



# Predicting Mortality in Severe Burns—What Is the Score?: Evaluation and Comparison of 4 Mortality Prediction Scores in an Irish Population

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### INTRODUCTION

Severe burns present a significant clinical challenge and are resource intensive. Predicting mortality at admission for burn patients is useful in determining the likely outcomes of interventions and in stratifying levels of care. In addition, it can provide benchmarks for audit and research.

More than 45 composite models exist for the prediction of mortality in thermal injury, of which only a handful have been developed with methodological rigor.<sup>1</sup> The 4 most routinely used are the Revised Baux score,<sup>2</sup> the Belgian Outcome in Burn Injury score,<sup>3</sup> Boston score,<sup>4</sup> and Abbreviated Burn Severity Index (ABSI).<sup>5</sup> Our aim was to validate and compare the utility of these scoring systems in an Irish population.

### MATERIALS AND METHODS

All acute admissions to the national burns unit of the Republic of Ireland from 2010 to 2014 were included, and a database including relevant admission and outcome information was collated. Predicted mortality was calculated using the Belgian, Boston, ABSI, and Revised Baux scores, with a nomogram being used for the Revised Baux score.<sup>6</sup>

Predicted mortality was compared with observed mortality for each scoring system. Predictive accuracy was assessed using a receiver operating characteristics curve, and positive and negative predictive values were calculated.

### RESULTS

Demographic data can be seen in Table 1. Mortality was found to be 5.4% (31/573) over the study period. A total of 122 burns had a  $\geq 10\%$  total body surface area thermal injury. The mean age of this group was 53.31 years, with a mean total body surface area of 25.21% (range, 10–90%) and an inhalational injury rate of 50% (n = 61).

All 4 mortality prediction scores proved to be valid in our group (area under receiver operating characteristics curve > 0.80). The Revised Baux score performed the best, with an area under receiver operating characteristics curve of 0.925 (Fig. 1; Table 2). The observed deaths in our group were 28. The Belgian Outcome in Burn Injury score was the most accurate at predicting

**Table 1. Demographic Data for Burn Injury Admissions in National Burns Unit of Ireland**

Total admissions	743
Acute burn admissions	573
Total mortality	31 (5.4%)
Significant burns	122
Mortality	28 (22.95%)
Female	47
Male	75
Mean age	53.31 yr
Mean % TBSA	25.21%
Inhalation injury	61

TBSA, total body surface area.

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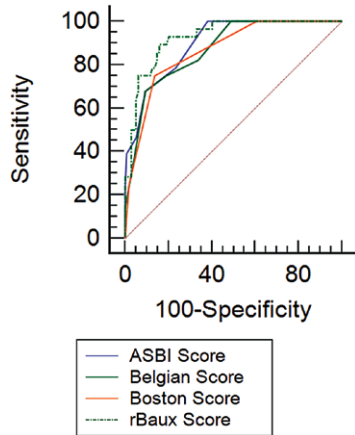
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**Fig. 1.** Receiver operating characteristics curves for mortality prediction scores. rBaux indicates revised Baux.

**Table 2. Area under the Receiver Operating Characteristics Curve for Mortality Prediction Scores**

Score	Area Under Curve	95% Confidence Interval
Revised Baux	0.925	0.863–0.965
ABSI	0.897	0.829–0.945
Belgian	0.870	0.797–0.924
Boston	0.864	0.791–0.920

**Table 3. Negative and Positive Predictive Values for Mortality Prediction Scores**

Score	Negative Predictive Value	Positive Predictive Value
Revised Baux	98.39	86.49
ABSI	99.75	66.08
Belgian	94.30	82.70
Boston	89.21	93.27

deaths in our group, with 27.33 deaths predicted. The Revised Baux score predicted 30.67 deaths.

To be a useful model, the score must have both high negative and positive predictive values. The Revised Baux score and Belgian score performed best in this respect (Table 3). The ABSI had the highest negative predictive value of 99.75%; however, it had a low positive predictive value of 66.08%, significantly overpredicting the mortality rate, whereas the Boston score underpredicted mortality with the lowest negative predictive value of 89.21%.

## DISCUSSION

Predicting mortality at admission in severe burns is a useful clinical adjunct. Several different scoring systems have been developed, and this indicates the complexity in calculating such a prediction. In reality, the use of only 1 or 2 of these tools should be necessary for clinical practice and research.

The 4 evaluated scoring systems in this study proved to be valid in an Irish population. The most accurate, reliable, and, therefore, useful predictors of mortality were considered to be the Revised Baux score and the Belgian Outcome in Burn Injury scoring system.

This compares favorably with other research, which has shown that the Belgian Outcome in Burn Injury score and the Revised Baux score seem to be particularly useful in predicting mortality in thermal injury.<sup>7,8</sup>

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