



## OS-MRS as a predictor of hospital length of stay – a retrospective audit of patients submitted to elective gastric bypass surgery

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### ABSTRACT

**Background:** Obesity is an important public health problem, with a high prevalence worldwide. Bariatric surgery emerged as an effective therapeutic tool, with improvement of quality of life and a decrease in all-cause mortality. Obesity Surgery Mortality Risk Score (OS-MRS) predicts 90-day mortality after bariatric surgery, but its association with hospital length of stay (LOS) has not been elucidated. We aimed to evaluate the association between OS-MRS and LOS after gastric bypass surgery.

**Methodology:** We retrieved clinical and demographic data of 474 patients who had been submitted to gastric bypass surgery for this retrospective audit at Hospital de Santo António, Centro Hospitalar Universitário do Porto, Porto, (Portugal), between January 2010 and May 2015. The patients were classified as Class A, B or C. The primary goal was to evaluate whether there was an association between OS-MRS and LOS after gastric bypass surgery. The study of the relationship between duration of surgery (DS) and LOS was also performed.

**Results:** After application of exclusion criteria, 402 patients were included in the statistical analysis (172 patients Class A, 187 Class B and 43 Class C). Patients classified as OS-MRS Class A had a significant shorter LOS ( $3.5 \pm 2.3$  days) than patients classified as Class B ( $4.2 \pm 5.1$  days) and Class C ( $5.7 \pm 12.6$  days;  $p < 0.001$ ). A significant positive correlation between DS and LOS was observed, although the degree of that correlation was weak ( $\rho = 0.203$ ;  $p = 0.001$ ).

**Conclusion:** A positive association of OS-MRS with hospital length of stay and duration of surgery was observed; the patients with higher OS-MRS classes had longer length of stay in the hospital and longer duration of surgery. Moreover, longer length of stay was slightly associated with longer surgery duration.

**Key words:** Obesity; Bariatric surgery; Hospital length of stay; Obesity, Morbid/surgery; Obesity surgery mortality risk score; OS-MRS

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### INTRODUCTION

Obesity is nowadays recognised as an important public health problem, having achieved epidemic

proportions. According to World Health Organization, in 2016 the world prevalence of obesity among adults was around 39%,<sup>1</sup> and the same organization estimates that every year at least 2.8 million people

die worldwide as a result of being overweight or obese.

Among the therapeutic options to deal with obesity, there have been some surgical approaches that aim to promote weight loss. Indeed, bariatric surgery can have an important positive impact in obese patients, leading to sustained weight loss, improvement of obesity related comorbidities,<sup>2,4</sup> better quality of life,<sup>5</sup> and ultimately a decrease of all-cause mortality.<sup>6</sup>

To access and stratify the risk of patients submitted to bariatric surgery, DeMaria *et al.* proposed a clinical score to predict 90-day mortality. Obesity Surgery Mortality Risk Score (OS-MRS) ranges from 0 to 5, with 1 point attributed per each of 5 variables: Body Mass Index (BMI) > 50 Kg/m<sup>2</sup>, arterial hypertension, male sex, age > 45 years old and risk factors for pulmonary thromboembolism (previous venous thromboembolism, previous inferior vena cava filter placement, history of right heart failure or pulmonary hypertension and/or history or physical findings of venous stasis). Patients may be classified as Class A (OS-MRS=0-1), B (OS-MRS=2-3) or C (OS-MRS=4-5), with expected mortality of 0.31%, 1.90% or 7.56%, respectively.<sup>7</sup> After the first study by DeMaria *et al.*, several other authors validated the OS-MRS as a useful score to predict 90-day mortality after bariatric surgery.<sup>8-11</sup>

Several authors have studied the OS-MRS relation with surgical complications, with contradicting results: while Sarela *et al.*<sup>12</sup> and Lorente *et al.*<sup>13</sup> have found an association with complications rate, several others have not replicated these results.<sup>14-17</sup>

However, the evidence regarding the association of

OS-MRS with hospital length of stay (LOS) is still scarce, and the authors of this article could only find one study in which both OS-MRS and POSSUM scores were found to be moderately accurate for predicting inpatient stay longer than 3 days.<sup>16</sup>

In this study 474 patients submitted to gastric bypass surgery were retrospectively audited. The primary goal was to evaluate whether there was an association between OS-MRS and LOS after gastric bypass surgery. Additionally, the relationship between LOS and duration of surgery (DS) was also accessed.

