

The ALFA Score Predicts 30-day Mortality after Elective Anterior Lumbar Interbody Fusion

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INTRODUCTION:

Anterior lumbar interbody fusion (ALIF) is an effective procedure for treatment of a variety of degenerative pathologies of the lumbar spine but is not without risks. The aim of this study was to develop and externally validate a risk calculator that could be used to predict mortality in patients undergoing ALIF.

METHODS: A total of 8,851 one or two level elective ALIF operations were identified from the National Surgical Quality Improvement Program American College of Surgeons (NSQIP-ACS) database from 2012 to 2018. Patients who had trauma, cancer, infection, spinal deformity, posterior arthrodesis, or were <18 years old were excluded. Bivariate analyses and multivariable logistic regression were employed to determine predictors of 30-day mortality. Factors found to be significant were used to construct a risk calculator (ALFA score). The ALFA score assigned points based on results of nomogram analysis: Age ≥ 65 (3 point), Functional dependence (5 points), ASA classification of ≥ 3 (4 points) and Loss of weight $>10\%$ within 6 months preoperatively (10 points). Optimal tiers for the scoring system were determined using stratum-specific likelihood ratio (SSLR) analysis. The ALFA score was compared to two commonly utilized scores: the ASA physical status classification alone and the 5-factor modified frailty index (MFI-5). Area under the curve (AUC) analysis was employed to assess discriminative ability and the Hosmer-Lemeshow test was used to assess goodness of fit. Youden's Index was utilized to identify the optimal single score cut-off for the ALFA score to determine odds of 30-day mortality. Finally, the score was internally validated using a validation subset of patients from the ACS-NSQIP and externally validated using a cohort of patients undergoing ALIF from the Nationwide Inpatient Sample in 2019.

RESULTS: Perioperative 30-day mortality after ALIF was 0.21% (Nineteen patients of 8,851). The AUC of the logistic regression model of the ALFA score was 0.79 on the internal training set and 0.80 on the internal validation set. This was more accurate than both the ASA physical status classification alone (AUC 0.73) and the mF-5 (AUC 0.67) with statistical significance ($P < 0.05$). SSLR analysis produced 4 distinct categories based on risk of mortality: 0.05% for score of 0, 0.28% for a score of 1-7, 2.2% for a score of 8-12, and 14.2% for a score of 13+. Compared to an ALFA score of zero, an ALFA score of 1-7, 8-12, and 13+ had 6x, 44x, and 334x greater odds of mortality ($P < 0.05$ for all). The optimal cut-off for the ALFA score was determined to be ≥ 7 (LR+ 3.6, J=0.49). The ALFA score had an AUC of 0.71 on external validation with NIS. The Hosmer-Lemeshow p-value was 0.10 indicating goodness of fit.

DISCUSSION AND CONCLUSION:

The ALFA score can help identify patients who may be at higher risk for perioperative mortality after ALIF.

