Clinical Risk Scoring Model for Predicting Composite Surgical Site Complications in Patients Undergoing Abdominoplasty Using a National, Multi-Institutional Database

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BACKGROUND

Abdominoplasty remains one of the most performed cosmetic surgeries in the United States. While there are high overall patient satisfaction rates, the procedure also has one of the highest complication rates in cosmetic surgery, including delayed wound healing, and seroma formation

OBJECTTIVE

To provide an informed and validated model of post-operative care, we sought to create a scoring system that can predict the likelihood of wound complications and surgical site infections after abdominoplasty, using a national multi-institutional database

METHODS

Patients who underwent abdominoplasty in the ACS-NSQIP 2007–2019 database were analyzed. The cohort was divided into 60% random testing, and 40% validation samples. A multivariable logistic regression analysis was performed to isolate independent factors of surgical site complications using the testing sample (n = 11,294). The predictors were then weighted according to beta coefficients to develop an integer-based clinical risk score predictive of complications. This system was then validated using receiver operating characteristics (ROC) analysis of the validation sample (n = 7,528).

RESULTS

Independent risk factors for composite surgical site complication included inpatient procedure ($p < 0.01$), smoking ($p < 0.01$), ASA class of 3 or higher ($p < 0.01$), and BMI greater than or less than the normal range of 18.5-24.9 ($p < 0.01$)

CONCLUSION

We believe this scoring system will enable physicians to screen their patients preoperatively and strategize intervention for patients considered higher risk in order to decrease patient morbidity and reduce health care expenditure

Figure 2: Score risk groups for surgical morbidity

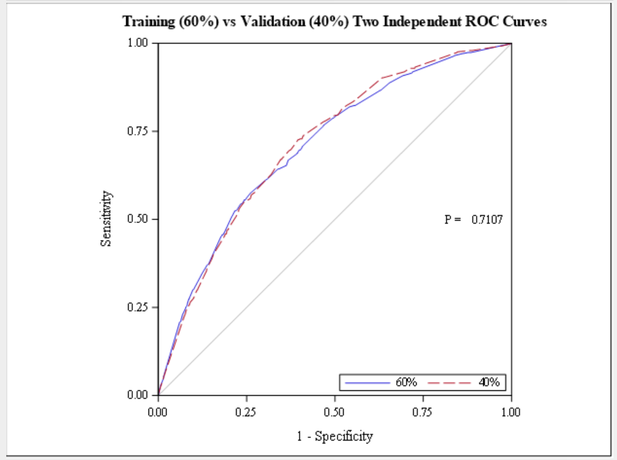

Figure 1: ROC curve for surgical morbidity. The AUC is 0.71

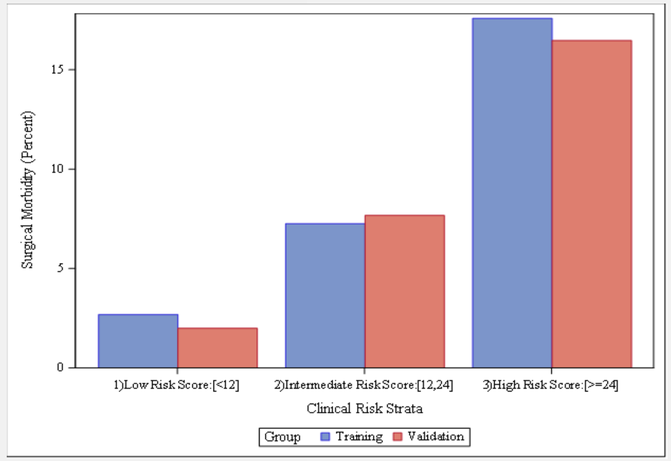

Table 2: Multivariate regression analysis for surgical morbidity

Variable	Multivariate regression: extensive adjustment			Scoring System	
	Odds Ratio	*P* value	95 % CI	β coefficient (SE*)	Integer score
Inpatient status	1.84	< 0.001	(1.59 – 2.15)	0.61 (+//– 0.16)	6
Race		0.0003			
White	Ref	—	—	—	—
Black	0.627	0.0005	(0.48 – 0.81)	–0.47 (+//– 0.08)	–5
Other	1.177	0.5718	(0.67 – 2.07)	0.16 (+//– 0.01)	—
Unknown	1.198	0.0570	(1.00 – 1.44)	0.18 (+//– 0.04)	—
Smoker within 6 months pre-op	1.619	< 0.0001	(1.30 – 2.01)	0.48 (+//– 0.08)	5
ASA Class		< 0.0001			
1/2	Ref	—	—	—	—
3/4/5	1.628	< 0.0001	(1.37 – 1.93)	0.49 (+//– 0.11)	5
Body mass index		< 0.0001			
Normal	Ref	—	—	—	—
Underweight	1.475	0.7058	(0.20 – 11.09)	0.39 (+//–0.01)	—
Overweight	1.495	0.0121	(1.09 – 2.05)	0.40 (+//– 0.1)	4
Obese I	2.151	<0.0001	(1.58 – 2.94)	0.77 (+//– 0.18)	8
Obese II	3.917	< 0.0001	(2.87 – 5.34)	1.37 (+//– 0.32)	14
Integer Range					[–5, 42]

This multivariable logistic regression model adjusted for the following perioperative variables: 1. Age (continuous), 2. Gender (dichotomous), 3. Smoking (Dichotomous), 4. Race (categorical), 5. Inpatient status (dichotomous), 6. Operation year (categorical), 7. Body mass index class (categorical), 8. Diabetes mellitus with oral agents or insulin (dichotomous), 9. Chronic steroid use (dichotomous), 10. Dyspnea (dichotomous), 11. Functional health status pre-operative (categorical), 12. Chronic obstructive pulmonary disease (dichotomous), 13. Hypertension requiring medication (dichotomous), 14. History of disseminated cancer (dichotomous), 15. History of bleed disorders (dichotomous), 16. Preoperative weight loss of [10 % in last 6 months (dichotomous), 17. Wound classification (categorical), 18. Preoperative platelet count (continuous), 19. Preoperative International Normalized Ratio (continuous), 20. Preoperative hematocrit (continuous), 21. Pre-operative serum albumin (continuous), 22. Operation time (categorical), 23. Length of hospital stay (continuous), 24. American Society of anesthesiologist classification (categorical)

**SE* standard error, represented throughout the text and tables by the symbol "+//–"