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The First Validated Nomogram to Predict 30-Day Mortality Following Surgery for Small Bowel Obstruction

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Objective: Surgery for small bowel obstruction (SBO) is associated with significant mortality and surgeons are being increasingly faced with complicated cases that have several risk factors for fatal outcomes. To date, there have been no studies examining the interaction of several risk factors and their additive effect on mortality. Our aim was to construct a comprehensive and validated model that takes into account all the factors that predict mortality in patients undergoing surgery for SBO. Design: Using the ACS-NSQIP database from 2005 to 2010, we conducted a retrospective review of SBO cases caused by adhesions or incarcerated hernias that underwent operative management. With 30-day mortality as the primary endpoint, a predictive model was built using 52 presurgical, 8 surgical and 16 postsurgical variables. We split the data into two sets: training set (75%) and a validation set (25%). The LASSO algorithm for logistic regression was applied to the training set with 10-fold cross-validation and the 1-SE rule used to select predictive variables. The ROC curve and the AUC statistic were used to test our model's predictive ability. Results: A total of 17,379 cases of surgical SBO cases were identified. The cause of SBO was attributed to Adhesions in 74% of cases whereas incarcerated hernia accounted for the remaining 26%. The 30-day mortality was 5.7%. LASSO identified several predictors of mortality listed in the table. The following factors were not found to predict mortality: gender, obesity, smoking, diabetes, emergency surgery, surgery day, disease type, and the use of laparoscopy. Thirty-day mortality can be predicted via the following equation: ex / (1 + ex) where x in the sum of coefficients. The predictive model performed well with a high predictive power and an AUC=0.92. Conclusion This is to date the most powerful and the only validated nomogram to predict 30-day mortality following surgery for SBO. This model represents an easy-to-use tool for surgeons to risk-stratify and counsel patients and can be used as a quality outcome measure. Implementing strategies to modify certain risk factors may lower mortality in surgical SBO cases.

Predictors of Mortality Following Surgery for SBO: Coefficients and Odds Ratios

	Coefficient	Odds Ratios
Intercept	-6.30	
Preoperative Factors: ASA V	1.66	5.27
ASA IV	0.82	2.27
Disseminated cancer	0.80	2.24
Ventilator dependence	0.78	2.18
Septic shock	0.75	2.12
Dialysis dependence	0.40	1.50
Sepsis	0.38	1.46
Peripheral vascular disease	0.28	1.32
BUN>40	0.24	1.27
Ascites	0.21	1.23
COPD	0.18	1.19
Weight loss>10%	0.08	1.09
Age (absolute number multiplied by coefficient)	0.04	1.04
Pneumonia	0.03	1.03
Creatinine>1.2	0.02	1.02
Hematocrit>38	0.02	1.02
Operative Factors: Bowel Gangrene	0.51	1.66
Bowel Resection	0.15	1.16
Contaminated Case	0.07	1.07
Postoperative Factors: Shock	1.64	5.18
CVA	1.05	2.87
Acute Renal Failure	0.90	2.47
Re-Intubation	0.71	2.03
Myocardial Infarction	0.64	1.89
Bleeding	0.17	1.18
Return to OR	0.11	1.12
Failure to wean	0.05	1.06

Coefficients can be added together