals. The median number of beds per PICU was 10 (range, 4-24), and the median...

Discussion

This study evaluated the ability of the PIM2 score to accurately predict mortality in a sample of patients admitted during 2013 in 34 PICUs located in 9 Latin American countries. The score demonstrated its capacity to differentiate patients who have a greater probability of dying in the general population. The AUC was 0.817 (95% CI, 0.808-0.825) compared to 0.90 obtained in the original population [9]. This adequate discrimination was also noted in the various subgroups analyzed: age group,...

Conclusions

The PIM2 score has been evaluated in an important sample of patients admitted to PICUs located in 9 Latin American countries. The discrimination power of the score was adequate, conferring a greater probability of death to patients who die than to those who survive. However, the agreement between the number of observed deaths and predicted deaths was not adequate in the total population or in the different risk levels. There was also an inadequate calibration observed in different age groups...

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