## METHODOLOGY

After approval by the institutional review board (114-15; 102-DEFI/NA-CES), a retrospective audit was conducted in a Portuguese tertiary university and central hospital (Hospital de Santo António, Centro Hospitalar Universitário do Porto, Porto, Portugal) between January 2010 and May 2015. Clinical and demographic data were collected, namely: age, gender, American Society of Anaesthesiology (ASA) Physical Status Classification, weight, height, OS-MRS, LOS and 90-day outcome. Patients with incomplete records, submitted to laparotomy or other bariatric procedures than gastric bypass were excluded. According to OS-MRS, the patients were classified as OS-MRS Class A, B or C.<sup>7</sup>

Normality of distribution of continuous variables was tested with Kolmogorov-Smirnov test. Accordingly, to analyse the influence of OS-MRS Class on LOS, the non-parametric Kruskal-Wallis with Dunn's post-hoc test was performed. Spearman correlation test was used to study the relationship between SL and LOS. Categorical data were analysed using the  $\chi^2$  test.

The statistical analysis was performed using SPSS® version 23. A  $p < 0.05$  was considered statistically significant.

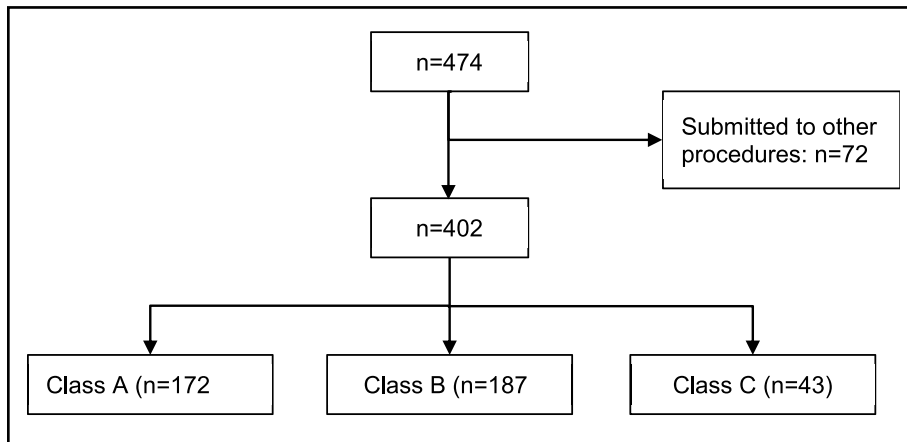
## RESULTS

A total of 474 patients were submitted to a gastric bypass between January 2010 and May 2015. After exclusion criteria, 402 patients were enrolled, and included in three groups, based on OS-MRS Class: 172 patients were classified as Class A, 187 as Class B and 43 as Class C (Figure 1).

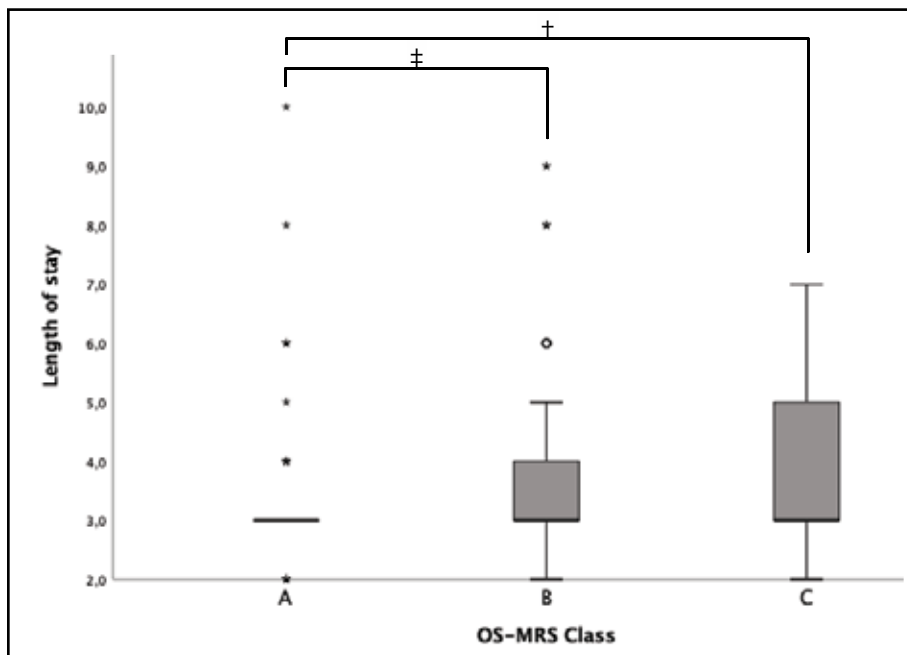
**Table 1: Demographic and clinical data**

