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Corresponding Author: Dr. Nele Brusselaers, M.D.

Corresponding Author's Institution: Ghent University Hospital

First Author: Nele Brusselaers, M.D.

Order of Authors: Nele Brusselaers, M.D.; Stan J Monstrey, M.D., PhD; Stijn I Blot, PhD

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Letter to the editor:

The FLAMES Score Accurately Predicts Mortality Risk in Burn Patients (Gomez M, et al. 2008)

Running title:

The FLAMES Score predicting mortality in Burns.

Brusselaers Nele, MD^{1,2}, Monstrey Stan, MD PhD^{1,2}, Blot Stijn, PhD^{2,3,4}

¹Dept. of Plastic Surgery, Ghent University Hospital, Ghent, Belgium.

²Ghent University, Faculty of Medicine and Health Sciences, Ghent, Belgium.

³Dept. of General Internal Medicine, Ghent University Hospital, Ghent, Belgium.

⁴Hogeschool Gent, Healthcare Dept., Ghent, Belgium.

Nele.Brusselaers@ugent.be, Stan.Monstrey@ugent.be, Stijn.Blot@ugent.be

Corresponding address:

Nele Brusselaers, MD

Dept of Plastic Surgery- Ghent University Hospital

De Pintelaan 185 - 9000 Gent- Belgium.

T: (+32) 9 332 62 16

F: (+32) 9 332 38 99

Nele.Brusselaers@ugent.be

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Dear Editor,

We read with interest the article of Gomez et al about the development of a new prediction model for severe burns. This model is based on the APACHE II score, the percentages of partial and full thickness burns, age and gender.¹ It was developed with rather old data (1991-1995) and validated with the data of 1995-2003 (from the same burn unit).

We question the decision to exclude inhalation injury in the final prediction model. A strong relationship between inhalation injury and death has been repeatedly described.²⁻⁷ In general, mortality is about 8 to 10-fold higher when inhalation injury is present (Table 1). The absence of inhalation injury in the model cannot be attributed to a low occurrence rate in the derivation cohort (38 on 378 patients) as this is mainly in line with other cohorts.^{3,4} A lack of power is probably responsible for the exclusion in the final model. We wonder if the relationship between inhalation injury and outcome was assessed in the whole population of 1343 patients (of which 175 patients with inhalation injury), and whether it also failed to affect the outcome substantially in this larger cohort.

Patients who are subject to do-not-resuscitate orders or therapy withdrawal can be considered as a source of bias in cohorts used to develop mortality prediction models as they, more or less, contribute to a self-fulfilling prophecy. It is probably for this reason why such patients were excluded from the analysis in the study by Gomez et al.¹ However, as these patients most probably represent the most severely burned subgroup, exclusion of these does harm reality. Indeed, excluding patients with therapy withdrawal creates a bias as well. For obvious ethical reasons one cannot - for the purpose of science - prolong evidently futile therapy for several days. Yet, it would be interesting to have some insights in the characteristics of the subgroup of excluded patients. Perhaps a lot of these suffered from severe inhalation injury and this might be one of the reasons why this variable did not reach the final set of criteria.

Finally, the inclusion of the variable “% of full thickness burns” in the model provides a practical concern. Recent literature demonstrated that clinical burn depth assessment only had a sensitivity of 60 to 75% when compared to Laser Doppler Imaging (LDI) technique.^{8,9} As such, risk of death prediction by use of a model which incorporates burn depth seems to be flawed in the absence of detailed LDI monitoring. One practical remark is that depth assessment by means of LDI should preferably be performed between 48 to 72 hours post burn. Therefore, a definitive and correct measurement of the depth of the burn is currently not possible at the time risk estimation is performed (24 hours post-burn). Therefore, the FLAMES score might be better suited for retrospective analysis of populations, and less for bed-side risk stratification.

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Table 1- Associated mortality in burn patients with and without inhalation injury.

| Author | Period | n centers | n patients | Mortality, % | |
|-------------------------------|-------------|------------|------------|-------------------|----------------------|
| | | | | Inhalation injury | No inhalation injury |
| Saffle ² | 1991 - 1993 | 28 | 6417 | 29% | 2% |
| Bloemsma ⁷ | 1996 - 2006 | 1 | 1905 | 21% | 3% |
| *BOBI Studygroup ³ | 1999 - 2004 | 6 | 6227 | 29% | 2% |
| Brusselsaers ⁴ | 1995-2004 | 1 | 1385 | 43% | 2% |
| Ryan ⁵ | 1990-1994 | 1 | 1665 | 24% | 1% |
| McGwin ⁶ | 1989 - 2005 | Nationwide | 54219 | 28% | 3% |

*BOBI- Study Group: The Belgian Outcome in Burn Injuries Study Group.