

## Open Source Software For Patient Data Management In Critical Care

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### Abstract and Objective

We have previously developed a Patient Data Management System for Intensive Care based on Open Source Software. The aim of this work was to adapt this software to use in Emergency Departments in low resource environments. The new software includes facilities for utilization of the South African Triage Scale and prediction of mortality based on independent predictive factors derived from data from the Tabarre Emergency Trauma Center in Port au Prince, Haiti.

#### Keywords:

Critical Care, Patient Data Management Software, Open Source Software, Patient Triage Systems.

### Introduction

The system for Intensive Care (IC) was designed using a client-server architecture, running on a PostgreSQL database. It offers functions for medical notes, observations and treatments, a scoring system for classification, and reporting of evolution. The system includes utilities for nursing charts and medication administration. To be used in an Emergency Department (ED), the system had to be adapted, particularly to facilitate triage at admission and to propose an adapted score.

### Methods

The software was extended to the use of the South African Triage Scale (SATS)<sup>1</sup> and of the TRISS scoring system using the same software architecture as before. For mortality predictions using TRISS, computations were based on the data published by Boyd *et al*<sup>2</sup>. For the SATS system, we did not find any existing publications reporting mortality prediction. To determine mortality prediction, we decided to use data from patients admitted to the Tabarre Emergency Trauma Center from Médecins Sans Frontières (MSF) in Port au Prince, Haiti, as the modified software was intended to be used there. Data from 4,468 consecutive patients admitted to that institution from 01/01/2013 to 08/03/2014 were used. Age of the patients, motif of admission according to MSF classification, and triage category (Red, Orange, Yellow, Green) according to the SATS system were extracted from the local MSF database and used as candidate parameters for analysis of factors associated with mortality. For the statistical analysis we used the Chi Square and Mann-Whitney tests as appropriate to determine association with mortality, and logistic regression with logit to compute independent odds ratios and predict mortality. A *p*-value < 0.05 was considered to be significant. For logistic regression we divided patients in two groups at random. The first group was used for the computations of odds ratios and coefficients and the second

for validation of the model. The STATA 8 software for Windows was used for the statistical analysis.

### Results

Added modules to the software help for triage at admission in the ED, and for data encoding. Software includes procedures to compute mortality predictions based on the SATS and TRISS systems. The model included for the SATS system is based on data from Tabarre. Mortality varied significantly with age of the patients, motif of admission, and triage category. Odds ratios for factors affecting mortality with coefficients of logit estimates for that model are illustrated in Table 1.

Table 1 – Factors affecting mortality

Factors	Odds Ratios	Coef.	Z	P > z
Age > 45	2.62	0.963	2.52	0.012
Red	78.98	4.369	7.54	0.000
Orange	3.67	1.300	2.18	0.029
Non Trauma	6.80	1.916	3.56	0.000
(Constant)		-6.317	-11.58	0.000

Area under the ROC curve is 0.8758 for the first group and 0.8344 for the validation group. In the validation group 98.3% of the admitted cases were correctly classified (cutoff of 0.5). In the studied population, the overall mortality was 1.68 %, the mortalities for the SATS groups were 15.81% in the Red group and 1.39% in the Orange. Mortality for patients older than 45 years was 3.29%, versus 1.33% for younger patients.

### Conclusion

Our software was extended for the use in the ED, and includes mortality prediction based on the South African Triage Scale. It should now be tested in ED and IC in low resource environments with extension of the data set used in the model.

### References

- [1] Twomey M, Wallis LA, Thomson ML, Meyers JE. The South African Triage Scale (adult version) provides valid acuity ratings when used by doctors and enrolled nursing assistants. *African J. Emerg Med* 2012;2:3-12.
- [2] Boyd CR, Tolson MA, Copes WS: Evaluating Trauma Care: The TRISS Method. *J. Trauma* 1987;27:370-378.