| Variable            |   | OS-MRS Class                |                              |                             | p       |
|---------------------|---|-----------------------------|------------------------------|-----------------------------|---------|
|                     |   | A (n=172)                   | B (n=187)                    | C (n=43)                    |         |
| Sex                 | F | 168                         | 149                          | 11                          | < 0.001 |
|                     | M | 4                           | 38                           | 32                          |         |
| ASA                 | 2 | 46                          | 39                           | 3                           | 0.238   |
|                     | 3 | 126                         | 146                          | 38                          |         |
|                     | 4 | 0                           | 2                            | 2                           |         |
| Age                 |   | 36.88 ± 7.73 <sup>a</sup>   | 48.91 ± 9.58 <sup>b</sup>    | 50.86 ± 7.14 <sup>b</sup>   | < 0.001 |
| Body Mass Index     |   | 43.18 ± 6.39                | 44.32 ± 5.94                 | 46.62 ± 7.59                | 0.072   |
| Duration of surgery |   | 127.53 ± 35.95 <sup>a</sup> | 136.88 ± 43.46 <sup>ab</sup> | 151.95 ± 51.50 <sup>b</sup> | 0.007   |
| LOS                 |   | 3.5 ± 2.3 <sup>a</sup>      | 4.2 ± 5.1 <sup>b</sup>       | 5.7 ± 12.6 <sup>b</sup>     | 0.001   |

Values are expressed as mean ± SD except for the sex and ASA classification. Values in the same line that do not share the same superscript are statistically different ( $p < 0.05$ ). See text for more detail.



**Figure 1: Patients included in statistical analysis after application of exclusion criteria**



**Figure 2: Hospital length of stay according OS-MRS classification (‡ –  $p = 0.020$ ; † –  $p = 0.003$ ).**

Table 1 shows the demographic and clinical data. Gender and age were statistically different between groups, while no differences were found in ASA classification and BMI. Moreover, SL was progressively longer with increasing OS-MRS Class, with the difference between Class A and Class C showing statistical significance.

Regarding the primary goal of this study, patients classified as OS-MRS Class A had a statistically significant shorter LOS ( $3.5 \pm 2.3$  days) than patients classified as Class B ( $4.2 \pm 5.1$  days) and Class C ( $5.7 \pm 12.6$  days;  $p=0.001$ ). The difference between patients classified as Class B and Class C was not statistically different (Figure 2).

The study of the relationship between SL and LOS was also performed (Figure 3). Although there is a statistically significant correlation between both variables, the degree of that correlation is weak ( $\rho = 0.203$ ;  $p < 0.001$ ).

## DISCUSSION

There is a positive association between OS-MRS class and LOS, with patients with higher classes having longer hospital stay.

Our results are aligned with a previous work by Gilhooly *et al.*, which showed that both OS-MRS and POSSUM scores were moderately accurate for predicting stay of 3 or more days due to morbidity and poor mobility.<sup>16</sup>

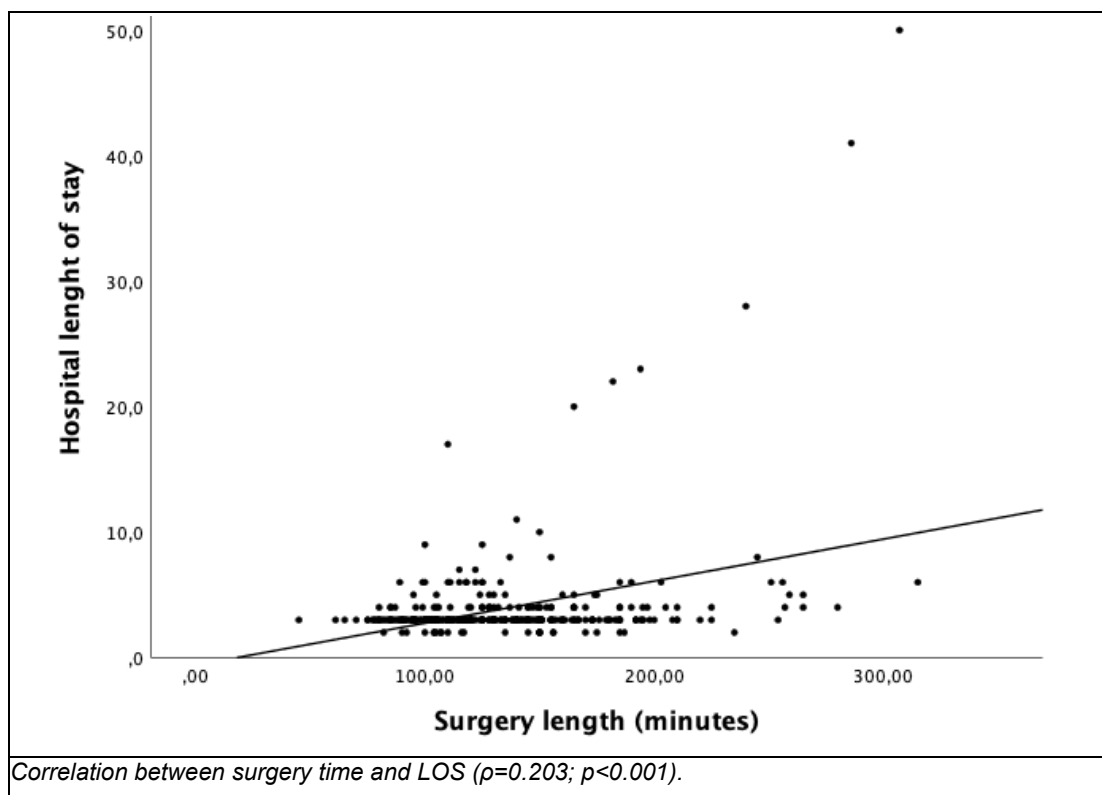
Our study has also found a positive correlation between the SL and LOS. In addition, SL was also progressively longer with increasing OS-MRS class. This finding may be justified with the assumption that the patients with higher OS-MRS class might represent greater technical difficulty for the surgeon, thus

increasing the procedure time. Therefore, both the complexity of the patient and the difficulty of the procedure may explain the longer LOS.

## STUDY LIMITATIONS

Being a retrospective audit, randomization and investigational unawareness were not included. Thus, a prospective, double blind randomized trial may add information to the results shown in this study.

The discharge criteria have not been strictly defined. Furthermore, the clinical records were in many cases incomplete and did not allow a more extensive and complete data collection regarding patient's clinical



**Figure 3: Relationship between duration of surgery and hospital length of stay**

characteristics and their evolution following surgery.

In addition, this was a single centre study, which may affect the generalization of the conclusions.

## CONCLUSIONS

A positive association of OS-MRS with hospital length of stay and duration of surgery was observed, with patients with higher OS-MRS classes having longer length of stay and had longer duration of surgery. Moreover, longer length of stay was slightly associated with longer surgery duration.

**Conflict of interest:** None declared by the authors.

Authors' contribution:

DM: Concept, bibliography review, data collection, statistical analysis, manuscript editing

PR: Concept, bibliography review, data collection, manuscript editing

JO: Concept, statistical analysis, manuscript editing

CF, FC: Concept, bibliography review, manuscript review, final approval

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